SILESIAN UNIVERSITY OF TECHNOLOGY
SCIENTIFIC PAPERS

ORGANIZATION AND MANAGEMENT
Scientific paper no. 151

CONTEMPORARY MANAGEMENT

Edited by

Radosław WOLNIAK

GLIWICE 2021

Druk z materiałów przygotowanych przez autorów
Redakcja Wydawnictwa nie odpowiada za stronę językową i treść artykułów

Wydano za zgodą
Rektora Politechniki Śląskiej

ISSN 1641-3466

WYDAWNICTWO POLITECHNIKI ŚLĄSKIEJ
ul. Akademicka 5, 44-100 Gliwice
tel. (32) 237-13-81, faks (32) 237-15-02
www.wydawnictwopolitechniki.pl

Sprzedaż i Marketing
tel. (32) 237-18-48
wydawnictwo_mark@polsl.pl

Nakł. 50 + 44	Ark. wyd. 57	Ark. druk. 46	Papier offset 70x100, 80 g

zam.

CONTENTS

FOREWORD

Presented number of Silesian University of Technology. Scientific Papers. Organization and Management Series concentrate on various aspects of contemporary management. The number contains results of researches of scientist from various Polish and International Universities. The number consists of 50 papers.

The papers presented in the number are connected with many topics connected with organization and management. Authors in his papers concentrate problems connected with: marketing management, production management, human resources management, Corporate Social Responsibility, quality management, Industry 4.0, relationship management, environmental management, logistics, risk management, international management, Smart City.

Radosław Wolniak

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE AGRICULTURAL SECTOR MARKETING POLICY IN TANZANIA: THE VALUE ADDED TO ECONOMIC GROWTH

Emilia BAMWENDA

emilia.bamwenda@gmail.com, ORCID: 0000-0002-9635-4334

Purpose: The aim of the article is to analyze the existing marketing policies of the agricultural sector and their impact on economic growth. The author will attempt to answer the following questions: What marketing strategies have been used in the Tanzanian agricultural sector? Can effective marketing strategies create greater added value for agricultural products? And are the developed marketing strategies for trade in agricultural products able to accelerate economic growth?
Design/methodology/approach: The author bases this article on the institutional and legal method. Analysis of selected government documents and existing studies will allow to obtain answers to the research questions and to describe descriptively the initiatives taken by the government. The above method is complemented by direct and indirect observations in the public sector and non-governmental centers in the regions of Bukoba, Kilimanjaro, Arusha, Mwanza, Dar es Salaam and Iringa, which the author conducted during two study trips in 2016 and 2017. The analysis of literature in this paper reveals that Tanzania has an extensive set of policies, strategies and programs designed to support agricultural marketing.
Findings: Public policy aimed at strengthening agricultural marketing can have a positive impact on farmers' activities by creating opportunities to develop a system for efficient sourcing of inputs, high yielding production, harvesting and warehousing and trade of agricultural products, or developing "instructions" for the marketing process. The study shows that political declarations and goals contained in national development frameworks are compatible with each other. The problem arises during the implementation of developed policies and resourcing the implementation process, which in its assumptions are aimed at improving society's quality of life and wellbeing of people in rural areas.
Practical implications: There is also a potential risk that the developed policy may have a negative impact and create impediments to the functioning of trade in agricultural products shaping various types of restrictions for farmers in the sphere of freedom to sell their goods in the form that customers expect from them (e.g. stunting of local food crops market activities, flexibility of a farmer where to sell his goods).

Keywords: marketing, economics, economic growth, development.

Category of the paper: Research paper.

1. Introduction

Tanzania is pursuing structural economic transformation with the aim of increasing productivity and output in strategic productive sectors, raising opportunities for employment and income generation, increasing public sector revenue and GDP growth to above 7% annually, and transforming the country into a strong and competitive middle income economy by 2025 (URT.2000. Tanzania Development Vision; National Five-Year Development Plans 2010/11-2015/16, and 2016/17-2020/21). During these first five year development plans I and II, the Government is working to address infrastructure needs with the country's transportation and energy sectors, improved productivity in the agricultural sector, increase in number of skilled labor, and enhanced business and investment environment. Selected Tanzania's economic and business indicators are summarized below in Table 1.

Table 1.
Tanzania Economic and Business Indicators

Indicator	Value	Reference
GDP Annual growth rate, (%)	7.2	Jun-19
Unemployment rate, (%)	9.7	Dec-19
Inflation rate, (%)	3.6	Oct-19
Interest rate, (%)	7	Sep-19
Balance of trade, (USD million)	-756	Sep-19
Current account (USD million)	-109	Sep-19
National debt (USD million)	23,770	Nov. 2019
- External debt (USD million)	17,500	Nov. 2019
- Domestic debt (USD million)	6,250	Nov. 2019
Competitive Index	48.19	Dec-19
Tanzania population (million)	57.3	Dec-19
Agriculture growth rate	5.2	Dec-19
Crops subsector growth rate	5.8	Dec-19
Contribution of the agricultural sector to GDP	28.2	Dec-19
Contribution of manufacturing sector to GDP	8.5	Dec-19

One of the biggest challenges facing countries in the period of economic transformation is the system of selling their agricultural products, both on the domestic and export markets. Professional agricultural marketing is seen as a way to overcome seasonal agricultural surpluses and shortages in food supply, by affecting food prices, and as a means to generate more income for producers. Trade in agricultural products in Tanzania presents unique challenges and requires special attention due to the bulk and impermanence of crops. Most of these products are basic food products whose prices and distribution are considered by governments as strategic for the implementation of development policy (URT. 2016. Agriculture Sector Development Programme Phase II, May 2016). Therefore, establishing resourced and effective institutions that will steer and oversee the marketing system of agricultural products is a prerequisite for changing the status quo in agricultural production (URT, 2011).

Successful agricultural marketing depends on many factors, i.e. effective sector institutions, quality infrastructure, appropriate technologies and production methodologies, efficient transportation, efficient value addition and processing, packaging, business and retail services and a robust information system. Marketing of food products can be seen in macro terms as a business activity related to the transfer of food products on the value chain from farms to consumers, or in micro terms related to business activity, directly affecting the flow of both services and products to consumers while strengthening the objectives of farmers or enterprises (Mutayoba, and Ngaruko, 2015). In the literature on the subject, there are also concepts such as agribusiness and food marketing. Robert E. Branson and Douglass G. Norvell attempted to combine these concepts and introduced to the discourse the concept of agro-marketing regarding all activities related to agricultural production, purchase of agricultural products, processing and distribution to final buyers (Szwacka-Mokrzycka, 2016). For the purposes of the article, the author assumes that agricultural marketing is a study of all activities of entities and policies related to the purchase of agricultural inputs, agricultural production as well as the process of processing and moving agricultural products from the producer to the consumer.

This definition highlights the fact that the provision of infrastructure, technology or transport is not a sufficient condition to ensure a smooth flow of agricultural goods. It is also necessary to create a favorable policy environment that gives freedom to key players to take advantage of emerging marketing opportunities in the country and beyond. Since the mid-1980s, the Tanzanian economy has undergone a fundamental transformation that has redefined the role and function of government and the private sector in the economy. Agricultural marketing has evolved through three major phases, i.e., the post-independence unregulated marketing system (1961-1967), the centrally controlled marketing system by the public sector during Arusha declaration era (1967-1989), and the current liberalized marketing system. During the transition from the socialist system to the free market system in 1980s, most of the production, processing and marketing functions were transferred to the private sector, while the government retained regulatory functions and public support. Decentralization of prices was done; monopolies of agricultural cooperatives and commodity boards were eliminated. In addition, new marketing policies and strategies were formulated and rolled out to address an uneven growth of national food crops markets, large falls in production of traditional export crops, and an increase in subsistence agriculture and rural poverty. Recently, it emerged that the adopted agricultural marketing strategies have not been successful, mainly due to the fragmented policy and lack of a structured marketing system that would guarantee producers reliable markets for selling their crops. In addition, the low ability of agribusiness entities to conduct market activities and influence increased access to agricultural inputs was the result of limited skills in the field of entrepreneurship of suppliers, producers and underdeveloped infrastructure, unfavorable legal and institutional framework, and insufficient competition. This necessitated a return to government intervention that plays a proactive role, particularly in the event of market failures to oversee private sector development and create favorable conditions for private sector participation in agricultural marketing (URT, 2008).

2. Agricultural sector and trend in agricultural production

Agriculture has been at the heart of Tanzania's political strategies since independence in 1961. The development process and economic growth were pursued through market interventions as the main instrument of policy implementation. The structure of agriculture was based on cereals, roots and tubers, whose previous harvest was too limited to be able to feed the growing population. The post-colonial economic system meant that industrialized countries were buying crops from former colonies, such as Tanzania (by then Tanganyika) for processing and re-selling ready finished goods again to the buying point, which made the Tanzanian economy increasingly dependent on external trade partners. During the first and second phase Government, with the increasingly strong position of the national party TANU, which later was transformed into CCM, and its leader Julius K. Nyerere, Tanzania underwent a political reform towards socialism created for the needs of Tanzanians. In 1967, the development policy under the Arusha Declaration took a number of initiatives to improve rural and agricultural landscapes, introduce municipal systems, price control mechanisms, and establishment of grants and marketing promotion of agricultural goods. Agriculture was the main sector to which Nyerere wanted to achieve real national independence and reduce dependence on foreign aid. The Arusha Declaration enriched the agricultural structure with the cultivation of cereals and legumes and increased the production of other goods (Mhando, 2011).

At the beginning of 1980, Tanzania could easily feed a rapidly growing population based on basic food production at 23-33% above WHO minimum rates. In the composition of the basic food basket, cereals have become a more important product for cultivation than roots and tubers. The structure of products consumed by an average Tanzanian also changed. In 1961, 35% of all basic energy obtained from food came from cassava and other roots and tubers, and 54% from cereals mainly from corn. In 1980s, basic calorie intake came in 63% from cereals, and only 27% from cassava and other roots and tubers. It is also important to emphasize the change in structure in the consumption of cereals. The importance of maize slowly decreased as rice consumption increased. The reason was urbanization in large industrial centers and slow development of the middle class. Production of cereals as well as tubers and roots at the turn of the 70s and 80s gained the greatest value in history (Leliveld et al., 2013).

Droughts, the war with Uganda, the oil crisis, the drastic decline in exports of major commodities such as coffee and sisal, and too rapid a desire for institutional and social changes caused the assumptions of the Arusha Declaration to fail and the country fell into an economic crisis in 1980s. In order to save the economy, the Tanzanian government had to turn to international financial institutions for help. Negotiations on loans from the International Monetary Fund (IMF) took a long time, mainly due to Nyerere's reluctance to give up the socialist regime and way of life (Ujamaa). In 1985, structural reforms aimed at the market were introduced with the great involvement of the IMF and the World Bank. Lack of state

intervention in economic matters had to create an environment in which prices will be shaped by the market, and the removal of subsidies for farmers will trigger measures to stimulate productivity and specialization of production. The rationale was that it was necessary to introduce institutional changes to increase the efficiency and effectiveness of agricultural production by changing the structures of production and marketing incentives. In the agricultural sector, structural adjustments were sought to increase producer prices and more effective marketing (Boulay, 2007). However, these changes turned out to be unfavorable for the economy of Tanzania, like in other economies in which the structural adjustment programs were introduced by the World Bank and the IMF.

The liberalization phase was favorable for the production and export of coffee and cotton, but the results of the export sector were still much lower than those in the 1960s. However, the most important part for the agricultural sector was that the harvest of cereals, tubers and roots products deteriorated. Cassava harvest level fell by about 50%. The removal of the subsidy also impacted the production of maize, whose yields fell by 22.5% per capita (McKay et al., 1997). In addition, the spatial structure of cereal crops changed due to increasing input and transport costs, which resulted in production moving closer to urban areas. Another important aspect of the failure of structural adjustment reforms was the liberalization in other countries on the basis of the same assumptions, which led to increased supply in global markets and at the same time resulted in reduced prices. Consequently, liberalization policies overlooked important factors related to the successful transformation of economies and their recovery from the crisis.

The government's monopoly on export crops was completely abolished, and in 1994 the Government began to allow private companies to buy half of the cotton production. At that time, the producer's share in the cotton export price was about 40% in 1989-1994 and increased to around 50% in 1995-2000 (Baffes, 2004). Despite the improvement in marketing efficiency and a slight increase in production in the mid-90s, the limitation of access to loans for financing production components was the main constraint for the poor farmers. It is also worth paying attention to the production of coffee. Although the coffee was entirely produced by small farmers, the Tanzania Coffee Board (TCB) had a monopoly on marketing, processing and export until the mid-90s. Private entrepreneurs had the opportunity to market and process coffee, even though exports were still carried out at TCB auctions. In 1997, there were already five fully vertically integrated exporters on the market (branches of multinational coffee companies) who dealt with domestic trade, processing, and export of coffee. During this period, marketing margins were drastically reduced, and the producer price as a share of the export price increased from 50% to over 90% (Morrissey, and Vincent, 2007).

From the mid-90s, sweet potatoes began to play a large role in the structure of agricultural production, but grains still accounted for more than half of agricultural production. Their production after economic liberalization began to decline sharply, mainly due to poor productivity and production conditions, which had significantly lower rates than during the economic crisis in the early 1980s (Figures 1 and 2). Efforts were made to address farm productivity challenges through technological progress and improved production methodologies. This includes increase the intensification of land use to raise production per hectare on an average farm (Skarstein, 2005). However, the intensification of land productivity at that time was associated with land degradation and a decrease in the land-to-work ratio, which forced small producers to intensify their crops.[1] Low real prices and limited marketing possibilities meant that the production was intended for own consumption and not for sale.

The growth dynamics in the agricultural sector in the 1990s was variable and relatively weak compared to the rest of the economy. The policy changes at that time led to a gradual withdrawal of government support. The agricultural sector was de-mechanized by declining investment and deregulation. However, the structural adjustment program strengthened the role of markets and led to price stability and higher levels of overall macroeconomic growth, but this did not impact the agricultural sector according to expectations. Therefore, most of the programs developed since the mid-90s on the development of the state were based on enhancing the dynamism of the agricultural sector.

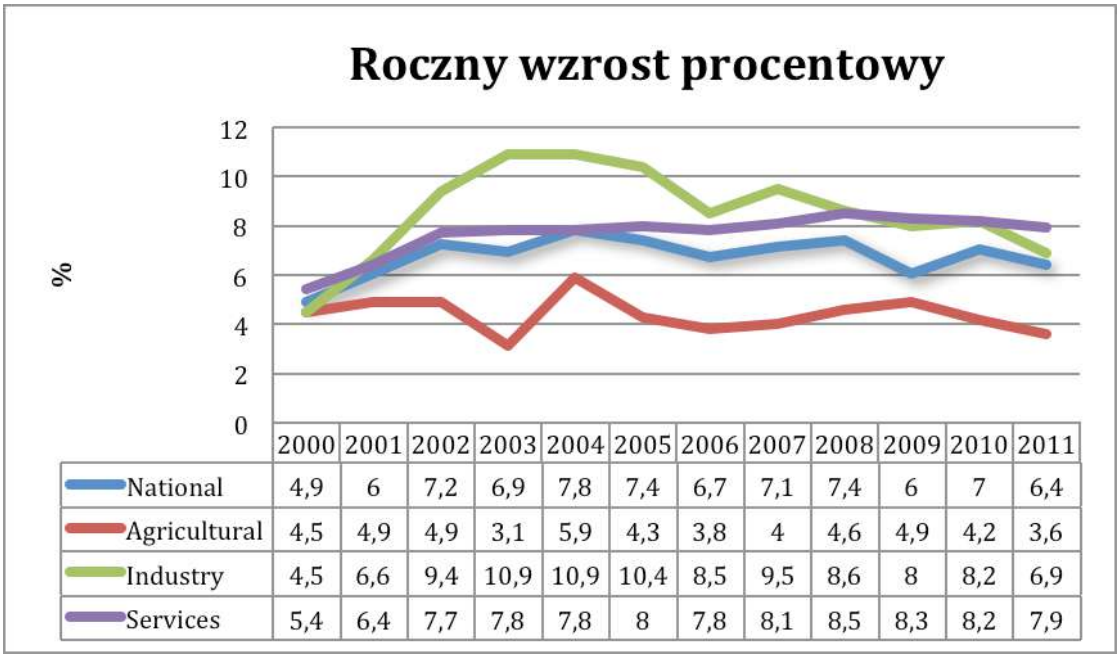
Thanks to the agricultural development programs, a change in the structure of agricultural cereal production was increasingly visible. The production of maize, which is the basic component of consumption among Tanzanian people, did not keep up with the rapid increase in population and developed at a much slower rate than the production of rice or wheat. However, it is worth indicating that the cultivation of these two products, in addition to small holder farmers, was increasingly carried out by commercial enterprises using modern means of production. Despite the rapid increase in rice and wheat production and overall favorable agro-ecological conditions, Tanzania remained a net importer of cereals because production could not keep up with the growing consumer demand. Root crops, with an annual growth of over 4% in 2000-2007, began to be important in the structure of agricultural production and accounted for almost 15% of harvested crops. In contrast, legumes with greater added value fell by more than 4% per year. These production losses were replaced by a rapid increase in oilseed crops that could easily be processed and sold as the final product. The fastest growth rates in the first decade of the 21st century concerned export-oriented crops, which was consistent with the assumptions of long, medium, and short-term development policies. Traditional export crops such as cotton, sugar cane and tobacco grew at a rate of 10% per year. In total, these three crops generated 17.4% of total commodity exports in 2007.

[1] It should be added that this situation was influenced by the increase in the population in rural areas, which resulted in the cultivation of less and less fertile land, without the possibility of obtaining funds for its harvest.

In the late 1990s, animal husbandry and fishing emerged to be key subsectors, accounting for almost a third of agriculture's contribution to GDP. Fisheries developed at a similar pace as agricultural production, increasing by 5.15%. However, the breeding lagged with only 3.3% annual growth. Income generated from cattle and poultry farming was the only reliable source of income in many parts of the country, and their slow growth had a significant impact on poverty rates (Pauw, and Thurlow, 2010).

An analysis of production trends indicates that the source of growth in 2000-2007 were mainly cotton, tobacco and sugar (which, as previously indicated, were mainly produced by commercial large agricultural enterprises). As a result, agriculture alone did not have staggering effects in the fight against poverty. Lessons from unsuccessful structural adjustment reforms as well as growth-based policies forced the government to apply not only pro-growth but also development-oriented policies in development strategies.

Today, the agricultural sector is still based on the cultivation of corn, cassava, rice, sorghum and millet, which are used to meet basic caloric demand, while the main export crops are still sugar, coffee, cotton, tobacco and tea. Favorable climatic conditions in many regions of Tanzania provide an opportunity for the development of the agricultural sector on a large scale. The country has a well-equipped potential base for the development of agriculture itself, but productivity is still low. Agriculture is characterized by the fact that farms are usually between 0.9 and 3 hectares, and production is dominated by subsistence, family farms, which largely feed on their crops, and only a quarter of their production, or even less, is sold at fairs for the local community. Buying products at a good market price is therefore still crucial for farmers.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
National	4,9	6	7,2	6,9	7,8	7,4	6,7	7,1	7,4	6	7	6,4
Agricultural	4,5	4,9	4,9	3,1	5,9	4,3	3,8	4	4,6	4,9	4,2	3,6
Industry	4,5	6,6	9,4	10,9	10,9	10,4	8,5	9,5	8,6	8	8,2	6,9
Services	5,4	6,4	7,7	7,8	7,8	8	7,8	8,1	8,5	8,3	8,2	7,9

Figure 1. Annual economic growth by sector. Source: Ministry of Finance Tanzania, 2011.

Table 2.
Shares of the Agriculture sector (Forestry, Fishing and Crops) in GDP

Economic activity	Shares of gross domestic product by kind of economic activity, at current prices, (%)						
	Year						
	2012	2013	2014	2015	2016	2017	2018
Agriculture, Forestry, Fishing and Crops	26.55	26.79	25.80	26.75	27.44	28.76	28.25
Crops	14.12	14.39	14.00	14.07	15.20	16.59	16.21
Livestock	7.43	7.65	6.76	7.59	7.57	7.46	7.61
Forestry	2.79	2.84	3.00	3.10	2.86	2.79	2.67
Fishing	2.17	1.89	2.01	1.95	1.78	1.89	1.72
Agriculture support services	0.04	0.04	0.04	0.03	0.03	0.03	0.03

Source: Tanzania National Bureau of Statistics.

Most agricultural products are sold at low market prices due to low quality resulting from low use of improved technologies and inputs such as fertilizers, improved seed varieties, the inadequate use of plant protection products, insufficient market demand, and low purchasing power of brokers and consumers. Thus, the low production output is mainly due to low investment per acre that result in poor productivity, limited and narrow range of cultivation of diversified crops, which also significantly affects the amount of the actual selling price of crops offered by farmers. Prices are also affected by a weak mechanism for accreditation, testing, quality monitoring and evaluation, and standards of agricultural products (Mashindano, and Kaino, 2009). In addition, the agricultural sector is characterized by traditional farming methods, with limited use of modern inputs and inefficient allocation of resources. In addition, this sector has weak linkages with other productive and support sectors, and has an underdeveloped marketing system as well as an underdeveloped infrastructure affecting access to both domestic and international markets. Figure 2 shows several productivity indicators over time. It can be seen that both the Food Production Index (FPI) adjusted for employment in the agricultural sector, as well as cereal yields measured in kilograms per hectare suggest that in 2007, the level of productivity in terms of production fell to the level of the 1980s. However, the value of production has been increasing steadily since 1990s, which shows the added value per employee in the agricultural sector (Kiratu et al., 2011).

Table 3.
The Trends of Major Food Crops Production (Tons' 000)

Crop/Year	2012	2013	2014	2015	2016	2017	2018
Maize	5,104	5,288	6,734	5,908	6,149	6,681	6,273
Rice	1,170	1,342	1,681	1,937	2,229	1,594	2,220
Wheat	109	102	167	72	76	50	57
Sorghum/Millet	1,052	1,074	1,246	1,007	1,003	1,064	988

Cont. table 3.

Cassava	1,821	1,878	1,664	1,962	2,205	1,342	2,791
Beans/Legumes	1,827	1,871	1,697	1,808	1,959	2,318	1,823
Bananas	842	1,317	1,064	1,195	1,061	845	1,132
Sweet potatoes	1,418	1,808	1,761	1,645	1,491	2,008	1,608

Table 4.

Trends of Major Cash Crops Production (Tons). Source: Ministry of Agriculture

	Year						
Crop	2012	2013	2014	2015	2016	2017	2018
Cotton	225,938	357,130	246,767	203,312	149,455	132,934	222,039
Coffee	33,219	71,200	47,301	41,674	60,691	48,329	45,245
Tea	32,810	33,700	33,000	35,750	32,629	26,975	34,010
Pyrethrum	5,700	5,700	6,100	7,090	6,050	2,150	2,400
Tobacco	126,624	86,359	100,000	87,737	60,691	81,976	50,522
Cashwenut	160,000	127,947	123,449	197,933	155,416	265,238	313,826
Sisal	25,690	34,875	37,571	39,204	42,314	36,533	40,635
Sugar	262,880	296,697	294,421	304,007	293,075	326,447	303,752
Total	872,861	1,014,008	889,599	915,667	796,512	901,641	967,184

Table 5.

Horticultural Output (tons)

Crop	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Fruits	3,938,730	4,096,2804,	4,416,690	4,574,240	4,711,000	5,243,343	3,703,124
Vegetables	901,680	937,750	1,005,305	1,041,375	1,189,000	1,298,388	1,595,489
Flowers	9,850	10,200	10,790	11,140	11,500	11,615	12,622
Spices	7,370	8,125	8,377	8,609	20,400	22,062	22,062

Source: Ministry of Agriculture.

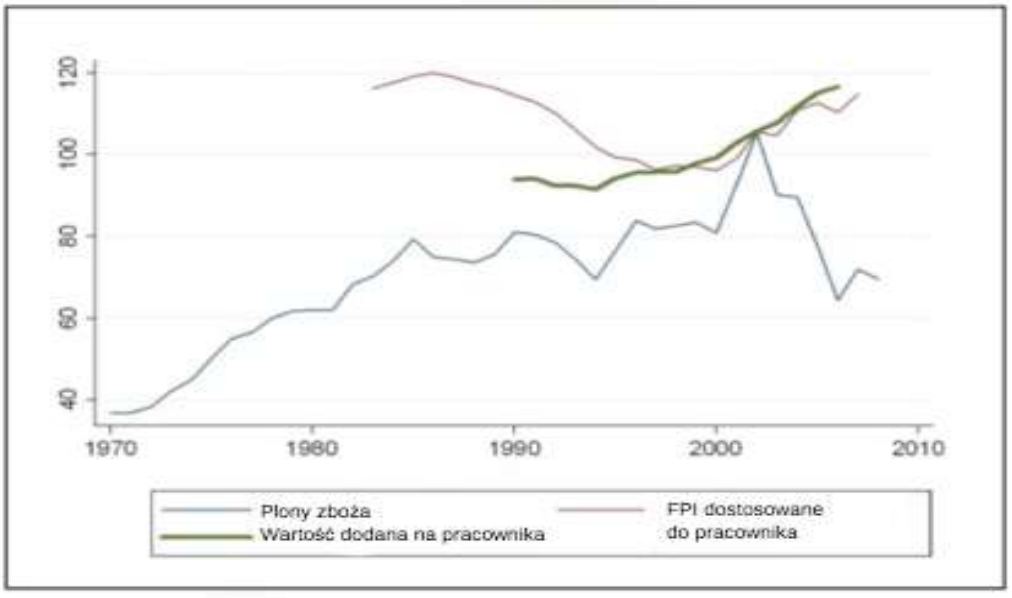


Figure 2. Production indicators of Tanzania, 1970-2007. Source: based on data from the World Bank.

The main food products that are consumed by Tanzanians are rice, corn, and cassava, which constitute 43.9% of the daily calories, as well as sweet potatoes, bananas and sugar cane. In contrast, meat and fish consumption is only 6.6% (Derksen-Schrock et al., 2011). Figure 3 indicates that most food products are based on starch and low protein content. The growing prices of fertilizers, seeds, fuel, and mechanical agricultural equipment are affecting production, which can be seen in the decrease in cassava production and fluctuations in maize production. It is worth noting, however, that the growing population, which is estimated at around 1 million births a year, requires an increasing effort in the production of major products consumed by society. Many factors affect the selection of specific plants for cultivation, including physical factors such as soil quality and water availability, economic factors such as marketability and seed prices, individual household preferences, crop profiles and their resistance to pests, and resources of machine and fertilizer availability (Greig, 2009). Another key factor is the impact of climate change, which result in variability of precipitation in fertile agro-ecological zones (Bamwenda, 2012).

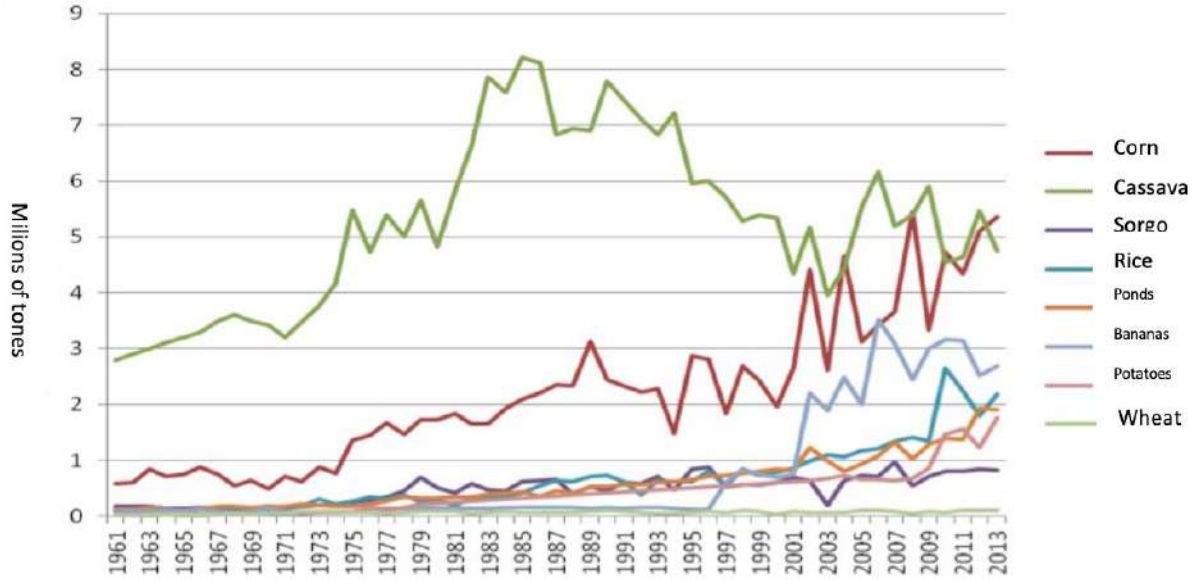


Figure 3. Agricultural production of Tanzania. Source: based on data from the World Bank.

Export, however, is mainly based on coffee, agave, cashew, and tobacco.

Table 6.
Export in billions of TZS

	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Coffe	162,3	225,7	292,8	259,1	204,3	309,7
Cotton	133,1	103,9	164,9	137,7	558,4	79,7
Sisal	11,1	16,9	18,4	25,4	111,3	340,2
Cashew	173,2	189,6	222	301	647,9	497,3
Diamonds	14,2	17	41	63,4	80,3	65,6
Gold	1336,7	3463,8	3410,7	2768,5	2705,7	2717,2
Tabacco	178.8	437,9	348,1	159,5	319,3	428,0
Tea	68.1	73,5	87,5	87,8	72,8	91,0
Total	**2077,5**	**4528,3**	**4585,4**	**3802,0**	**4700**	**4538,8**

3. Agriculture development initiatives.

Agriculture plays a key role in the economy of Tanzania. In order to enable the sector to fully exploit the evolving opportunities a new policy framework, has been developed by revising old policies, strategies, and plans, but more improvements and adjustments to policies have been and are still needed to align to changing production, market and business environments.

In the last two decades, agriculture sector development initiatives were enhanced by the development of the Agricultural Sector Development Strategy (ASDS-I), which was an important guiding tool for the implementation of the sectoral policy. The aim of ASDS is primarily to streamline the process of transforming the agricultural sector into a more modern, commercialized, highly efficient, inclusive, resilient, and competitive sector in the domestic and international markets. Other objectives include achieving food security, reduce poverty, and contribute to the implementation of the Tanzania Development Vision 2025, which provides for raising the overall standard of living of Tanzanian people to the level of a low middle income economy by year 2025 (which was attained in July 20120) (URT, 2009).

After launching the ASDS I strategy in 2001, its implementation was initiated by developing and rolling out the Agricultural Sector Development Program I (ASDP-I, 2006/2007-2013/2014). In practice, this programme addressed constraints that limit the efficiency of the agricultural sector and provide effective guidance for public sector resourcing of interventions that augment the development of the private sector to achieve the optimal development of strategic productive sectors by 2025 (URT, 2015). ASDP-I aimed to create additional opportunities for improving investments in the crops, livestock, and fisheries sectors, increase share of agriculture's in GDP, and its contribution to real GDP growth. This includes achieving basic food availability and access for the nation and improving national nutrition standards by increasing the quality and quantities of farm production. Other aims included improving living standards in rural areas as well as increasing income from value addition and processing of agricultural and animal products to enhance value capture, and to facilitate increased market access in domestic and regional markets. Furthermore, it was intended to raise foreign exchange earnings by encouraging the production and increased export of cash crops, cereals, animal products, by-products and residues, through the production and supply of quality and market-demanded products, including industrial crops, animal products and residues for local industries. Furthermore, it aimed at raising the standard of living of the rural population by developing, introducing, and adapting new technologies that increase labor productivity as well as crop productivity from arable land. The ASDP-I also promoted an integrated and sustainable use and management of natural resources to prevent environmental degradation. Finally, it intended to support the agricultural sector, in areas in which the private sector cannot invest, such as promotion women's and youth's access to land, low cost capital, knowledge and

competences development, and access to reliable and credible information and statistics, including market information (Survey 2, 2020).

More recently, Tanzania has developed and launched the ten-year Agricultural Sector Development Programme II, (ASDP-II) (URT, 2016). It was designed based on the lessons learnt during the implementation of ASDP-I. The programme strategy is mainly focusing on gradual transformation of subsistence smallholder farmers into commercial farmers by enhancing and activating sector drivers and supporting small holder farmers to increase productivity of targeted commodities within sustainable production systems and forge sustainable market linkages for competitive commercialization and value chain development. It will be implemented in two phases each divided into five years implementation period, starting with 2017/18-2022/23). Furthermore, ASDP II aims at transforming the agricultural sector (crops, livestock, and fisheries) towards higher productivity comparable to global levels, increased commercialization and mechanization of agricultural production, improving small holder farmer incomes and living standards, improving food and nutrition security, and increasing sector contribution to GDP.

ASDS and ASDP are implemented so as to achieve the objectives of the Tanzania Development Vision, the Long Term Perspective Plan 2011-2025, the National Strategy for Growth and Reduction of Poverty II, The Five Year Development Plans I, II, and III, and to able the country to eventually undertake a successful economic structural transformation by transferring key resources from low-productivity agriculture to more productive value addition and manufacturing industries.

All the above strategies and development plans are intended to undertake initiatives to: develop a strong linkages between agriculture and other sectors of the economy; create favorable business and investment conditions for the private sector to engage in, invest, and actively participate in farming and value addition activities in the sector; develop effective competences and research programs; and to engage in sustainable production by prudently and judiciously exploiting available natural resources, in particular land, water and forestry.

For Tanzania to reach middle income economic status by 2025, it was set that the agriculture must grow at above 6%, according to the assumptions in the First Five Development Plan and the National Strategy for Growth and Reduction Poverty II. In addition, these plans assume that high levels of productivity and growth in key sectors of the economy are essential factors for a strong and competitive economy. It should be added that agriculture, due to its comparative and competitive advantages, has a significant impact on poverty reduction and strong synergies with other key sectors in the development process (URT, 2016).

4. Agriculture Marketing Policy

Initiatives to improve the functioning of farmers and their participation in the economic life emphasizes the need for access to outlets for farm products and the possibility of obtaining added value to multiply income. In this situation, effective, flexible and fair access to an agricultural marketing system is important. This is one of the factor conditions for supporting market-oriented participation of agriculture in generating income, creating jobs, generating foreign earnings and ensuring an optimal balance between urban and rural areas, providing fair food prices and strengthening links with industry. The then Ministry of Industry, Trade and Marketing, in cooperation with key stakeholders, developed the This included the Agricultural Marketing Policy, 2008 (AMP 2008), which aimed to strategically facilitate the marketing of agricultural products, ensuring fair exchange for all stakeholders based on a competitive, efficient and equitable marketing system (URT, 2011).

This policy guides the marketing activities of agricultural systems, ensures the coherence, profitability, and sustainability of the activities of various market participants, and promotes effective marketing of agricultural products on the domestic, regional and international market. In addition, it recognizes the need to improve marketing capacity in the field of agriculture by facilitating funding, promoting cooperatives, associations and groups, improving marketing infrastructure, timely and appropriate services in the field of agricultural marketing information and intelligence, risk management, investing in agricultural processing as well as marketing research and development. The policy takes into account the main marketing constraints and opportunities in agriculture, including inadequate institutional, legal and regulatory frameworks, poorly developed and maintained marketing infrastructure, limited agricultural processing, the need to improve quality and standards, poor entrepreneurial skills, limited access to finance, as well as insufficient inter-institutional coordination. AMP is expected to properly address these restrictions and thus increase competitiveness of Tanzanian producers and traders on the domestic, regional, and international markets. The policy analyzes the limitations and challenges facing the agricultural marketing system, and then defines strategies and actions to resolve them. It was determined that in order to achieve the set policy objectives, it was necessary to return to state intervention in agricultural marketing. The active role of the government was recognized as a necessary condition in marketing policy for the sustainable development and growth of the agricultural sector. Variability and deterioration in the prices of agricultural commodities on world markets and restrictions on access to local importing markets are just some of the challenges that the government faces today in marketing and promotion of agricultural products. The share of traditional agricultural exports on world markets is decreasing, mainly due to the growing competition from other suppliers, subsidized exports and increasing consumption of substitutes (e.g. jute, nylon, polyester and other synthetics) and the use of non-tariff barriers for traditional exports. In addition, quality and traceability

requirements, ever changing farm and product standards, and requirement on working and social conditions are also constraining Tanzania's trade in agricultural products in the region and internationally (Mugenyi, 2012).

The main task during the implementation of AMP was to accelerate the potential of agricultural processing by adding value and extending the product shelf life. The implementation of this intention was based on the establishment of small agro-processing enterprises and rural sectors of the agricultural industry. The efficient management of commercial agro-industries was to respond to changing market requirements and improve economic growth in rural areas. The whole process has been developed on the basis of the value chain from good land management practices through production, harvesting, small- and medium-scale processing, transport, storage, which is essential in adding value to a given product. Government actions to improve the value added of products and their promotion relate to the promotion of basic agri-food processing, the introduction of special programs and incentives for investors in agro-processing enterprises, investment in research, development and promotion of local products (URT, 2011). The current strategic thrust is to prepare the basic conditions for stimulating rural industrialization.

At sectoral level, the government has formulated a number of policies, including the Agricultural Policy 2013, which is being currently revised to incorporate new local, regional, and global changes in crop production and trade. In addition, the Government is revising the following key development frameworks to align them to current and future dynamics in the production, marketing and trade landscape: Sustainable Industrial Development Policy (SIDP), 1996-2020; Agriculture and animal production policy (ALP), 1997; Cooperative Development Policy (CDP), 2002; Rural development policy (RDP); National Trade Policy 2003; Small and medium-sized enterprise development policy (SMEDP), 2003; National livestock policy, 2006; Agricultural sector development strategy (ASDS) 2001; and the Agricultural Sector Development Program (ASDP), 2005. To date these policies did not effectively address the root causes that are impacting agricultural marketing and other related productive sectors. In addition, Tanzania's agricultural marketing is strongly affected by ongoing liberalization and globalization trends, and emerging pandemics such as the corona virus surges. The country is in the process on reflecting and designing appropriate responses.

The main challenges that the government identified under AMP were:

a) Inadequate value added to agricultural products.
b) Inadequate compliance with standards and quality in marketing of agricultural products.
c) Poor legal and regulatory framework for agricultural marketing.
d) Poor institutional development regarding agricultural marketing.
e) Underdeveloped and poorly managed agricultural marketing infrastructure.
f) Inadequate marketing research and intelligence that inhibits the timely availability of data and information necessary to make an evidence based decision.
g) Limited use of marketing risk management methods.

h) Insufficient access to financial services in the field of agricultural marketing.
i) Inadequate marketing relationships and linkages.
j) Inability to seize and take advantage of opportunities evolving in the country, region and international markets, including preferential market access.
k) Environmental degradation, gender imbalance and caused costs by health concerns, including pandemics such as HIV/AIDS, and COVID-19 (URT, 2008).

All the above led to the call for the formulation of a more comprehensive marketing policy and strategies and an integrated approach to agricultural marketing for the feature perspective.

While efforts are being undertaken to revise the development frameworks and to improve sector conditions, currently, the agricultural marketing policy is being implemented through the Cooperatives Societies Act 2003 which recognizes two structures: the primary society at the local level – the Agricultural Marketing Cooperative Societies and AMCOs, and the federation at national level (Tanzania Federation of Cooperatives, TFC). The AMCOs are the second common type of cooperatives, next to savings and credit cooperatives, SACCOS. There are more than 3,400 AMCOs in the country (TCDC, 2019). Oversight, regulation, and development of AMCOs is overseen by the Tanzania Cooperative Development Commission (TCDC). The AMCOs play a key role in marketing of crops and facilitating participation of smallholder farmers in the crop market. The primary societies in villages market their crops through AMCOs. In addition, the AMCOs, which are supposed to be business and market oriented, have a role in improving knowledge management and the productive capacity of members, managing business negotiations with buyers, enhancing access to extension services, and enhancing better access to information and communication to encourage better food and cash crop marketing. Very recently, the Ministry of Agriculture introduced Agriculture Trade and Marketing Information System (ATMIS) to ease access to marketing information. The buyers are supposed to fill the online forms with information including amount of buying posts applied in the district and corresponding AMCOS and then upload the file to the ATMIS system. A typical case is TIGO KOROSHO, an innovative mobile money transfer service, launched in 2017/2018 season and is available on Tigo Tanzania's mobile financial services platform Tigo Pesa. Farmers are first required to register and subscribe to receive the service through their AMCOs, upon which they are provided with information on collection, transportation, auctioning and purchase of their cashew nut produce through the AMCOs. Once the money from the sale is received into the accounts of the AMCOs, Tigo Pesa through Tigo Korosho service will transfer the payments directly to farmers who have registered to receive the service, with the farmers being alerted of the payments via an SMS message. The farmers are then afforded the convenience to withdraw, transfer or conduct other transactions as they wish via the Tigo pesa platform and wide network of agents.

In terms of cash crop marketing, AMCOs play more than a facilitation role. With cash crops, such as cotton, etc., private traders can only buy cash crops from AMCOs. Traders must receive permits from the District Executive Officer in a given local government authority (LGA) to buy and transport the cash crops out of a village. In the case of cashew nuts, a Warehouse Receipt System, which was introduced in 2008, is used. The system is overseen by the Warehouse Receipt Regulatory Board (WRRB). All the cashew nut produce is auctioned via cooperatives at an auction managed by the Cashew Board of Tanzania (CBT). Farmers deliver the crop to AMCOs and they receive payments in two installments. AMCOs pay the first installment before the cashew is sold, often using a bank loan, and the final payment is made after the cashew nuts are sold to traders at the auction. As a payment to their service, the AMCOs deduct a small commission from the total sales revenue. These funds are eventually distributed among members once all administration costs are covered. The aim of all this is to enhance the value capture for farmers and to prevent exploitation of farmers by unscrupulous traders and middlemen who capitalize on information asymmetry, and immediate needs of money by the farmers to cover the costs of living and education for their children (Anania, and Rwekaza, 2018).

Other efforts include using the information communication technology to facilitate marketing of crops. The public and private sector buyers in collaboration, banks (CRDB, NMB and NBC), and mobile telephone services providers and other private IT-based platforms are making payments to farmers through their bank accounts or mobile wallets. It is now emerging that the farmers are of the view that payment through mobile wallet is more convenient compared to bank account. Previously, farmers who had immediate cash needs and living in low production areas, had to wait up to a month to get their cash from sale of their crops.

The government also undertook marketing of goods on regional and international markets by increasing the export of agricultural products. Agricultural marketing entities were to receive support for negotiating and effective competition of agricultural products on regional and international markets. In addition, the government's task was to protect against unfair commercial practices, transparent application, and predictability of tariffs, and to ensure transparent trade policy rules and regulations in order to harmonize it with other markets. On a local level, the government's actions were based on raising awareness of the possibilities associated with bilateral and multilateral agreements, and producers were encouraged to enter the market directly without the help of intermediaries. Ponda's goal was to improve access to financial services in the field of agricultural marketing and to facilitate credit options, help in risk management, improvement and development of infrastructure or strengthening of entrepreneurial and marketing skills through the support and promotion of training and entrepreneurship programs in which he was to participate also the private sector (URT, 2008).

5. Summary

The agricultural sector development strategies mentioned in the article are an important guiding tool in implementing long-term development strategies. They aim to operationalize the transformation of the agricultural sector into modern, commercial, highly productive, resilient, and competitive on the domestic and international market. These goals are intended to achieve food security and reduce poverty, and to raise the standard of living of Tanzanian people to middle-income countries. All government initiatives have identified issues that limit agricultural sector performance as well as interventions that are consistent with the assumptions of other policies, strategies, and programs.

Tanzania has a very high potential for agricultural development but is still struggling with a change in its structure. There are still a small number of large commercial farms, and production is still dominated by small agricultural producers. They sell a quarter of their crop, while the remainder is used for their own food. Low market prices are still crucial, which is associated with poor crop quality. This relationship is due to the constant use of traditional farming methods and the inability to implement new technologies due to a lack of information and the possibility of obtaining funds for modernization. In addition, the price is affected by a weak mechanism for accreditation, testing, quality monitoring, evaluation, and standards of agricultural products. A continuous attempt to industrialize the country that fails results in the inability to obtain added value. The processing industries for agricultural products remained underdeveloped due to infrastructure. The problem can also be seen in the implementation and operationalization of the principles of government initiatives.

Agricultural marketing is the main tool with which you can achieve ambitious growth goals. However, without updating and effectively and adequately implementing other associated development policies in strategic productive sectors, such as logistics, processing/ manufacturing, and policies related to delivery of affordable factor costs (Affordable credit at competitive rates; skilled workforce; reliable and competitively priced electricity; water, communications; transportation, and efficient ports and customs), it is challenging to successfully introduce efficient marketing activities. The elimination of constraints and improvement of business and investment climate in agricultural marketing is a must in conducting effective, competitive, inclusive and resilient marketing in the agricultural sector.

During the field visits the author identified key issues that need to be immediately addressed by the public sector to facilitate the development of a sustainable, efficient and cost effective crop marketing system. The Government is supposed to increase its commitment and allocate adequate public resources to:

1. Invest in physical infrastructure for efficient and cost-effective crop marketing: The Government through Tanzania Rural and Urban Road Agency (TARURA) to build all weather roads to facilitate fast transportation and distribution and export of agricultural products. In addition, the Government should expedite the distribution of electricity and water in all rural areas that are cultivating and marketing strategic and high value crops in abundance.
2. Improve the investment and business environment in crop marketing, including provision of sufficient incentive systems for investors who can undertake agricultural marketing and invest in running and managing the entire supply chain.
3. Strengthen the integrated information system for agriculture marketing.
4. The Government is supposed to invest in building the capacity and capabilities of AMCOs (management, organization, marketing and trade facilitation, and management skills of the workforce; technical infrastructure; transportation; warehousing; access to competitively priced finance for investment and operations).
5. Resource and strengthen the Tanzania Cooperative Development Commission (TCDC) and Crop Boards to sufficiently enforce agricultural marketing development, regulations and institutional coordination. In addition, streamline and update the legislation, mandates and functions of crop boards to cater for current and future agricultural marketing needs and demands locally and globally.
6. Significantly enhance dialogue and participation of the private sector in the formulation and implementation of policies, strategies, and plans to enable a ownership of a clear sector vision and strategy, and understanding and participation of the private enterprises in agricultural marketing and provision of business, extension, and industrial services.
7. Develop a robust Monitoring, Evaluation and Learning Framework for agricultural marketing at AMCOs level.
8. The Government to support AMCOs to increase access to inputs and markets through linkages to global supply chains and marketing channels embedded in investing multinational firms, and access to global markets through established e-commerce channels, and bilateral and multilateral agreements This includes, seizing opportunities in potential beneficial and ensured long-term trade and sustainable African Continental Free Trade Area market access schemes for intermediate and finished agricultural products in local and regional markets.
9. Significantly improve the capacity of sector institutions and associations and Local Government capacity to expedite changes in bureaucratic procedures, rules, processes, and to quickly design, promote, resource, and implement reforms in agricultural marketing with changing production and trade dynamics in the local and export markets.
10. The Government and development partners to support AMCOs to address business challenges and production and marketing disruptions among AMCOs members caused by pandemics, particularly COVID-19 surges, and related potential feature waves.

11. Tanzania Cooperative Development Commission to undertake or commission research to get solutions on how the AMCOs can address emerging constraints and opportunities in crops seeds and production methodologies (best practices for increasing productivity and output, yield management, plant health, efficient technologies for harvesting and warehousing, supply chain management); assessment of feasibility of projects; agri-business of crop production; resource mobilization; irrigation development; value addition to crops and use of by-products; product and market development and diversification; addressing climate change effects and other externalities and environmental costs; and in addressing demand and price variability, unfair competition and negative effects of the trade wars.
12. From time to time, revise and update the policies, legislation, strategies and plans related to agricultural marketing to enable them to be in sync with stakeholder demands, market requirements, farmer and buyer/traders needs and country strategic priorities in the agricultural and associated sectors.

An effective and adequate implementation and resolution of the above issues will: a) enhance the performance of agricultural marketing; b) raise the competitiveness, inclusiveness, and resilience of the agricultural marketing system; c) increasing resources inflow and foreign and local investment in agricultural marketing that will boost rapid growth of productivity, sector value-add and output for export and local markets; d) increase the number of direct and indirect employment opportunities created and income generation in agricultural marketing and supporting industries/services providers; and e) sustainably increase the contribution of agriculture marketing activities to the public tax revenue and contribution to GDP.

References

1. Baffes, J. (2004). Tanzania's Cotton Sector: Reforms, Constraints and Challenges. *Development Policy Review, vol. 22, iss. 1*.
2. Barham, J., and Chitemi, C. (2009). Collective action initiatives to improve marketing performance: Lesson from framer groups in Tanzania. *Food Policy, 34,* 53-59.
3. *Barriers to trade for smallholder farmers in Tanzania*, A review and analysis or agricultural related market policies in Tanzania, http://www.pelumtanzania.org/assets/market-barriers-for-farmers-in-tanzania.pdf.
4. Boulay, B., (2015). The Nature of Agricultural Markets: Output Marketing in Tanzania. *CREDIT Research Paper, No. 15/07*.
5. Chidna – DAC Study Group (2011). *Effective Support for Agricultural Development. Join Study Visit to Tanzania*.

6. Chongela, J. (2015). Contribution of Agriculture Sector to The Tanzania Economy. *AJRC Vol. 3(7)*, 57-70.
7. Derksen-Schrock, K., Anderson, C.L., and Gurgerty, M.K. (2011). Tanzania: Agricultural Sector Overview. *EPAR Brief, No. 133*.
8. Eskola, E. (2005). Agricultural Marketing and Supply Chain Management in Tanzania: A Case Study. *ESRF Study on Globalisation and East Africa Economies, No. 16*.
9. *Food and Agriculture Organization of the United Nations*, http://www.fao.org/home/en/.
10. Greig, L. (2009). An Analysis of the Key Factors Influencing Farmer's Choice of Crop, Kibamba Ward, Tanzania. *Journal of Agricultural Economics, 60(3).*
11. International Monetary Found, http://www.imf.org/en/Data.
12. Kiratu, S., Marker, L., and Mwakolobo, A. (2011). *Food Security: The Tanzanian Case*. Manitoba: International Institute for Sustainable Development.
13. Leliveld, A., Dietz, T., Klaver, W., Kilama, B., and Foeken, D. (2013). *Agricultural dynamics and food security trend in Tanzania. Development regimes in Africa.* London.
14. Mashindano, O., Kaino, D. (2009). Transformation of agricultural sector in Tanzania: Justifications for Kilimo Kwanza and conditions for its success. *Quarterly Economic Review, 9(2)*.
15. McKay, A., Morrissey, O., and Vaillant, C. (1997). Trade liberalisation and agricultural supply response: Issues and some lessons. *The European Journal of Development Research, vol. 9, iss. 2.*
16. Mhando, L. (2011). Tanzania and the Geo-Politics Of Rural Development: The return of Neoliberalism. *Journal of Emerging Knowledge on Emerging Markets, Vol. 3*.
17. *Ministry of Finance Tanzania,* http://www.mof.go.tz/.
18. Morrissey, O., and Vincen, L. (2007). Distotions to Agricultural Incentives in Tanzania. *Agricultural Distortions Working Paper, 52*.
19. Mugenyi, F. (2012). *Marketing barriers with focus of maize, rice and oilseeds in Tanzania*. Presented at the National Agriculture Policy Forum: Unleashing Potential Markets for Exporting Agricultural Products in Tanzania, Dar es Salaam.
20. Mutayoba, V., and Ngaruko, D. (2015). Market performance and farmers' choice of marketing channels of high value crops in Tanzania. *International Journal of Economics, Commerce and Management, Vol. III, Iss. 8*.
21. Pauw, K., and Thurlow, J. (2010). *Agricultural Growth, Poverty and Nutrition in Tanzania*. Contributed Paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23.
22. Pudełkiewicz, E. (2011). Refleksje wokół koncepcji marketingu w agrobiznesie. Polityki Europejskie. *Finanse i Marketing, 5(54).*

23. Skarstein, R. (2005). Economic Liberalization and Smallholder Productivity in Tanzania. From Promised Succes to Real Failure 1985-1998. Jou*rnal of Agrarian Change, Vol. 5. No. 3.*
24. *Survey 2: Agricultural Trade Policies Tanzania*. http://www.fao.org/docrep/013/al668e/al668e03.pdf.
25. Szwacka-Mokrzycka, J. (2016). Specyfika marketingu w agrobiznesie. Przegląd koncepcji. *Handel Wewnętrzny, nr. 5,* pp. 115-130, 305-313.
26. *Tanzania National Bureau of Statistics,* http://www.nbs.go.tz/.
27. *TCDC. Statistics by region and cooperative type as of 2017*. https://www.ushirika.go.tz/statistics/.
28. The United Republic of Tanzania Planning Commission (2009). *Study on the identification of potential growth drivers for Tanzania based on an analysis of Tanzanians competitive and comperative advantages. Growth sectors and growth drivers: a situational analysis report*. Economic and Social Research Foundation.
29. The United Republic of Tanzania (2008). *Agricultural Marketing Policy.* Dar es Salaam.
30. The United Republic of Tanzania (2011). *Agricultural Marketing Strategy.* Dar es Salaam.
31. The United Republic of Tanzania (2015). *Agricultural Sector Development Strategy* – II 2015/2016-2024/2025.
32. The United Republic of Tanzania (2016). *Agricultural Sector Development Programme Phase Two (ASDP II).* Dar es Salaam.
33. The United Republic of Tanzania (2016). *National Five Year Development Plan 2016/17-2020/21.* Nurturing Industrialization for Economic Transformation and Human Development.
34. *United Nations Development Programme,* http://www.undp.org/.
35. *World Bank*, https://data.worldbank.org/.
36. *World Population Review*, http://worldpopulationreview.com/.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

ASSUMPTIONS FOR WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT COLLECTION SYSTEM EVALUATION

Barbara BIAŁECKA[1], Mariusz KRUCZEK[2*], Kordian RUDZIŃSKI[3]

[1] Central Mining Institute, Katowice; bbialecka@gig.eu, ORCID: 0000-0002-6002-5475
[2] Central Mining Institute, Katowice; mkruczek@gig.eu, ORCID: 0000-0002-5052-3729
[3] Śląskie Środowiskowe Studium Doktoranckie, Katowice; kordianrudzinski1992@gmail.com
* Correspondence author

Purpose: The main aims of the article are to analyse the waste electrical and electronical equipment management system and present a conceptual framework for evaluating the collection system for this group of waste.
Design/methodology/approach: The research methods used in the article were desk research analysis of available source data on the structure and functioning of WEEE management systems. An additional approach to the research referred to the statistical data on waste collection of the following groups of waste
Findings: WEEE management systems are widely described in the literature because this waste are source of significant and rare secondary raw materials. However, it is still a problem to create a fully efficient system for collecting this group of waste.
Research limitations/implications: The main limitation in carrying out the research is the lack of current data on the quantity and quality of electrical and electronical waste which can be used for the production
Practical implications: Further research will focus on using the approach presented to investigate the effectiveness of the different WEEE collection solutions and the possible improvement of these systems
Originality/value: The analysis carried out indicates the need to reconstruct the WEEE management system. This approach to assessing the effectiveness of the system can be used to compare different WEEE collection options.

Keywords: waste collection system, WEEE, assessment.

Category of the paper: conceptual paper.

Introduction

The management of electrical and electronic waste is an important problem on both a local and global scale, mainly due to the increasing amount of electro-waste generated worldwide. As production increases and the life cycle of electrical and electronic equipment shortens, it is replaced more and more often so that it becomes a rapidly growing source of waste. Used electrical and electronic equipment is considered to be one of the fastest growing waste streams in the European Union, with an increase rate of 3-5% annually (Gurauskienė, 2008; Nowakowski, Szwarc, 2016). This is related to the consumer lifestyle, which results in a shortened life cycle of electrical and electronic equipment. Moreover, new devices with increasingly better parameters constantly appear on the market. Therefore, still working electrical and electronic devices become hazardous waste, which contains harmful substances such as lead, mercury, cadmium, bromine, etc. (Goodship, Stevels, Huisman, 2019; Góralczyk, Uzunow, 2013). Incorrect handling of WEEE leads to pollution of waters, soil and air, as well as to a number of threats to our health and wellbeing. In addition, loss of natural resources and increasingly difficult access to them can be observed. Paradoxically, waste is also one of the most important resources of raw materials and critical elements (Kruczek, 2017). In 2005, the Electrical and Electronic Equipment Waste Act came into force. It was the first document in Poland to regulate issues related to the collection and processing of WEEE. The Act implemented the provisions of the Directive on electrical and electronic equipment waste (Directive 2002/96/EC 2003; Applia, 2019). Although several years have passed since the WEEE collection and handling system was introduced, the solutions currently applied in Poland are still incomplete, uncoordinated, and not very flexible. This is caused by several different barriers created by an unclear legal, organizational, and financial system related to the organization of WEEE collection and handling. The purpose of this article is to present an initial concept of a model to assess the effectiveness of electrical and electronic waste equipment collection based on literature.

Development of the WEEE management system

In Polish legislation, the term equipment waste first appeared in the Regulation on waste classification issued by the Minister of Environmental Protection, Natural Resources, and Forestry (Dz.U. nr 162, poz. 1135, 1997). The Regulation contains 7 types of waste that meet the currently valid definition of equipment waste (Table 1). Neither then valid the Waste Act (1997) nor the executive regulations contained a definition of the term waste equipment.

Table 1.
Selected sub-groups and types of equipment waste

No	Code	Subgroups and types of waste
1	09 01	Waste from the photographic industry
1	09 01 09	Disposable cameras with batteries
2	09 01 10	Disposable cameras without batteries
2	16 02	Used equipment and its components
3	16 02 01	Transformers and capacitors containing PCB or PCT
4	16 02 02	Other electronic and electrical waste equipment
5	16 02 03	Devices containing freon
6	16 02 04	Equipment containing free asbestos
7	16 02 05	Other used equipment

Source: (Dz.U. nr 162, poz. 1135, 1997).

The definition of equipment and waste equipment was first introduced in the Act on electrical and electronic equipment waste (Dz.U. nr 180, poz. 1495, 2005), which transposed Directive on waste electrical and electronic equipment (Directive 2002/96/EC 2003). Article 4 of the Act dated 11th September 2015 on Waste Electrical and Electronic Equipment (Goodship, Stevels, Huisman, 2019), currently being in force, defines equipment as "a device whose correct operation depends on the supply of electric current or the presence of electromagnetic fields, as well as a device capable of generating, transmitting or measuring electric current or electromagnetic fields, designed for use with electric voltage not exceeding 1000 V for alternating current and 1500 V for direct current".

While implementing Directive 2002/96/EC, the European Union imposed on the Member States the necessity to achieve a collection level of at least 4 kilograms of WEEE per citizen per year by 31st December 2006 at the latest. However, there was no provision for the set collection rate in the WEEE Act of 2005 (Bukowski 2018). In 2007, only 0.27 kg of WEEE per capita was collected in Poland (Cieszyńska, 2017). Figure 1 shows the volume of electrical and electronic equipment collected per capita in the years 2007 to 2017 (Figure 1).

After the amendment of the WEEE Act changes aimed at improving the functioning of WEEE management system were introduced in order to achieve the required level of collection in Poland The minimum annual levels of WEEE collection were set in the Regulation of the Minister of Environment, and then increased in 2010 (table 2) (Nowakowski, 2015).

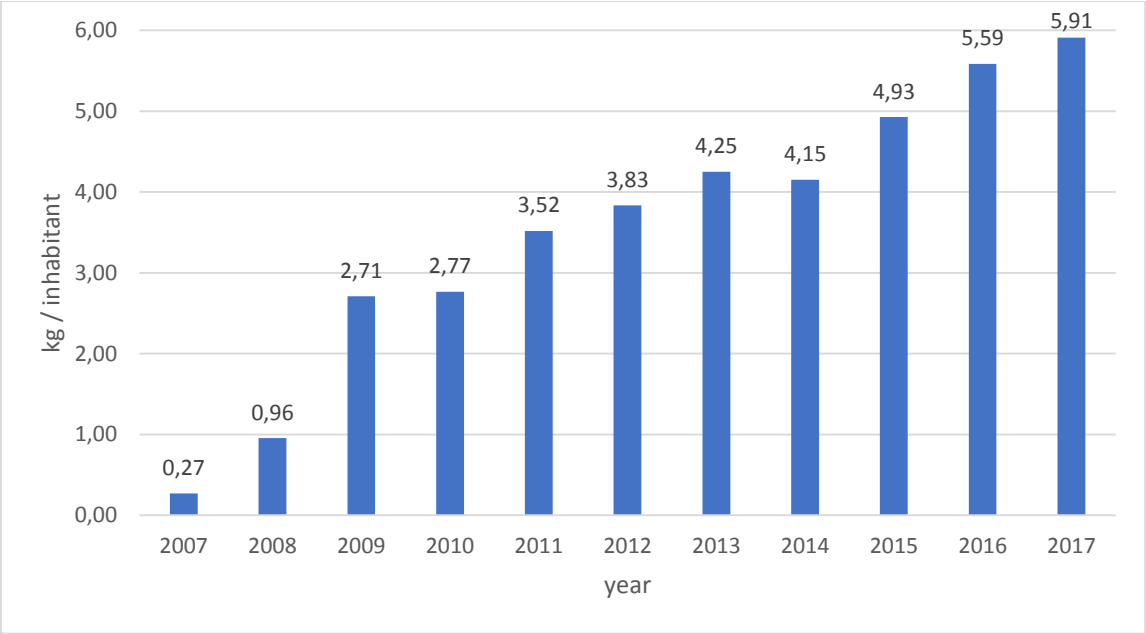


Figure 1. Weight of WEEE collected from households per capita during 2007-2017. Source (Eurostat, 2018).

Table 2.
Minimum annual levels of WEEE collection

No	Waste electrical and electronic equipment from households	Collection rate [%]	
		since 2009	since 2011
1	Large household equipment	24	35
2	Small household equipment	24	35
3	ICT and telecommunications equipment	24	35
4	Audiovisual equipment	24	35
5	Lighting equipment type 2-5	40	43
	Lighting equipment type 6	24	35
6	Electrical and electronic tools, except for large, stationary industrial tools	24	35
7	Toys, leisure and sports equipment	24	35
8	Medical devices, except for all implantable and contaminated products	-	35
9	Control and monitoring instruments	24	35

Source: (Nowakowski, 2015).

Directive 2012/19/EU of the European Parliament and Council on waste electrical and electronic equipment (WEEE), and later on new polnish regulacy (Dz.U. poz. 1688, 2015), was another step in creating a WEEE management system. Until 31 December 2015, the WEEE collection rate amounted to 4 kilograms per citizen. From 2016, the minimum collection rate was 45%, and from 2019 onwards it grew to 65%. By way of deviation, as of 14th August 2016, Poland was obliged to achieve a collection level lower than 45% but higher than 40%. The 65% collection rate was deferred until 14th August 2021 at the latest.

The annual level of WEEE collection from households in Poland, expressed in kilograms per capita, was just over 6.5 kg in 2017. Compared to other European countries, the level of collection in Poland was low (Figure 2). The lowest level of collection was recorded in Romania. The highest collection level in 2017 was in Norway (over 18.7 kg of WEEE per capita). Average collection volume for European Union was also higher than for Poland – 8.3 kg

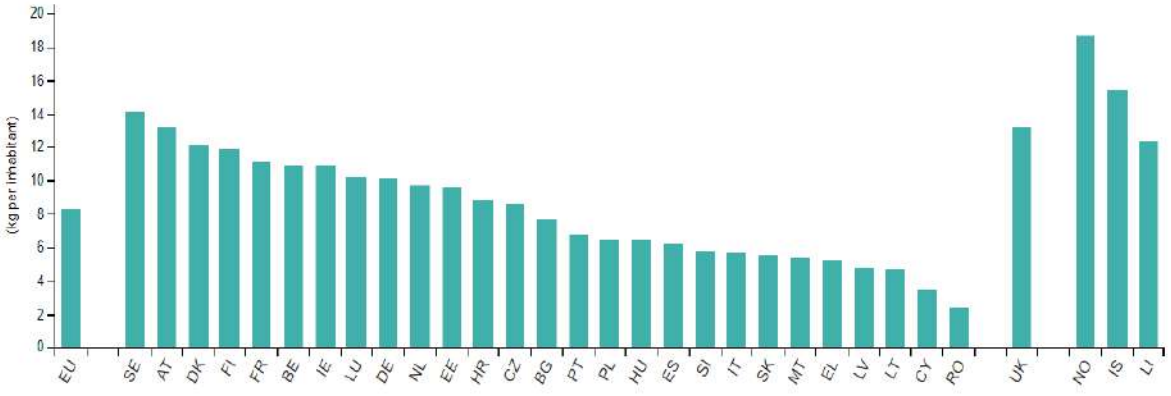


Figure 2. WEEE collection level in selected European countries 2017. Source (Eurostat, 2020).

Analysis of the data contained in the reports on the functioning of the WEEE management system for the years 2007-2017 (Eurostat, 2020) indicates that the current trend in WEEE collection will not allow Poland to meet the requirements set by the European Union as regards the required levels of collection (Figure 3).

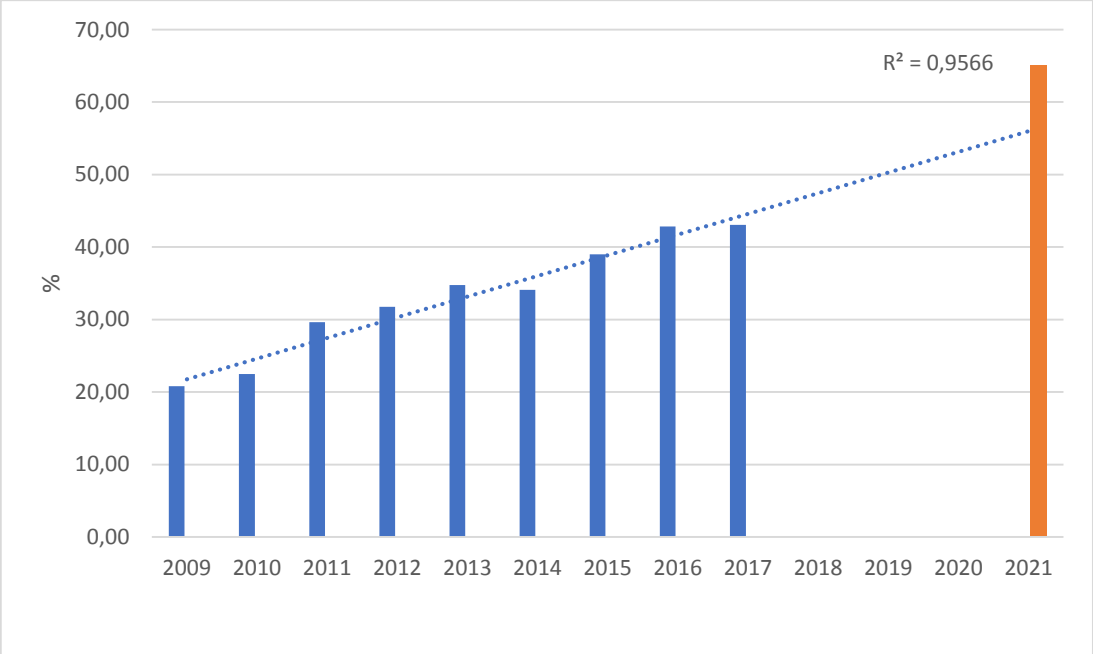


Figure 3. Level of WEEE collection in Poland in 2009-2017 with its extrapolation for 2021. Source: own calculations based on (Eurostat, 2020; Goodship, Stevels, Huisman, 2019).

The low level of WEEE collection in Poland is influenced by gaps in legislation related to the matter, for example, to the functioning of waste electrical and electronic equipment recovery organizations. Another gap is due to low awareness and poorly developed pro-environmental attitudes in the Polish society and an inefficient and ineffective waste collection system Laskowska M. (2018).

Waste electrical and electronic equipment collection system in Poland

Organization of the system of handling waste electrical and electronic equipment in Poland is mainly regulated by the Electrical and Electronic Equipment Waste Act. According to the principle of extended responsibility, producers are obliged to organize collection of WEEE from collectors and to handle WEEE from households. The WEEE management system is financed by consumers in the form of waste management cost (WMC) included in the price of each new piece of equipment.

Logistic approach to the WEEE management system makes it possible to identify three main streams: physical (materials), informational and financial one (Kruczek, 2017; Horodyńska, 2017). The analysis of the physical stream of WEEE flow has been carried out and established waste producers, who are also waste holders, as the first link in the chain of WEEE colection. A waste holder has many opportunities to legally transfer WEEE to the next link. When purchasing new equipment, the customer (holder) may hand over the old piece free of charge, as long as it is of the same type and has the same functionality as the purchased equipment. When delivering a new device to the customer, the retailer is obliged to take back the old one. In case of retail entities with a sales area of at least 400 m^2, the customer is has the right to hand over any piece of WEEE (if none of its external dimensions exceeds 25 cm), free of charge, without the need of purchasing any new equipment. Service points are also authorized to collect WEEE. When equipment repair is technically impossible or unprofitable, the operator is obliged to accept waste equipment. Once an appropriate quantity of waste equipment is collected, it is handed over to the collection unit with which a contract has been signed. Then the equipment is transferred to the next link, which is the handling/processing plant. Entities participating in the transfer are authorized to collect waste equipment and are exempted from the obligation to obtain a waste collection permit (non-professional waste collection activities). The holder may also hand over WEEE to an entity holding a waste collection or handling/processing permit, or to a municipal waste selective collection point (MWSCP) compulsorily established by local (district) authorities (Nowakowski, 2017).

From collection points WEEE goes to treatment plants. At a handling/processing plant, hazardous substances are first removed, followed by fragmentation of parts and separation of raw materials. Hazardous substances, such as e.g. freon, are handed over to entities that deal with their disposal. In small plants, only manual disassembly is carried out. In plants operating on an industrial scale, manual dismantling is followed by mechanical dismantling, which produces raw materials such as metals or plastics. Those are, in turn, sent to recyclers or other non-recycling recovery processes. The physical flows are illustrated in the figure 4.

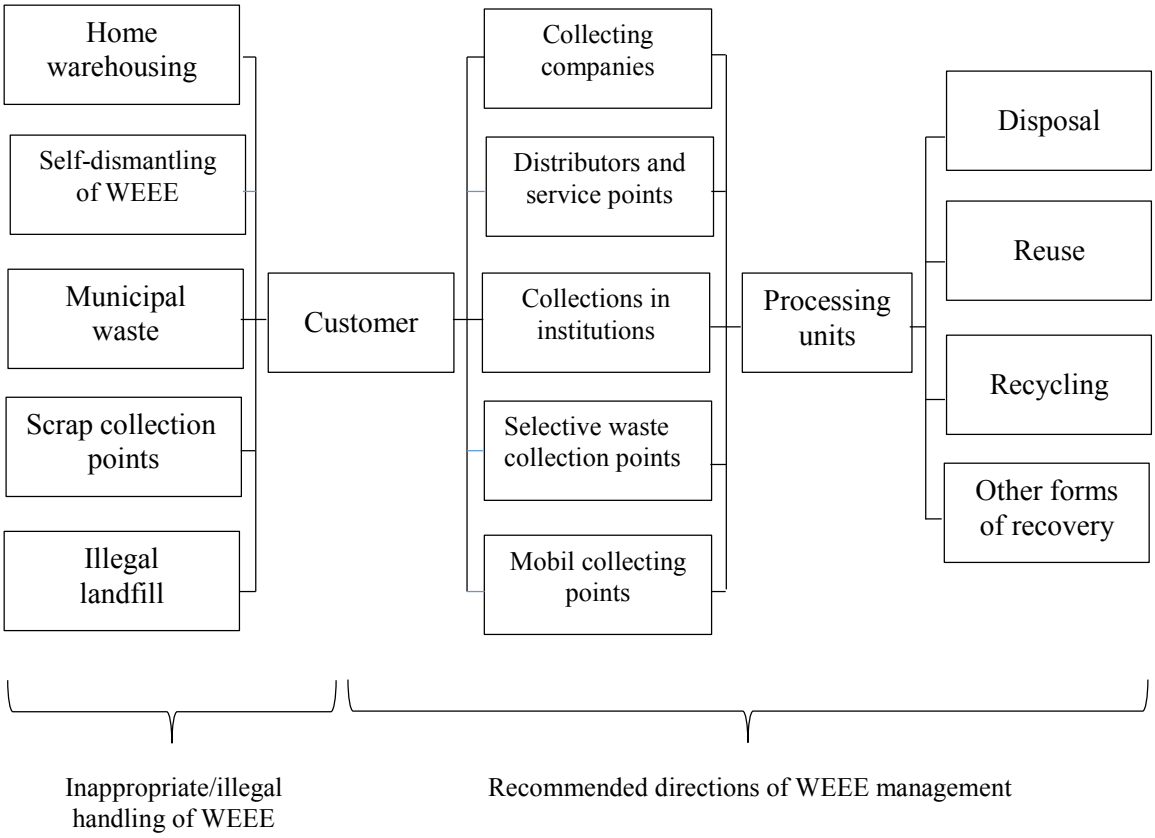


Figure 4. Overall structure of WEEE management system. Source: own elaboration.

The information flow system can distinguish between information that is necessary to perform statutory duties and information required by law, such as certificates, reports or summaries. It is also possible to divide the circulation of information into circulation between individual commercial entities and public administration, as well as between individual public administration authorities. The flow of information is shown schematically in the figure 5.

The system of WEEE management financing is based on the "polluter pays" principle, which is implemented in the form of waste management costs (WMC). WMC is a separate amount which is part of the price of each new product placed on the market. The whole cost of waste management is covered by consumers at the time of purchasing new equipment, and its amount is determined by the producer. WMC should be fully utilized to pay for the WEEE collection, treatment and recycling system. Distribution of funds from WEEE is conducted through two channels. In the first one, distributors transfer the funds to the system themselves. In the second case, the funds are distributed by intermediaries – recovery organizations, which transfer them to treatment facilities (ElektroEko, 2019).

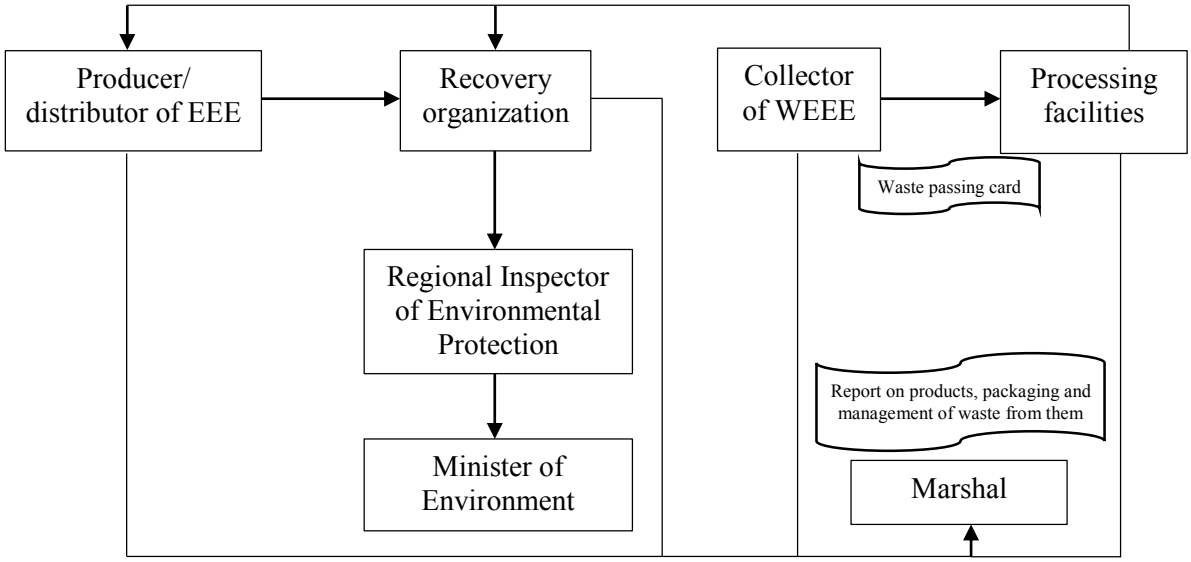


Figure 5. Information flow in the WEEE management system. Source: own elaboration.

In the presented model, a number of disturbances can be identified that affect the deterioration of system performance indicators. One of them is the transfer of WEEE to scrap yards or to municipal waste landfills, which in effect makes it impossible to indicate how much and what type of WEEE is collected and processed. Another is storage and processing of WEEE in inappropriate conditions, resulting in the release of hazardous substances to the environment, as well as high and uncompetitive costs of waste collection and processing by recovery organizations (Kruczek, 2017; Horodyńska, 2017).

Assumptions for the assessment of the WEEE collection system

An effectively and efficiently functioning WEEE collection system is one that is characterized by a high level of collection and which generates benefits for users. The system in Poland is assessed as not functioning correctly. P. Nowakowski (2017) pointed out the factors that affect the effectiveness of the WEEE collection system (table 3).

According to the WEEE Act, the WEEE collection system should take into account the density of population. An effective and efficient WEEE collection system requires that collection points are located in frequently visited places and open at convenient hours. However, a significant percentage of consumers are not even aware where these collection points are located (Goodship, Stevels, Huisman, 2019). Disposal of WEEE together with municipal waste is a common phenomenon in Poland.

Table 3.
Factors influencing the efficiency of the WEEE return logistics chain

Factors		Characteristics
Decision	Location and availability of collection points	Collection points should be easily accessible and located in frequently visited places. Opening hours should include evening time.
	Mobile collection schedules	The mobile collection should be conducted according to a schedule. The best option is repeatability, which affects residents' memory of WEEE collection dates.
	Environmentally friendly attitude	Respecting a separate collection method results in the desire for legal and, consequently, environmentally friendly waste disposal. If there is no interest in environmental protection, WEEE is disposed of together with municipal waste or abandoned.
	Education	Educational activities should be conducted for all age groups. Educational programmes cover the young generation and there are few programmes for target groups in middle age.
	Possible benefits	For many people, the possibility of getting rid of bulky equipment (e.g. washing machine, dishwasher) is connected with the possibility of additional income, e.g. in scrap yards. This method, although run through an unofficial channel, allows for metal recycling. Mass of WEEE passing through a scrap yard avoids the register but ultimately goes to a steelworks.
Economy	Arrangement of the containers	The containers should be adapted to the equipment that is being removed. When left unattended they may facilitate the theft of stored WEEE. The person responsible for supervision must report their filling. To empty containers from multiple locations, software with optimised routes is necessary.
	Design of collection routes	It is necessary to design routes adapted to the anticipated number of WEEE to be delivered. Routes have to be designed in an optimal way – this affects the number of vehicles and staff to handle the route.
	Exchange of information between manufacturers and dismantling plants	This is a requirement for equipment manufacturers, although an effective method of large-scale information exchange has not been achieved so far.
	Choice of dismantling methods	Disassembly methods require efficient staff and efficient processing lines. Depending on labour costs and current prices on the exchanges, the so-called dismantling depth can be adapted to external market conditions.

Source: (Nowakowski, 2017; Kruczek, 2017; Horodyńska, 2017; Goodship, Stevels, Huisman, 2019).

Measurement of WEEE collection efficiency indicators requires taking into account the stream of products (SEE) on the market and the outgoing stream of collected waste generated from those products (WEEE). The basic criterion of effectiveness of a WEEE collection system is the WEEE collection rate calculated by dividing the weight of collected equipment by the weight of equipment available on the market in a given calendar year (Nowakowski, 2015). Comparison of effectiveness indicators for different countries may provide a basis for assessing the effectiveness of a WEEE collection system.

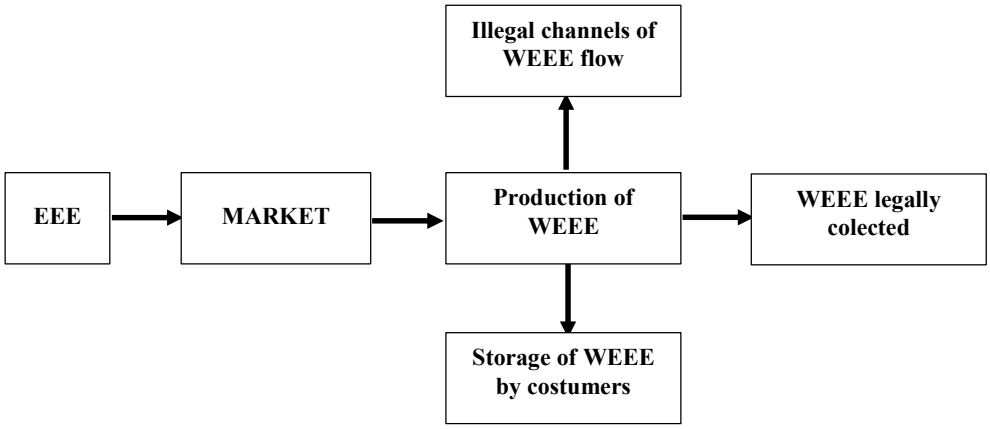


Figure 6. Product and waste streams – efficiency measurement. Source: own elaboration.

$$W_z = \frac{m_l}{m_{ur}} \cdot 100\% \quad (1)$$

where:
W_z – collection rate,
m_l – weight of WEEE collected in a legal manner,
m_{ur} – weight of equipment placed on the market.

The European Union has obliged Member States to achieve sufficiently high collection rates. The collection rate is expressed as the ratio of the weight of WEEE collected to the average annual weight of SEE available on the market during the previous three years in the Member State concerned.

$$P_z = \frac{m_l}{M_{ur}} \times 100\% \quad (2)$$

where:
P_z – collection level,
m_l – weight of WEEE legally collected,
M_{ur} – average annual weight of equipment placed on the market calculated according to the formula:

$$M_{ur} = \frac{m_{1ur}+m_{2ur}+m_{3ur}}{3} \quad (3)$$

where:
m_{1ur}, m_{2ur}, m_{3ur} – weight of equipment placed on the market in each 3 years preceding the year in question.

The level of collection allows to determine the degree of achievement of the Union requirements in accordance with the formula below:

$$S_{ow} = \frac{P_z}{P_{UE}} \quad (4)$$

where:
S_{ow} – the degree of achievement of EU requirements,
P_z – collection level (in Poland),
P_{UE} – collection level required by the European Union.

Improper handling of WEEE by consumers leads to a reduction in the weight of waste collected by legal means and thus affects the size of the collection rate. Results of studies concerning influence of citizens' behaviour on the effectiveness of waste electrical and electronic equipment collection published by Nowakowski (2015) make it possible to determine the total weight of generated WEEE.

$$m_c = m_l + m_{nl} + m_s \tag{5}$$

$$m_l = \sum_{i=1}^{n} m_i \tag{6}$$

$$m_{nl} = \sum_{j=1}^{k} m_j \tag{7}$$

$$m_s = \sum_{p=1}^{1} m_p \tag{8}$$

where:
m_c – total mass of WEEE (mass of WEEE produced by consumers),
m_l – mass of WEEE legally collected,
m_{nl} – mass of WEEE removed from households illegally,
m_s – mass of WEEE stored,
n – number of waste appliances legally collected,
k – number of waste appliances removed from households,
l – number of waste appliances stored in households.

On the basis of the total weight and the weight of WEEE legally collected, an efficiency index for disposal of WEEE from households can be determined:

$$W_u = \frac{m_l}{m_c} \tag{9}$$

where:
W_u – efficiency ratio for the disposal of WEEE from households,
m_l – mass of WEEE legally collected,
m_c – total mass of WEEE.

Available literature very often uses the annual WEEE collection rate per citizen. It is calculated based on the mass of WEEE collected in a given country during the year divided by the population of that country.

$$w_z = \frac{m_l}{L} \tag{10}$$

where:
w_z – collection rate,
m_l – weight of WEEE legally collected,
L – country population.

The above-mentioned indicators make it possible to assess the WEEE collection system by individual groups of equipment and to compare collection systems operating in different regions.

Summary

The aim of the environmental policy of the European Union is to preserve, protect, and improve the quality of the environment and to use natural resources rationally. This policy necessitates the development of an economic concept in which products, materials and raw resources should remain in the economy for as long as possible and waste generation should be minimized as much as possible. Despite the introduction of Directive 2002/95/EC aimed at limiting the use of certain hazardous substances in electrical and electronic equipment, substances such as mercury, cadmium, lead, chromium, polychlorinated biphenyls (PCBs) and ozone depleting compounds will still be present in WEEE for many years (Nowakowski, 2015). Hazardous substances are still a major problem in waste management and insufficient recycling causes loss of valuable resources. Therefore, improvement of the efficiency and effectiveness of WEEE waste collection as well as putting the resulting materials back into circulation are a serious issue. This will significantly contribute to a more economical use of raw materials and will reduce the amount of generated waste. Against that background, the concept of circular economy is developing more and more intensively, taking into account all stages of life of products: from their design, through production, consumption, collection of waste, to their recycling. The Polish WEEE waste management system still lacks solutions aimed at closing the material flow loop. This situation is aggravated by gaps in the existing system, and therefore striving for its parameterization and ordering of flows is crucial for the elimination of disruptions and successful implementation of the new management concept.

References

1. Applia (2019). Raport AGD 2018. Retrieved from https://applia.pl/wp-content/uploads/2019/01/APPLiA.PL_raport-AGD-2018.pdf, 10.03.2020.
2. Bukowski, H. (2018). *W Kierunku Gospodarki Cyrkularnej: rekomendacje rozwoju i implementacji praktycznych rozwiązań dla biznesu*. Warszawa: Instytut Innowacyjna Gospodarka.
3. Cieszyńska, A. (2017). Odzysk platynowców ze zużytego sprzętu elektrycznego i elektronicznego (ZSEE) metodami metalurgicznymi. *Logistyka Odzysku, Nr 1(22)*, pp. 52-57.
4. Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) – Joint declaration of the European Parliament, the Council and the Commission relating to Article 9 (2003).
5. Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) (2012)
6. ElektroEko (2019). *Gospodarka elektroodpadami. Wyzwania na lata 2019-2023.* Retrieved from https://www.teraz-srodowisko.pl/media/pdf/aktualnosci/7847-ElektroEko-raport-elektrosmieci-2019.pdf, 12.11.2020.
7. Eurostat (2020). *Waste statistics – electrical and electronic equipment.* Available online https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment&oldid=496578, 20.08.2020.
8. Goodship, V., Stevels, A., Huisman, J. (2019). *Waste Electrical and Electronic Equipment (WEEE) Handbook.* Elsevier Ltd.
9. Góralczyk, S., Uzunow, E. (2013). The recovery of yttrium and europium compounds form waste materials. *Archives of Environmental Protection*, *Vol. 39, no 3*, pp. 107-114.
10. Gurauskienė, I. (2008). Behaviour of Consumers as One of the Most Important Factors in E-Waste Problem. *Environmental Research, Engineering and Management, Vol. 4(46),* pp. 56-65.
11. Horodyńska, M. (2017). *Ekologistyka i zagospodarowanie odpadów*. Gliwice: Wydawnictwo Politechniki Śląskiej.
12. Kruczek, M. (2017). Domykanie pętli łańcucha zużytego sprzętu elektrycznego i elektronicznego jako realizacja paradygmatu gospodarki cyrkularnej. *Logistyka Odzysku, Nr 1(22)*, pp. 48-51.
13. Laskowska, M. (2018). ZSEE dwa lata po nowelizacji. Czy się udało? *Energia i Recykling: gospodarka obiegu zamkniętego, Nr 4(4),* pp. 10-12.
14. Nowakowski, P. (2015). Wyznaczanie efektywności łańcucha logistyki zwrotnej na przykładzie zużytego sprzętu elektrycznego i elektronicznego. *Logistyka, Nr 2*, pp. 655-665.

15. Nowakowski, P. (2015). *Logistyka recyklingu zużytego sprzętu elektrycznego i elektronicznego. Od projektowania po przetwarzanie*. Gliwice: Wydawnictwo Politechniki Śląskiej.
16. Nowakowski, P. (2017). Identyfikacja czynników wpływających na efektywność łańcucha logistyki zwrotnej zużytego sprzętu elektrycznego i elektronicznego. In: R. Knosala (Ed.), *Innowacje w zarządzaniu i inżynierii produkcji. T. 2* (pp. 65-78). Opole: Oficyna Wydaw. Polskiego Towarzystwa Zarządzania Produkcją.
17. Nowakowski, P., Szwarc, K. (2016). *Supporting of the mobile collection of waste electrical and electronic equipment based on a web application with the integrated database*. Transport problems 2016. VIII International scientific conference. V International symposium of young researchers (pp. 801-810). Katowice: Wydawnictwo Politechniki Śląskiej.
18. Rozporządzenie Ministra Ochrony Środowiska, Zasobów Naturalnych i Leśnictwa z dnia 24 grudnia 1997 r. w sprawie klasyfikacji odpadów. Dz.U. nr 162, poz. 1135 (1997).
19. Ustawa z dnia 11 września 2015 r. o zużytym sprzęcie elektrycznym i elektronicznym Dz.U. poz. 1688 (2015).
20. Ustawa z dnia 27 czerwca 1997 r. o odpadach, Dz.U. nr 96, poz. 592 (1997).
21. Ustawa z dnia 29 lipca 2005 r. o zużytym sprzęcie elektrycznym i elektronicznym. Dz.U. nr 180, poz. 1495 (2005).

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE ASSESSMENT OF THE INTER-ORGANISATIONAL COOPERATION EFFECTIVENESS BASED ON THE CREATIVE SECTOR IN POLAND – EMPIRICAL RESEARCH RESULTS

Edyta BIELIŃSKA-DUSZA[1*], Małgorzata TYRAŃSKA[2]

[1] Cracow University of Economics, Department of Strategic Analyses; bielinse@uek.krakow.pl, ORCID: 0000-0003-2007-8828
[2] Cracow University of Economics, Department of Labor Resource Management; tyranskm@uek.krakow.pl, ORCID: 000-0002-1141-2938
* Correspondence author

Purpose: The aim of this article is to illustrate the assessment procedure concerning the effectiveness of the inter-organisational cooperation in terms of practice represented by the creative sector companies under consideration.
Design/methodology/approach: The accomplishment of the research objective was based on the hypothesis that the effectiveness of the inter-organisational cooperation between companies in the creative sector constitutes an important determinant of strengthening the competitive advantage thereof. In order to assess the effectiveness of the inter-organisational cooperation, a categorisation method has been used, which belongs to the mathematical methods of multi-criteria benchmarking.
Findings: The effectiveness of the inter-organisational cooperation between companies in the creative sector is an important determinant of improving their competitive advantage.
Originality/value: The paper describes the effectiveness of the inter-organisational cooperation between companies in the creative sector. We identify increasing and lowering factors of the effectiveness, describe the benefits model of the inter-organisational cooperation and present the matrix of relations between the level of cooperation effectiveness and the level of competitive advantage. The article can be used by managers of the creative sector.

Keywords: inter-organisational cooperation, effectiveness, creative sektor.

Category of the paper: research paper.

1. Introduction

The aim of this article is to illustrate the assessment procedure concerning the effectiveness of the inter-organisational cooperation in terms of practice represented by the creative sector companies under consideration. The creative sector centres not only on narrowly defined activities in the fields of arts, music and crafts but include areas of economic life as well that

have been influenced by modern technologies enabling production, processing and distribution of cultural products. On the other hand, however, the notion of the inter-organisational cooperation is understood as the existence of relatively permanent, non-incidental economic links between companies, and the well-defined - and beneficial to all the parties concerned – relationship between two or more organisations aimed at achieving common goals.

The accomplishment of the research objective was based on the hypothesis that the effectiveness of the inter-organisational cooperation between companies in the creative sector constitutes an important determinant of strengthening the competitive advantage thereof. An underlying foundation for the indicated hypothesis includes the results of the hitherto conducted research on the inter-organisational cooperation. On the one hand, the research results reveal the significance of the aforementioned area within the specificity of business operations of the creative sector companies. The partnership provides the opportunity to acquire necessary resources, increase production efficiency and sales volume. Moreover, the indicated companies acquire new competencies and, through building and increasing their capabilities, they are able to more effectively implement the strategy they have adopted. On the other hand, however, the research reveals numerous barriers to the effective inter-organisational cooperation: partners' incompetence, going concern failing, no rules of communication or bad communication, cultural mismatch, the lack of strategic or financial benefits.

In order to assess the effectiveness of the inter-organisational cooperation between companies in the creative sector, a categorisation method has been used, which belongs to the mathematical methods of multi-criteria benchmarking (Łuniewska, Tarczyński, 2006). The categorisation method takes the form of diagnostic tests, the result of which is a qualitative assessment of the examined phenomenon analysed through the prism of the index value of effectiveness of the inter-organisational cooperation between the creative sector companies.

This research was regionalised. It covered 43 companies located in south-eastern Poland, operating in the creative sector. An interview questionnaire and a survey addressed to the top managers of the surveyed companies were used for collecting data.

2. Effective Cooperation Pre-conditions

Business-to-business cooperation based on networks of interconnections is an integral part of the modern entrepreneurship. On the one hand, it expresses a response to the dynamics of changes in the environment and on the other hand, it constitutes a company's strategic resource. Effective cooperation facilitates the implementation of the strategy that has been adopted, the development of a company, and provides for the achievement of a competitive advantage in the market. The lack of cooperation may cause many companies to merely lose the market. Additionally, it should also be emphasised that apart from benefits, it may bring adverse effects

as well. Whether a given company will take up the cooperation and what effects it will bring depends to a large extent on the rules adopted throughout the entire process.

A number of researchers concentrate their studies on the issues of alliance, partnership, cooperation, and very often treat the indicated conceptual frameworks as synonyms, while the peak of research and development falls at the turn of the 20th and 21st century (Cygler, 2013). W. Czakon notes that the topic of cooperation is related to other fields such as sociology or economics (Czakon, 2010a), but over the years we have seen massive changes in its definition. From its initial bilateral form, it has evolved into multilateral cooperation and networking, with the extension of cooperation within the framework of coopetition. Consequently, it has brought about a diversity of interpretations, resulting from the adopted criteria of description, form, scientific discipline, or context. The heterogeneity makes us understand it in different ways. For the purposes of this paper, however, we will define cooperation as *multi-level interplay within the framework of cooperation with partners outside the organisation, providing for the achievement of specific benefits not otherwise achievable, being dynamic, complex structures reaching different degrees of effectiveness and sustainability.*

We can therefore assume that the aim of cooperation with other market participants is to achieve measurable benefits. The researchers such as A. Adamik (2015), J. Child et al. (2005), W. Czakon (2012), W. Dyduch, M. Bartnicki (2016), Y.L. Doz, G. Hamel (2006), P. Klimas (2014), Krzakiewicz K. (2013), Michna et al. (2020), E. Stańczyk-Hugiet (2012), R. Tyszkiewicz (2017), A. Zakrzewska-Bielawska (2015) have pointed out a number of benefits derived from cooperation. The effective cooperation may be reached in two ways. By maximising factors, conditions, parameters facilitating the cooperation efficiency and through minimising the potential risks (or mitigating them) leading to the discontinuation of cooperation or a partial achievement of objectives. Moreover, the effectiveness of cooperation depends on the inter-organisational proximity, which is a set of some similar features, attributes of the organisation (Klimas, 2013; Czakon 2010b; Knoben, Oerlemons, 2006).

A critical analysis of the related literature displaying various factors determining the cooperation efficiency has made it possible to specify the framework pre-conditions for its effectiveness. We have grouped the aforementioned factors into homogeneous areas (ranges) and described them in a synthetic analysis presented below.

1. The Planning Scope

One of the most important attributes of each company is a defined level of cooperation capability, due to which reaching the pursued goals, the achievement of which on their own would be significantly impeded or even impossible, is more effective. Therefore, on the one hand, the effective cooperation facilitates the development of a company and, on the other hand, provides for improvement of its competitive advantage. There is no doubt that one can talk about effective cooperation only if it puts forward jointly assumed and uncontested objectives and is planned in an appropriate manner, taking into account a comprehensive approach.

The measure of effectiveness is the degree at which the targets resulting from the cooperation are reached[1].

2. The Extent of Cost-effectiveness

Cooperation is effective when it leads to the achievement of measurable benefits. It means that the benefit-cost ratio is higher than one and the action itself contributes to the achievement of the pursued goal. In the case of a partnership, it denotes such an activity which is the most effective of all possible actions in terms of the intended purpose, conditions, constraints, and contributes to reducing costs or exploiting the synergy effect. To a large extent, an appropriate distribution of profits and costs increases the effectiveness of the cooperation implemented.

3. The Scope of Organisation

Another important factor influencing the effectiveness of the inter-organisational cooperation is the adoption of an appropriate structural scheme adjusted to the strategy as well as to the principles of cooperation, the partners' potential or the complexity of cooperation. The effectiveness will grow if the adopted arrangement determines the extent of objectives, tasks and responsibilities of respective organisational units, the way in which the lines of subordination will run, coordination mechanisms, communication channels between elements of the organisational structure or the exploitation of modern types of structural schemes: team-based scheme, network-based scheme, virtual one, the scheme facilitating flexibility of activities. It should also be noted that the partners' independence and the way of task supervision constitute an important factor affecting effectiveness.

4. The Scope of Knowledge

More and more often the scope of undertaken cooperation is tied to the acquisition, transfer or generation of specific knowledge. The faster it is created, easier to use and absorb, the more it will contribute to increasing the competence of both individual employees and the entire organisation in terms of processes and product. The importance of protecting both silent and formal knowledge in the whole cooperation process should also be underlined, as it is one of the main factors of competition. Moreover, cooperation denotes collaboration of all participants. We can therefore assume the hypothesis that the higher the awareness and understanding of the need for cooperation at each management level, the more effective it is.

[1] In view of the aim of the study as well as the limited publication capacity of those interested in this topic, we refer to the literature focusing on the difficult problem of measuring the effectiveness of cooperation. Most researchers measure the effectiveness of cooperation using descriptive characteristics, like for example Heimbürger M., Dietrich P. or Schnobrich-Davis J., and Terrill W.
We can also point to studies using methods of analysing the effectiveness of inter-organisational cooperation based on qualitative assessment. We can name researchers such as: A.M. Thomson, J.C. Perry and T.K. Miller or T.M. Simatupang and R. Sridharam. Respectively: M. Heimbürger, P. Dietrich: Identifying the Basis of Collaboration Performance in Facility Service Business. *Facilities, 2012, Vol. 30/11*; J. Schnobrich-Davis, W. Terrill: Interagency Collaboration: An Administrative and Operational Assessment of the Metro-LEC Approach. Policing: *An International Journal of Police Strategies & Management, 2010, Vol. 33/3*, pp. 506-530; A.M. Thomson, J.L. Perry, T.K. Miller: Conceptualizing and Measuring Collaboration. *Journal of Public Administration Research and Theory, 2009, Vol. 19/1*, pp. 23-56; T.M. Simatupang, R. Sridharan: The Collaboration Index: A Measure for Supply Chain Collaboration. *International Journal of Physical Distribution & Logistics Management, 2005, Vol. 35/1*, pp. 44-62.

5. The Scope of Communication

The effective cooperation is also dependent on the quality of information and its effective flow, called the communication process. In the case of complex cooperation networks, the process of proper communication plays a special and sometimes even the most significant and crucial role. Information appears as one of the three essential elements of exchange between relatively isolated systems and the environment. The aforementioned exchange is characterised by a network of information transmission connections in terms of the system – environment and particular attention ought to be paid to a proper organisation of the entire process as well as the exchange of information on an on-going basis, maintaining the continuity, timeliness and effectiveness of procedures.

6. Cultural Conditionalities

The effectiveness of cooperation is also reflected in the degree of compatibility in terms of common values, norms, habits and patterns of behaviour. Properly shaped culture should facilitate the integration of partners as well as adaptation to dynamically changing environmental conditionalities. Moreover, it is a carrier of content affecting the effectiveness of cooperation. One of the key elements of successful partnership is common trust between partners, which reduces uncertainty by higher predictability of partner's behavior (Sako, 1998). Trust-building competence is a significant part of relational competence of an organization, which we define as a bundle of attitudes, organizational routines and capabilities necessary to: establish partnership and prepare the frame for it; lead common activities and control their effects; manage knowledge creation and exchange between partners, communicate effectively, solve problems and integrate partnering firms on interorganizational, interpersonal and inter-team level (Chrupała-Pniak et al., 2017; Sulimowska-Formowicz, 2015).

In conclusion, it is plausible to state that the above considerations have provided the opportunity to distinguish a number of important factors and conditionalities affecting the effectiveness of cooperation, becoming a source of competitive advantage. Apart from the above mentioned issues, effective cooperation is the one that makes it feasible to build lasting relations that produce measurable results not only in financial terms. Furthermore, it is also such cooperation that benefits from isomorphism, constitutes a company's resource, influences its development and enhances the efficiency of performance. Moreover, the more it is based on mutual respect, trust and when it takes into account common standards and principles and is widely accepted, the more effective it is.

3. Effective Cooperation Benefits

Due to the complexity and heterogeneity of the concept of the inter-organisational cooperation, we may conclude that the indicated effectiveness may come forward with synergistic benefits in various areas of a company's performance. The researchers have developed

a proprietary benefit model of the inter-organisational cooperation (Figure 1), in which two main planes are distinguished within the framework of which cooperation benefits are identified:

1. strategic, tactical, and operational benefits,
2. regarding: resource, competence, organisation, and competition.

Commonly accepted, non-contradictory goals, values and trust between partners constitute the key and the most important cooperation outcome. The three elements make up the core of the inter-organisational cooperation. The main prerequisite of cooperation is to achieve the pursued goals which initiate the whole process and are aggregated and implemented by the partners during the cooperation. They should be a resultant of an objective or a group of objectives stemming from the adopted vision and mission/strategy of cooperating companies. Moreover, the cooperation should be based on common values, independence and mutual trust, aiming at creating sustainable cooperation resulting from the partners' key resources and competencies. It should also be noted that the achieved effects of cooperation depend to a large extent on partners' experience and socio-cultural context.

As cooperation is a complex and multifaceted issue, it is believed to deliver synergistic benefits at diverse levels. The decision has been made to distinguish two levels of benefits. One level arises from strategic, tactical and operational benefits. The second one is related to benefits regarding resource, competence, organisation and competition. The achieved resource benefits are part of tangible and intangible resources, based on complementarity or the scarcity effect.

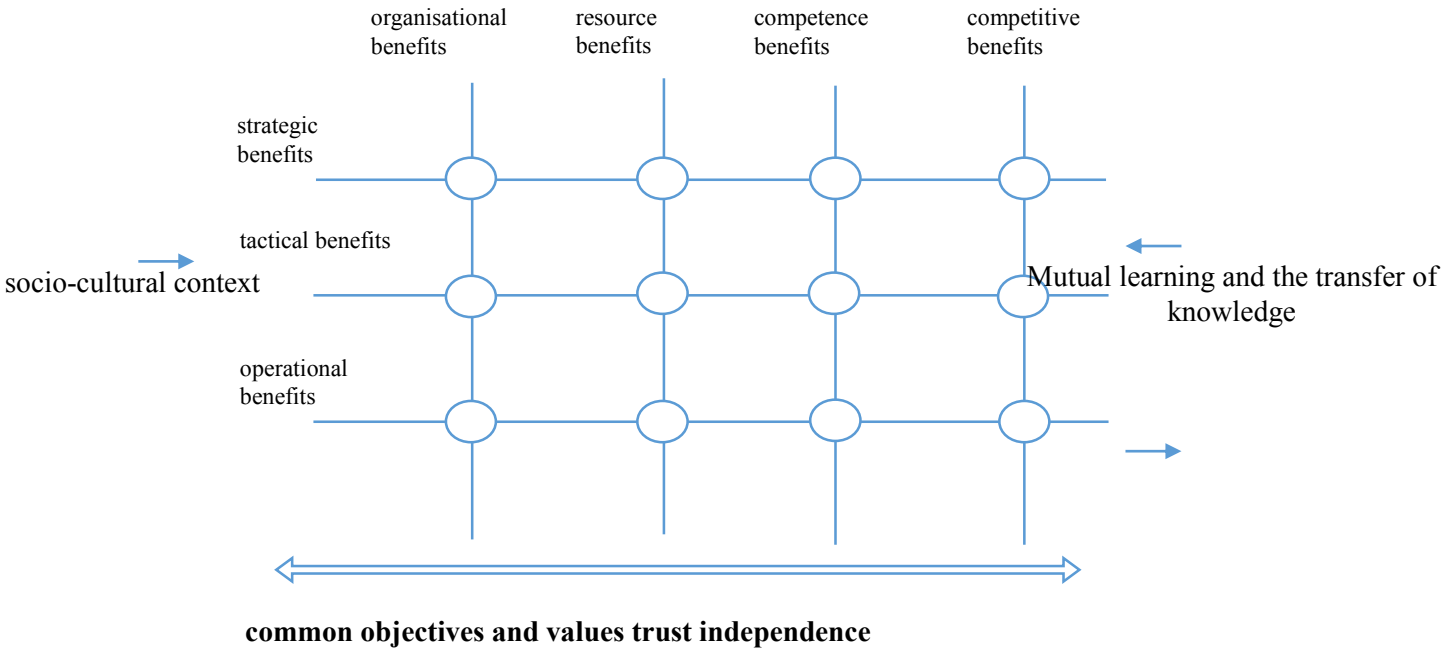


Figure 1. The benefit model of the inter-organisational cooperation. Source: own elaboration.

Given the importance of knowledge, skills and experience, competence benefits have been deliberately highlighted. They include issues of mutual learning within the partnership, continuous expansion of knowledge, product and process innovation, as well as the ability to adapt quickly to changes in the environment and to influence the shape of the relationship between the organisation and the environment. The area of competence benefits should include, in particular: the ability to use one's skills in specific areas of activity, integration and coordination, and the proper application of managerial knowledge in terms of cooperation, collaboration, attitudes and values. The skills of continuous improvement, openness and constant readiness to change as well as overcoming common stereotypes are also important.

Organisational benefits represent another group of effects achieved through the inter-organisational cooperation. They include the improvement of implemented processes and structural arrangements by means of increasing the level of its adaptability and flexibility. The effects will also facilitate the improvement of the company's performance and efficiency thanks to cooperation.

The last but not the least group consists of the benefits resulting from the strengthened competitive advantage. They contribute to a better use of opportunities and increasing opportunities as well as expanding the scale of business operations onto new markets. On the one hand, the aforementioned activities increase a company's equity, and on the other hand, they strengthen its competitive advantage in the market.

It should also be noted that, in addition to the above mentioned benefits, cooperation may also have an adverse impact arising from factors that reduce the effectiveness of cooperation and thus may diminish competitiveness in the market. The issue represents a relatively new research area. The subject matter and numerous studies focus on advantages and benefits rather than on negative consequences. The indicated issues are tackled in the studies of the following researchers: W. Czakon (2007), P. Klimas (2014), J. Niemczyk (2008), E. Stańczyk-Hugiet, M. Strychalski (2013). The reasons for ineffectiveness depend on a number of individual conditionalities that characterise a given cooperation. They may abundantly include a correlation of irregularities. Table 1 below presents the selected factors that affect the cooperation efficiency.

The above mentioned set of adverse effects is diverse and does not exhaust all the irregularities. However, their occurrence affects the effectiveness of cooperation and there is no doubt that if they occur, they should be actively counteracted. In a situation where the efforts made do not bring the desired results, the cooperation should be discontinued in a controlled manner.

Table 1.
Factors lowering the effectiveness of the inter-organisational cooperation

Factor	Cause	Negative Effect
Strategy	incorrectly defined scope of plans and objectives, aggregated and implemented at lower management levels	- discrepancy between aims - duplication of objectives - no clear rules of cooperation - no strategic benefits
Structure	incorrectly defined goals, tasks, responsibilities of organisational units and the way the lines of subordination will run	- improper assignment of objectives, tasks and responsibilities - workload, conflicts - increased organisational complexity - loss of independence
Competencies	partner's incompetence	- financial losses - conflicts - image loss
Knowledge	improper knowledge transfer	- knowledge loss - unidirectional knowledge transfer - lack or incorrect absorption of knowledge - no technological benefits
Management Style	inappropriate distribution of discretional powers and diffusion of knowledge	- inappropriate position and status of participants (power imbalance) - loss of independence - weakening of the negotiating position - inter-organisational conflicts
Processes	incorrectly defined ways of organising cooperation	- improper process of communication - formal as well as informal links and high strength and frequency of links with a high degree of trust
Culture	cultural mismatch	- distrust - loss of identity - cultural mismatch - conflicts
Financial	incorrect structure of cost and profit appropriation	- financial losses
Legal		- financial losses

Source: own elaboration.

4. Assessment Methodology

The degree of effectiveness of the inter-organisational cooperation between companies in the creative sector has been assessed by means of a categorisation method. In particular, the categorisation procedure consists of determining the structure of the assessment criteria in respect of the examined phenomenon, qualification of the assessment criteria, carrying out

a follow-up evaluation, developing the qualification regulations. The subsequent stages of the categorisation procedure are briefly discussed below.

Determining the Assessment Criteria

In order to assess the degree of effectiveness of the inter-organisational cooperation between companies in the creative sector, 15 criteria have been adopted and included in three generic groups, examining the level of implementation of the distinguished aspects of the inter-organisational cooperation:

1) essence and scope of the inter-organisational cooperation (A_1):
   - number of partners with which the company cooperates (K_1),
   - partner selection criteria for the inter-organisational cooperation (K_2),
   - reasons for establishing the inter-organisational cooperation (K_3),
   - reasons for not undertaking the inter-organisational cooperation (K_4),
   - extent of the inter-organisational cooperation (K_5),
   - business areas of the company covered by the inter-organisational cooperation (K_6),
   - factors destabilising the inter-organisational cooperation (K_7),
2) the involvement of the company's managers and employees in shaping the inter-organisational cooperation (A_2):
   - the degree to which the managers of the company understand the need for the inter-organisational cooperation (K_8),
   - the degree to which the employees of the company understand the need for the inter-organisational cooperation (K_9),
   - organisation of the principles underlying the inter-organisational cooperation in the company (K_{10}),
3) effects of the inter-organisational cooperation (A_3):
   - impact of the inter-organisational cooperation on the implementation of the company's objectives (K_{11}),
   - impact of the inter-organisational cooperation on the objective implementation by partners (K_{12}),
   - impact of the inter-organisational cooperation on the development of a company (K_{13}),
   - extent to which the inter-organisational cooperation is the company's resource (K_{14}),
   - effectiveness of the inter-organisational cooperation (K_{15}).

The values of respective criteria have been determined by assigning to them an appropriately selected range of questions taken from the survey questionnaire. An example of the characteristics of one of the adopted criteria together with the interpretation is presented in Table 2.

Assessment Criteria Qualification

Once the criteria for assessing the degree of effectiveness of the inter-organisational cooperation between companies in the creative sector have been defined, the following steps may be taken to qualify them: 1) developing the assessment benchmark, 2) setting selection preferences, 3) determining the weight of the assessment criteria. Each of the subsequent steps will be briefly described below.

Table 2.
Sample characteristics of the criterion (K_7)

K_7 – factors destabilising the inter-organisational cooperation
The criterion is a destimulant, i.e. the more factors destabilise the inter-organisational cooperation, the lower the aforementioned criterion scores. For the purposes of the conducted research, the following barriers disrupting and restricting the cooperation have been distinguished: - the fear of the loss of knowledge, - the fear of the loss of independence, - the lack of clear and mandatory rules of cooperation, - going concern failing, - cultural mismatch, - personal mismatch, - difficulties in determining the rules for profit appropriation, - the resistance of employees to change, - too high costs of cooperation, - the incompetence of a partner, - mismatch of goals, - work overload, - the fear of dismissal of specialists, - no financial benefits, - no strategic benefits, - no technological benefits, - too much dependence on partners, - the lack of trust between the parties, - high organisational complexity, - no time for cooperation. Comment: The benchmark value is equivalent to the absence of barriers that limit or interfere with the inter-organisational cooperation. The more barriers, the narrower the scope of the inter-organisational cooperation is.

Source: own elaboration.

1. **Developing the benchmark value for effectiveness of the inter-organisational cooperation between companies in the creative sector**

The assessment benchmark is a set of criteria incorporated into the assessment system. It may be either normative or postulative. The normative benchmarks are considered to be extreme volumes. Exceeding or failing to achieve them accounts for a drawback of the system being tested. On the other hand, there are two kinds of postulative benchmarks:

- stimulants, i.e. features for which an upward trend is desired,
- destimulants, i.e. features for which a downward trend is desired.

From the point of view of the aforementioned aspects of the inter-organisational cooperation, the benchmark values have been described by means of qualitative features for each of the proposed assessment criteria. An example of the benchmark value for one of the adopted assessment criteria has been presented in Table 3.

Table 3.
An example of the benchmark value for the assessment criterion

K_7– factors destabilising the inter-organisational cooperation
The assessment criterion takes the highest value when at an enterprise: - no fear of loss of knowledge is observed, - there is no fear of loss of independence, - clear mandatory rules of cooperation are established, - continuity of cooperation between partners is maintained, - there is a cultural match, - there is a personal match, - the rules for profit appropriation are established, - there is no resistance of employees to change, - the costs of cooperation are not felt to be high, - the partner is competent, - partners' objectives are matched, - there is no work overload, - there is no fear of dismissal of specialists, - inter-organisational cooperation brings financial benefits, - inter-organisational cooperation brings strategic benefits, - inter-organisational cooperation brings technological benefits, - there is not too much dependence on partners, - there is no lack of trust between the parties, - the organisational complexity is not high, - there is no lack of time for cooperation.

Source: own elaboration.

2. Setting selection preferences

Preferences serve the grounds for determining the validity of the assessment criteria, prioritising thereof by means of scoring. Preferences are selected according to the extent and substantive significance of the conducted research. Those may be purposeful, e.g. economic, organisational, technical, social as well as situations or circumstances according to which the weight of assessment criteria is determined.

The preferred level of a company's competitive advantage has been assumed to fit the distinguished assessment criteria for the degree of effectiveness of the inter-organisational cooperation between companies in the creative sector. The sustainable and undisturbed inter-organisational cooperation has been found to stimulate a company's development, which may be indirectly verified through the financial and market performance thereof.

3. Determining the weight of the assessment criteria

Once the preferences have been selected, the weight of the assessment criteria should be determined. The weight expresses the significance of a given criterion. Preferences serve as a yardstick against which justification is given as to why a particular weight is attributed to a given criterion. The weight has been determined by the researchers of the Cracow University

of Economics for the purpose of this research. The weights have been assigned to respective assessment criteria on the basis of a three-point scale:

- 3 points: absolutely necessary criteria (dominant),
- 2 points: required criteria (essential),
- 1 point: useful criteria (good).

Table 4 correlates the weights determined by the experts for respective assessment criteria for the degree of effectiveness of the inter-organisational cooperation between companies in the creative sector.

Table 4.
Correlation of weights for the assessment criteria

No.	Criterion	Weight
K_1	the number of partners with whom a company cooperates	1
K_2	partner selection criteria for inter-organisational cooperation	2
K_3	reasons for establishing inter-organisational cooperation	1
K_4	reasons for not undertaking inter-organisational cooperation	1
K_5	extent of inter-organisational cooperation	3
K_6	a company's business areas covered by inter-organisational cooperation	2
K_7	factors destabilising inter-organisational cooperation	3
K_8	the degree to which the managers of a company understand the need for inter-organisational cooperation	2
K_9	the degree to which the employees of a company understand the need for inter-organisational cooperation	2
K_{10}	organisation of the principles of inter-organisational cooperation in a company	2
K_{11}	the impact of inter-organisational cooperation on achievement of a company's objectives	3
K_{12}	the impact of inter-organisational cooperation on the objective deliverable by partners	2
K_{13}	the impact of inter-organisational cooperation on the development of a company	3
K_{14}	the extent to which inter-organisational cooperation is a company's resource	3
K_{15}	the level of effectiveness of inter-organisational cooperation	3

Source: own elaboration.

Carrying out a follow-up assessment

A follow-up assessment is a tool to standardise assessment criteria, which makes aggregate assessment possible. The primary aim of the standardisation of assessment criteria is, on the one hand, to deprive the distinguished diagnostic variables of their natural size that is measured to value them and, on the other hand, to unify the order of magnitude in order to make the ultimate diagnostic variables comparable (Pawełek, 2005, p. 47). The follow-up assessment should indicate whether a given object satisfies the pre-set requirements. The interpretation of

resulting figures and related trends is essential for the accurate follow-up assessment, especially when a multi-criteria model is applied, and respective criteria represents nominants (K_1, K_2, K_5, K_6, K_{10}), stimulants (K_3, K_8, K_9, K_{11}, K_{12}, K_{13}, K_{14}, K_{15}) and destimulant (K_4, K_7). The follow-up assessment may be expressed in terms of indicators (it expresses the relationship between the actual figures and the benchmark value) or in terms of scores (it is a reference of the factual state to the relevant degree of assessment on the point scale) (Stabryła, 2005). The follow-up assessment based on indicators represents the ratio scale and the numerical scores corresponds to an interval scale. The scheme of positive, standardised six-point follow-up assessment was employed in this study (Table 5):

- 0 – unsatisfactory condition,
- 1 – allowable condition,
- 2 – satisfactory condition,
- 3 – moderate condition,
- 4 – good condition,
- 5 – high utility condition,
- 6 – outstanding condition.

Table 5.
Scalers for the follow-up score-based assessment in relation to the effectiveness of the inter-organisational cooperation between companies in the creative sector

Assessment criteria	**Score**						
	0	1	2	3	4	5	6
K_1	0	1-3	4-6	7-9	10-20	21-40	above 40
K_2	0		1	2	3	4	5
K_3	0	1	2-3	4-5	6-7	8-9	10
K_4	7 - 6	5	4	3	2	1	0
K_5	0			1	2	3	4
K_6	0	1-2	3-4	5-6	7	8	9
K_7	21-20	19-16	15-12	11-8	7-4	3-1	0
K_8	0	1	2	3	4	5	6
K_9	0	1	2	3	4	5	6
K_{10}	0				one organisation	several organisations	all organisations jointly
K_{11}	0		small	medium	large	very large	full
K_{12}	0		small	medium	large	very large	full
K_{13}	0		small	medium	large	very large	full

Cont. table 5.

K_{14}	0		low importance resource	medium importance resource	high importance resource	resource of a very high importance	key resource
K_{15}	0		small	medium	large	very large	full

Source: own elaboration.

Given Table 5, the index value of the effectiveness of the inter-organisational cooperation between companies from the creative sector (S_i) has been determined for each company surveyed according to the formula:

$$S_i = \Sigma^{n}_{j=1} w_j * o_{ij} \quad (1)$$

where:

w_j – the j weight of the assessment criterion,

o_{ij} – the follow-up score-based assessment related to i-of that company,

$i = 1, \ldots, m$ – companies,

$j = 1, \ldots, n$ – assessment criteria.

Drawing up qualification regulations

The qualification regulations account for a formalised set of rules and pre-conditions for determining the category of a company in view of the achieved value of the index of effectiveness of the inter-organisational cooperation between companies in the creative sector (S_i). The qualification regulations serve the purpose of qualitative assessment of the system under consideration, which means translating the value of the S_i index into a specific category. The qualification regulations include provisions concerning: arranging for the valuation scale, setting hierarchical ranges on the valuation scale and marking the category of companies.

The maximum score-weighted value of the S_i index amounts to 198 in the presented method. The indicated value would be achieved by a company if it were given a score of 6 for each of the 15 assessment criteria that have been distinguished, multiplied by the weight criterion adopted for each of them.

Hierarchical ranges are the limit values of qualification degrees set for the index. Those ranges correspond to specific categories: A, B, C, D, which express the gradation of the S_i significance index. The applied S_i index hierarchy is represented by the ranges given in Table 6.

Table 6.
The adopted hierarchical ranges of the S_i index

Category	Points	Characteristics
A	198-159	a company with a high effectiveness level of inter-organisational cooperation – the S_i index above 80%
B	158-119	a company with an average, good level of effectiveness of inter-organisational cooperation – the S_i index ranging from 60 to 79%
C	79-118	a company with a low, sufficient level of effectiveness of inter-organisational cooperation – for the S_i index ranging from 40 to 59%
D	0-78	a company with a very low, insufficient level of effectiveness of inter-organisational cooperation – for the S_i index lower than 39% of its maximum value

Source: own elaboration.

The stage of marking the category of a company closes the categorisation process. Within the framework thereof, the S_i index is calculated for each *i*- of that company and a specific category is assigned to it.

5. Research Results

This paper shows the results of a study on the analysis of the inter-organisational cooperation in the creative sector, carried out between January 2019 and February 2020. The study was conducted by means of the Delphic method and two research methods, a partially standardised interview and a survey. The results of numerous interviews using open and closed questions had been employed to develop a survey questionnaire which included 26 open and closed single and multiple-choice questions. The research involved 43 companies of varied size, ownership, extent of operation, sectors of the creative industry, based in the south-eastern Poland in the Małopolskie, Podkarpackie and Śląskie Voivodeships, located mainly in large cities of over 500 thousand inhabitants. The companies were selected deliberately and included companies operating in the creative industry. The survey was addressed to the managers, mainly self-employed, top managers, and chief executive officers. As a result of the calculations carried out with the use of *S* index, the surveyed companies were classified into three subsequent categories indicating the gradation of the significance index (Figure 2).

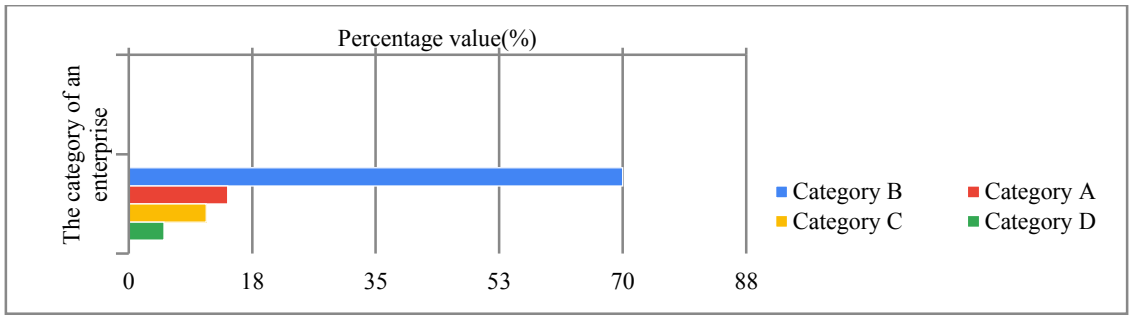


Figure 2. The benefit model of the inter-organisational cooperation. Source: own study based on the results of the conducted research.

The analysis of the obtained results shows that the highest value of the S index reached the score of 163 points, and the lowest one was the score of 62 points. The vast majority of companies (70%) were classified into category B, due to the value of the S_i index, characterised by an average or good level of effectiveness of the inter-organisational cooperation. Within the framework of categories A and C, 14% and 11% of the surveyed companies were classified respectively. It should be noted, however, that the highest value of the S_i index (amounting to 163 points), only slightly exceeds the assumed threshold value for this range. It shows that none of the surveyed companies displays the inter-organisational cooperation which would be organised and implemented according to the benchmark, and which would guarantee a very high competitive advantage. However, it is satisfactory that only 5% of the surveyed companies, due to the S_i index in the group of the surveyed companies, received category D, indicating insufficient or very low level of effectiveness of the inter-organisational cooperation.

In order to deepen the conducted analyses, the decision was made to develop a matrix describing, comparing and then evaluating the surveyed companies taking into account two variables: the level of competitive advantage and the level of cooperation effectiveness (Figure 3). The developed tool is based on the assumption that higher effectiveness of cooperation should result in a higher level of competitive advantage.

As a result of the conducted analysis, we have obtained eight groups of companies, the varied levels of effectiveness of cooperation of which translate into the varied levels of their competitiveness. The size of circles shows the percentage share of companies with the same coordinates in the total number of the companies under consideration. As we can see, the largest group 1, that includes 37% of the surveyed companies, is found in the quarter on the matrix with over 60% of all surveyed companies. It shows that the implemented cooperation is at a good level of effectiveness, which is also confirmed by the results obtained in terms of S_i index hierarchy. It is also worth noting that almost all companies in category A are found in group 4.

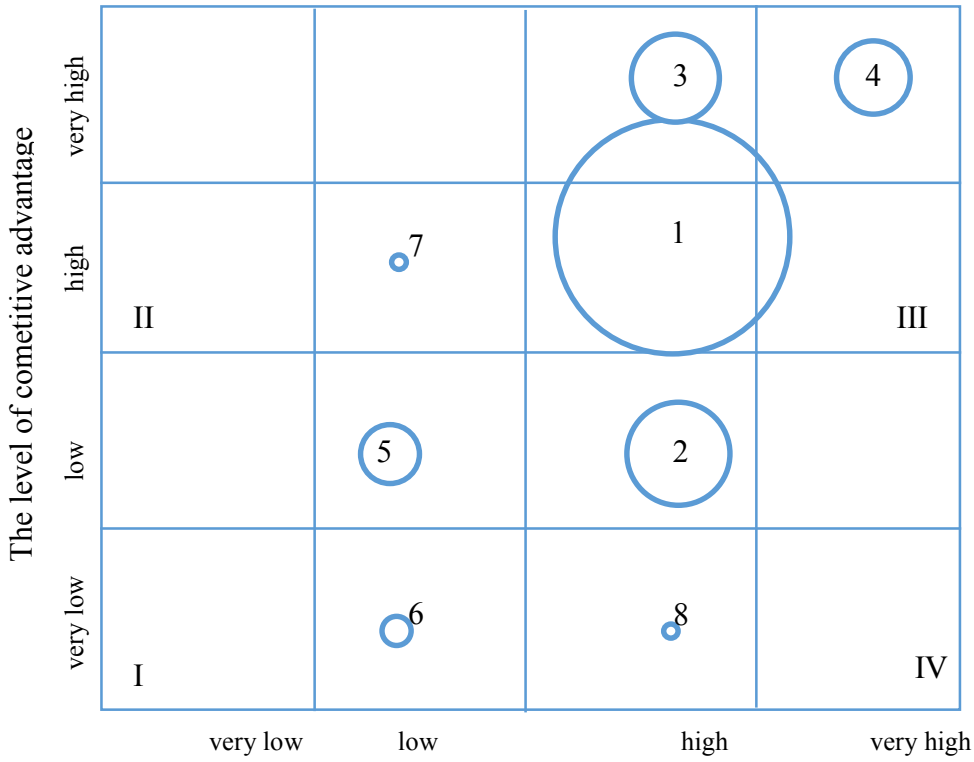


Figure 3. The matrix of relations between the level of cooperation effectiveness and the level of competitive advantage. Source: own study based on the results of the conducted research.

While conducting a further assessment analysis as regards the degree of effectiveness of the inter-organisational cooperation between companies in the creative sector, taking into account the criteria described above, it seems cognitively interesting to point out the differences between companies in categories A and D. The indicated differences relate in particular to the third criterion associated with the effects of the inter-organisational cooperation (A3) and the criterion of the essence and extent of cooperation (A_1).

The A category companies are characterised by a much broader extent of cooperation than those in category D. When selecting partners, the category A companies take into account such aspects as the knowledge or technology used by the potential partner, experience, reputation or financial criteria. However, for category D companies, the most important are financial issues, proximity (distance) and knowledge possessed by the partner.

Moreover, the subject matter of the inter-organisational cooperation is much more diverse in the case of the category A companies and is related to obtaining the necessary resources, complementary competencies as well as increasing production capacity and sales volume. The partnership in those companies includes, among others, the provision of information, a semi-finished product or a sub-assembly necessary to produce a final product, assistance in the implementation of processes in the company. In the case of companies connected with IT industry, computer games or film production, the subject matter of the cooperation includes providing technology or a semi-finished product essential for the production process.

Moreover, the cooperation implemented in the aforementioned companies is more open and active and is characterised by higher consciousness. Additionally, it includes many partners in the field of production, accounting, financial, marketing, human resources, logistics, IT and EU funding functions. The minimum number of partners indicated by those companies is seven, although a significant part of companies indicate more than 40 partners.

The companies included in category D, in turn, focus primarily on cooperation in the field of information transmission, assistance in the implemented processes (accounting, financial, marketing and logistics) and a semi-finished product delivery. The number of partners in most cases include only a few (three partners in most of the cases).

The conducted research has also shown that the managers and employees in the category A companies more knowingly participate in shaping the inter-organisational cooperation than in the category D companies. The degree to which managers and employees understand the need for cooperation is full or very high. Moreover, the effectiveness of cooperation is assesses to be higher among organisations in category A, that constitute a significant source of value for all of the cooperation participants, contributing significantly to achieving a competitive advantage in the market.

However, the effectiveness of the partnership, as indicated by the study, is reduced by factors such: as cooperation discontinuity, mismatch and incompetence of partners, cultural differences, the lack of jointly defined and respected rules of cooperation, which may contribute to the loss of independence or knowledge, the lack of support from managers and improperly defined processes.

Despite the fact that none of the surveyed companies accomplishes full effectiveness in the field of the realised cooperation, they consciously establish relations with partners, expecting concrete, measurable effects, and in most cases it is achieved.

It is also worth noting that all companies under consideration are involved in cooperation. There are only a few examples of companies which do not undertake cooperation. It results from the lack of need or an appropriate, competent partner.

In view of the above-mentioned factors, it may be concluded that the more effective inter-organisational cooperation is, the more determined it is to improve the competitive advantage of companies in the creative sector. It contributes to the growth of strategic and operational benefits, it facilitates the implemented processes and provides a possibility to acquire and complement competences as well as necessary resources. Moreover, it increases production and sales potential in new markets.

6. Summary

The results of the research efforts make it possible to confirm the assumed hypothesis that the effectiveness of the inter-organisational cooperation between companies in the creative sector is an important determinant of improving their competitive advantage. The inter-organisational cooperation implemented in 70% of the surveyed companies is at an average or good level of the inter-organisational cooperation effectiveness (the B category companies). Only 5% of the surveyed companies display a very low or insufficient level of the inter-organisational cooperation effectiveness. Moreover, the comparative analysis of the obtained results for organisations qualified to be A and D categories has allowed to indicate the factors increasing the effectiveness of the inter-organisational cooperation. The partnership is more effective when:

- the extent of cooperation is clearly defined and also includes regulations governing the protection of information, knowledge, technology, profit and cost sharing, and the rules established are strictly obeyed by all participants;
- the partners' independence is preserved;
- managers' support and understanding of the need for cooperation is bigger and they prove commitment;
- employees' and partners' consciousness and common understanding of the need for cooperation is increased;
- it contributes more to the objectives of all cooperation partners;
- it contributes more to the development of the company and constitutes its resources as well as allows to derive strategic, financial and technological benefits;
- it takes into account the higher degree of diversity of partners, but the higher the diversity, the more carefully they should be selected;
- the cultural, personal, organisational, cooperation objectives and competence are matched better and the level of trust between partners is higher.

We can conclude that the cooperation in the sector under consideration, taking into account the above mentioned factors, may become a significant source of equity for all participants, especially if it is perceived as an opportunity rather than a business risk.

The above considerations do not fully exhaust the problem that has been addressed, and indicate further research areas of interest in both cognitive and normative terms. The determination of correlations in terms of partner selection criteria or the assessment of effectiveness of the implemented inter-organisational cooperation and in-depth analysis in the field of competitiveness may still be an outstanding issue.

Acknowledgements

The Project has been financed by the Ministry of Science and Higher Education within "Regional Initiative of Excellence" Programme for 2019-2022. Project no.: 021/RID/2018/19. Total financing: 11 897 131.40 PLN.

References

1. Adamik, A. (2015). Partnerstwo strategiczne a konkurencyjność przedsiębiorstw. Perspektywa MSP. *Zeszyty Naukowe, No. 1199, Rozprawy Naukowe, 484*. Politechnika Łódzka.
2. Child, J, Faulkner, D., Tallman, S. (2005). *Cooperative strategy: managing alliances, networks and joint ventures.* Oxford: Oxford University Press.
3. Chrupala-Pniak, M., Grabowski, D., Sulimowska-Formowicz, M. (2017). Trust in Effective International Business Cooperation: Mediating Effect of Work Engagement. *Entrepreneurial Business & Economics Review, 5(2),* 27-50.
4. Cygler, J., Aluchna, M., Marciszewska, E., Witek-Hajduk, M.K., Materna, G. (2013). *Kooperencja przedsiębiorstw w dobie globalizacji. Wyzwania strategiczne, uwarunkowania prawne.* Warszawa: Oficyna a Wolters Kluwer business, 15-16.
5. Czakon, W. (2007). *Dynamika więzi międzyorganizacyjnych.* Katowice: Wydawnictwo Akademii Ekonomicznej, 115.
6. Czakon, W. (2010a). Świadomość sieciowa w strategiach relacyjnych. *Przegląd Organizacji, nr 2/176*, 93-104.
7. Czakon, W. (2010b). Hipoteza bliskości. *Przegląd Organizacji, nr 9*, 16-20.
8. Czakon, W. (2012). *Sieci w zarządzaniu strategicznym.* Warszawa: Oficyna a Wolters Kluwer Business.
9. Doz, Y.L., Hamel, G. (2006). *Alianse strategiczne. Sztuka zdobywania korzyści przez współpracę.* Gliwice: Wydawnictwo Helion.
10. Dyduch, W., Bratnicki, M. (2016). Tworzenie wartości oparte na twórczej strategii – zamysł koncepcyjny, sprzeczności, paradoksy i przesłanki dla teorii. *Prace Naukowe Uniwersytetu Ekonomicznego*, *420.* Wrocław, 66-79.
11. Heimbürger, M., Dietrich, P. (2012). Identifying the Basis of Collaboration Performance in Facility Service Business. *Facilities*, *Vol. 30/11*.
12. Huiskonen, J., Pertilla, T. (2002). Lateran Coordination in a Logistics Outsourcing Relationship. *International Journal Production Economics*, *Vol. 78*, 177-185.

13. Karbownik, A. (2013). *Paradygmat sieciowy. Wyzwania dla teorii i praktyki zarządzania*. Gliwice: Wyd. Politechniki Śląskiej.
14. Klimas, P. (2013). *Uwarunkowania skutecznej współpracy międzyorganizacyjnej*. *Wydawnictwo Uniwersytetu Ekonomicznego, Nr 141.* Katowice, 189.
15. Klimas, P. (2014). *Sieci Innowacji. Implikacje bliskości organizacyjnej*. Katowice: Wydawnictwo Uniwersytetu Ekonomicznego, 17.
16. Knoben, J., Oerlemons, L.A.G. (2006). Proximity and Inter-Organizational Colaboration: A Literature Review. *International Journal of Management Reviews, Vol. 8,* 71-89.
17. Krzakiewicz, K. (2013), Koncepcja sieciowa – w poszukiwaniu nowego paradygmatu teorii strategicznego zarządzania. In: A. Karbownik (Ed.), *Paradygmat sieciowy. Wyzwania dla teorii i praktyki zarządzania*. Gliwice.
18. Łuniewska, M., Tarczyński, W. (2006). *Metody wielowymiarowej analizy porównawczej na rynku kapitałowym.* Warszawa: PWN.
19. Michna, A., Kmieciak, R., Czerwinska-Lubszczyk, A. (2020). Dimensions of Intercompany Cooperation in the Construction Industry and their Relations to Performance of SMEs. *Inzinerine Ekonomika-Engineering Economics*, *31(2),* 221-232.
20. Niemczyk, J. (2008). Wady sieci międzyorganizacyjnych. In: M. Przybyła (Ed.), *Zarządzanie. Wybrane obszary funkcjonalne instytucji* (pp. 176-182). Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego.
21. Pawełek, B. (2008). *Metody normalizacji zmiennych w badaniach porównawczych złożonych zjawisk ekonomicznych.* Kraków: Wydawnictwo Uniwersytetu Ekonomicznego, 47.
22. Sako, M. (1998). Does trust improve business performance? In: C. Lane & R. Backman (Eds.), *Trust within and between organizations: Conceptual issues and empirical application* (pp. 88-117). Oxford: Oxford University Press.
23. Schnobrich-Davis, J., Terrill, W. (2010). Interagency Collaboration: An Administrative and Operational Assessment of the Metro-LEC Approach. *Policing: An International Journal of Police Strategies & Management*, *Vol. 33/3,* 506-530.
24. Simatupang, T.M., Sridharan, R. (2005). The Collaboration Index: A Measure for Supply Chain Collaboration. *International Journal of Physical Distribution & Logistics Management, Vol. 35/1*, 44-62.
25. Stabryła, A. (2013). Metodyka oceny osiągnięć przedsiębiorstwa. *Zarządzanie i Finanse. Journal of Management and Finance, nr 4, z. 11, cz. 1,* 317-332.
26. Stańczyk-Hugiet, E. (2012). Charakterystyka relacji. In: J. Niemczyk, E. Stańczyk-Hugiet, B. Jasiński (Eds.), *Sieci międzyorganizacyjne. Współczesne wyzwanie dla teorii i praktyki zarządzania.* Warszawa: C.H. Beck.
27. Stańczyk-Hugiet, E., Strychalski, M. (2013). Asymetria wiedzy w relacjach międzyorganizacyjnych. Przedsiębiorstwo jako organizacja ucząca się. *Prace Naukowe Uniwersytetu Ekonomicznego, 310.* Wrocław, 123-131.

28. Sulimowska-Formowicz, M. (2015). *Relational competence of a firm as a determinant of interorganizational relations' effectiveness and efficiency – a study from Polish market*. Proceedings of the 31 IMP Conference, Kolding, Denmark.
29. Thomson, A.M., Perry, J.L., Miller, T.K. (2009). Conceptualizing and Measuring Collaboration. *Journal of Public Administration Research and Theory, 19/1*, 23-56.
30. Tyszkiewicz, R. (2017). *Zarządzanie relacjami z interesariuszami organizacji.* Warszawa: Agencja Wydawnicza Placet.
31. Zakrzewska-Bielawska, A. (2015). Strategie przedsiębiorstw w sieci. Wyniki badań firm high-tech. *Prace Naukowe WWSZiP, 32(20).*

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SOCIAL ACTIVITY AS A VALUE OF CIVIL SOCIETY

Michał BOCZEK

SWPS Uniwersytet Humanistycznospołeczny; michal.boczek@vp.pl, michal.boczek.kancelaria@gmail.com,
ORCID: 0000-0002-2784-5973

The aim of the article: is to show the relationship between social activity and the values of civil society. An additional assumption is to indicate the essence of the issue in an interdisciplinary approach, to draw attention to its multidimensionality, connection and social significance, leaving room for own research.
Design/methodology/approach: The research method used in this article is the analysis of scientific papers, supplemented by the author's observations and experience. The research procedure included a review of Polish and foreign literature, analysis of legal acts, method of analysis and synthesis, case study and deductive reasoning. The article presents the results of research on the awareness, activity and values of civil society.
Conclusions: A high level of influence of citizens' awareness in the process of building a civic society was demonstrated. Examples of activities and values of the changes taking place in civilization, spontaneity and voluntariness, understood as the principle of subsidiarity setting limits for citizens and authorities. Active citizens is an active society, a community of citizens that consciously and responsibly manages its interests. The conducted analysis shows that a conscious citizen is a conscious choice and a conscious way of their implementation. Intellectually healthy people are the sum of a healthy society, the sick are the sum of destruction and narcissism. Citizenship is inscribed in the life of every human being, although few people are aware of it.
Research limitations/implications: Limitations of the obtained results may result from a limited text sample.
Originality/value: The presented research and conclusions provide practical tips not only to people of science, but above all to average citizens, mainly those who are not aware that civilization change does not arise overnight, it is always preceded by a number of smaller changes hidden under the surface many areas. Thanks to the activity of the society, it is easier to develop a consensus on matters of key importance to society. It is easier to understand another person, learn tolerance, and recognize the differences of interests as natural and desirable.

Keywords: Social activity as a value of civil society. Article category: research paper.

1. Admission

The way we think, speak and act, what language we use, translates into human attitudes and their social dimension. Not all people are interested in social activity, many think: let others do it for us. This is not the case in civil society. The consciousness of an individual translates into group consciousness, and many groups into the level of general consciousness. Citizenship is one of the most important features of social activity in relations between the state – citizen, citizen – citizen, Church – citizen. The level of social awareness shapes the level of social rules and values. The level of values recognized in the society stimulates the development of technology and is not indifferent to ethics. Man as a conscious citizen is part of sustainable development, which is faced by life with more and more difficult tasks. A. Kuzior speaks broadly about the value of civil society and axiological development, pointing to responsibility as a key feature of sustainable development (Kuzior, 2014, pp. 351-363). Civilization change does not arise overnight, it is always preceded by a series of minor changes hidden under the surface of many areas, recognized or not. A healthy society is the sum of healthy people, the sick constitute the sum of destruction and narcissism, acting according to the formula: ideology becomes doctrine, and doctrine becomes dictatorship. Citizenship is assigned to a person, but not everyone is aware of it and not everyone wants to actively participate in it. It is difficult for many people to understand that civil society is a society for everyone. We do a lot separately, let's do even more together.

2. Society – a historical outline

Society is not only a territory, language, culture, it is primarily a system of interconnected elements. These are processes taking place according to the adopted hierarchy of values and principles, relations between individuals, social categories, institutions and broadly understood organizations. Herbert Spencer compared society to an animal organism, saying: "social reality is derived from the natural – there is only a difference in the degree of complexity between them. Social institutions are what makes the naturally non-social man adapt to the natural state of cooperation with society (Kasprzyk, Spencer, 1967, p. 167). What is good is what serves to adapt and develop, what is not – it should not be good, so we should support the strong rather than the weak (Turowski, 1994, pp. 58 et seq). Karl Marx considered a society three successive social formations: "the formation of the primitive community, the slave formation and the feudal formation". The history of all existing societies is the history of class struggles. Humanity only sets itself tasks that it can solve. Individual behavior should be conditioned by the social structure. The entirety of relations creates the structure of society, the real foundation

on which appears a legal and political superstructure to which certain forms of social awareness correspond. The process of social, political and intellectual life and the consciousness of people determine their existence, and their social existence determines their consciousness (Adamus-Matuszyńska, 2017, p. 24). According to Plato's concept, society (the State) is a multi-dimensional organism, in which every sphere of social life, however trivial it may seem, is functional in relation to the whole organism, therefore the individualization of society poses a great threat to the social order (Plato, State, 1958, p. 25). Aristotle thought differently – the society "State" is by nature a multitude, if it develops towards ever greater unity, then from this unity a family will emerge, and from the family an individual (Aristotle, 1956, p. 1189). In the heyday of Stoicism, people began to seek not so much a good life in the state, but a good life despite the state (Szacki, 2005, pp. 35 et seq).

Philosophical schools no longer perceive the individual solely in the context of social life, focusing on the creation of a universalist anthropology, they understood man as a human being, a member of the human race, a being endowed with an innate social urge (Berlin, 1998, pp. 5 et seq).

The change in human philosophy influenced the emergence of the concept of a universal community in which all people would participate (Ranowicz, Hellenism, 1961, pp. 403-404). Marek Tulliusz Cicero ascribes to man "an innate drive to collective life", he writes about society as a great group, connected by the element of common existence, by recognizing the same principles, law and morality (Cycero, 1960, pp. 133-135).

Society perceived Seneca in a different way, for whom the bond of humanity is not law or politics, but moral and religious ties, a drive to act naturally devoid of institutional corruption (Seneca, 1961, p. 417).

The emergence of the Christian idea significantly revised a number of existing philosophical and political thoughts. The pursuit of understanding group life as a path to eternal salvation according to the Christian doctrine created a new perspective, the ideal of a community of conscious choice and participation in a specific goal. Christianity has triumphed wherever the philosophies of the ancient world, which advocated a completely different ideal of community, did not meet the requirements of the times. Since then, the fact of belonging to a community was not dependent on birth, social position, wealth, power and ethnic origin, and it became a matter of conscious choice of purpose and way of life.

The community of values, as it came to be defined, did not focus on temporal things: “none of its members called his own what he had, but they had everything in common (Borowski, 1980, 1 Cor 12). The issues of the early Christian community were widely discussed by St. Augustine in the work On God's State. Against the pagans of books XXII (De civitate Dei contra paganos libri XXII). Augustine characterized this community as people of one faith, where exceptional laws, incomprehensible to the "ordinary" man, were in force. with the social order, he was able to reconcile both to good effect. The foundation of the Augustinian social

idea was the conviction that, in fact, every society is a community of values (Augustine, 1977, pp. 161-163).

The internal order of the "unspiritual" community is completely different. The "earthly" community is inherently imperfect, since each member is primarily concerned with his own interests. When the goods are not sufficient for all, the community is divided into parts, one oppresses the other.

The divine community is - according to St. Augustine – a true peace in which no one will be hurt, and all are united by one idea, one goal. These two very different value systems correspond to two types of social order, one based on conflict, the other based on consensus.

The fact that a person belongs to one of these models of social community determines what he believes and how he acts, not the conditions under which he comes to live. Each community must have a meaning and purpose, the right school and the right teacher to be a diligent student.

In the opinion of Robert A. Nisbet, the essence of the social order consists in the fact that each person gives and receives what his functional place in society requires, according to the scheme of community and belonging. Within the community of communities, regardless of status, each individual was obliged to serve it (Guriewicz, 1976, pp. 72 et seq). Each link in the chain was considered an important part of the whole. The ideal of human relations in the writings of St. Thomas Aquinas becomes the model of the earthly world, it begins to be applied in society to all kinds of collectives (Maneli, 1967, pp. 178). Theology is mixed with politics, and the ideal is mixed with reality. The claim that man is a social creature has a broader meaning than in the ancient world. Despite the strong emphasis on the religious character of social thought, the individual – not self-sufficient by nature – was placed in the family, local community, state and co-option, according to the vertical and horizontal relations of domination and dependence. The Lutheran concept of life radically belonging to Christianity expressed the model of casteism – the superiority of Christians over other people, equal to the position of other Christians (Szczucki, 1972, pp. 39 et seq).

3. Evolution or revolution

Civilization change does not arise overnight, it is always preceded by a series of smaller changes hidden under the surface of many areas, including economy, law and culture. At some point, the world realized that the position of an individual depends not only on himself, but on how the individual manages to fit into society. People who can live in a community with a limited degree of dictates and traditions are internally controllable, they feel safer and more courageous. The unlimited are undecided and more submissive.

All times require an appropriate diagnosis. Machiavelli, making a diagnosis of his times, claimed: "Between what is happening in the world and what should happen, there is a great difference that whoever neglects reality in the name of the ideal of reality would cause his own loss than improve his situation; a man who would be governed only by the principles of good, would have to have a gulf in the environment of people governed by other principles" (Machiavelli, 1969, p. 66).

John H. Butterfield believed that discovering the rules of effective action is possible because circumstances are repeatable, human characteristics are constant, and human behavior is predictable – provided we have the appropriate knowledge. Fate does not rule the world so far that free will has no influence on what is going on around it (Butterfield, 1963, p. 41).

The development of society, including civil society, was significantly influenced by the emergence of the concept of Jean Bodin, who, in addition to the relations between the ruler and his subjects, took up the problem of social relations in general. Bodin believed that one cannot speak of a state if there is no supreme power endowed with the attribute of empire and dominion, if the community is not naturally organized in communities (Suchodolski, 1968, pp. 320-321).

The idea of a human society, such as Thomas Hobbes – Baruch Spinoza, John Locke, assuming the durability of human nature, helped to organize public life that guarantees the individual freedom and security, focused on a scientific representation of the future. John Locke wrote: "the overriding purpose for which people unite in community and submit themselves to government is to preserve their property" (Locke, 1992, pp. 250 et seq).

Thomas Hobbes, apart from competition and struggle, pointed to the sources of social order – the natural social state as a state without ties between individuals, not only redundant, but also harmful (Hobbes, 1954, pp. 5-7). According to Giambattista Vico, people act in a group because of a sense of belonging, a sense of shame, a search for authority and truth, because of anti-rationalism and criticism. Man is a social and historical being at the same time – there is no human nature as a given substance once and for all. The process of shaping human nature went through several phases, each of which was a consequence of the previous phase. Human development depends mainly on his relations with other people, which translates into the social order, thanks to which permanent interpersonal relations are possible.

According to Immanuel Kant, human immaturity is a state of underage, lack of courage to use reason without foreign guidance (Vico, 1966, pp. 150-151). "Have the courage to use your reason" – this appeal from Kant influenced human consciousness, developed in individuals a sense of the importance of their own mission (Krońśki, 1966, pp. 165-167).

Voltaire saw man as a being who always lived in society, with an instinct that made him love himself and others, as well as the work of his hands (Dierżawin, 1962, pp. 300 et seq). Jean Jacques Rousseau, author of the treatise On The Origin and the Foundations of Inequalities Among People, writes that "man of nature" is free, good, independent, equal to all other people. According to Rousseau, a society does not arise in order to satisfy already existing needs,

but itself produces new and new needs that can only be satisfied in it. The savage lives in himself, the socialized man is also outside himself, he knows how to live in the opinion of others, and derives a sense of his existence from their evaluation. As a result of the social contract, a social organism (Leviathan) is created, in which the parts are inseparable from the whole, the will of the individuals transforms into the social will (Rousseau, 1956, pp. 141, 229; Peretiatkowicz, 1966, pp. 166-167).

A controversial figure was Niklas Luhmann, who argued that society is not only made up of people, because man cannot be placed in any sub-system of society. Social systems are communication systems: society consists of closed interpersonal communication systems that do not maintain external contacts. They are also autopoietic systems that produce their own elements, define their boundaries and structure, are self-producing, and each of their operations depends on previous operations and the information they have collected. Each system has its own code which cannot be translated into the code of other systems. Communication takes place within the systems, not between them (Szacki, 2002, pp. 935-942).

Whatever you say, the activity of social contacts, as opposed to the feeling of uselessness or the feeling of isolation, not only influences the development of civil society, but is able to maintain this state, even develop it. Social institutions are what makes the naturally non-social man adapt to the natural state of cooperation with society.

It is thanks to the creation of these institutions that an individual can integrate, take part and decide about his and other positions for today and tomorrow (Kaczmarczyk, 2007, pp. 144 et seq). There is always greater potential in man than he realizes, the point is that he should be aware of his possibilities, also aware of his freedom and value, because the dualism of being and values is inevitable.

Freedom leads to values – and vice versa: values lead to freedom. According to Immanuel Kant, this dualism can never be abolished or resolved (Kant, 2002, p. 49). When people wonder why they should do this and not otherwise, the answer seems short: because it should. The words of Saint-Simon seem to be the key to success: any social reorganization must begin with a reform of consciousness (de Saint-Simon, 1968, p. 357). Conscious man is conscious choices and a conscious way of their implementation. You can be a personality and not be an authority, you can be an authority, but not a personality, you can be both, and not be one or the other.

4. Democracy – social activity

The participation of citizens in political, social, religious and cultural life (...) has been the subject of scientific research for many years. The interest in the social activity of citizens results from many reasons – for scientific, statistical, propaganda, historical and ideological reasons.

There is currently no doubt among the community that one of the conditions necessary for the proper functioning of democracy is to obtain an appropriate level of civic participation. (...) every human being is to be obedient and humble during his life. By being faithful to the principles, he is to create and be a moral and spiritual activist for a common cause (de Chardin, 1984, p. 87).

As the indicators of citizen engagement show, it depends on many factors: place of residence, education, degree of awareness and responsibility for the fate of a given country and Europe (Boguszewski, 2016, p. 4). As of April 1, 2012, EU citizens have at their disposal a new tool to participate in the EU policy-making process. Citizens' initiative, introduced by the Treaty of Lisbon. The civic budget, also known as participatory budget, is a democratic process whereby residents co-decide on public spending in the city for the next financial year is another example of a civic initiative.

Originally, democracy was to be the power of the people and for the people. Every citizen was to participate in the life of the state and decide on its affairs. In turn, civic activity is how members of society express their opinions, take part in elections, run the state, and thus their own lives. Activity and self-organization is a key issue for the quality and durability of a democratic state. According to Cicero, the state, res populi, is a moral community of people bound by rights and obligations.

The factor constituting the state community is participation in social life and the legal community. According to Cicero, law takes the first place – each type of system is only a type of state management in which law is a sovereign element, used in the spirit of the values of democratic principles (Brożek, 1969, p. 128).

The idea of Cicero was to combine the advantages of monarchy, elite rule and democratic principles – without their drawbacks – into a balanced whole that would resist corruption and prevent tyranny. For democratic thinking, adequate knowledge is necessary, for knowledge – social facts and the specificity of social phenomena. In order to understand the variability of the relationship between an individual and society, to treat social facts as a certain thing, it is necessary to use a certain mental attitude in the historical, philosophical, cultural and legal aspect (Durkhein, 1965, pp. 118-119). What binds people together is not that they are similar to each other, but that they are different and because of their differentiation they need each other. The essence of freedom and rationality requires that rights and obligations be properly understood in society. A man has knowledge mostly thanks to his reason, more extensive when he develops the adopted principles through an appropriate organization (Hegel, 1889, p. 75).

In a democracy for a higher idea, for a good cause, it is even possible to sacrifice personal interests. To do business, the community must be active, it must engage in public life, participate in elections, referenda and plebiscites. Being aware of how much depends on ourselves, through passive or active participation in public life we shape our life, our freedom mainly through the environment.

Freedom is a difficult thing – says Leszek Kołakowski – “man needs a point of reference, democracy is no longer a rebellion against oppression and is not a measure of moral attitudes. Contemporary reality is defined by money, which has ceased to be a tool of exchange, but has become a means in itself, which leads to the degradation of man and the degradation of things that can be bought with money. Never before has political life been so dependent on opinion and interpretation, which leads us to doubt the stability of capitalism and democracy. Perhaps, in the long run, modern democracy will not be able to deal with such phenomena as terrorism, religious fundamentalism, the LGBT issue, the problem of abortion and euthanasia" (Kołakowski, 2014, p. 284).

A well-educated and well-informed society that knows that most important state decisions depend on it strengthens the democratic system and makes it better and better for the needs of the individual and the general public. It depends on us who rules us, what our country looks like and how we live. Democracy has nothing to rest on unless society itself believes it can do something by participating.

By not taking part in the life of our country, we rely on absolute subordination to those whose views and actions do not necessarily align with our values and our interests. Solidarity and consistent action not only strengthen the sense of belonging to a civic community, but also stimulate social awareness and combine the interests of the individual with the general interest. Until we realize that the interests of the individual depend overwhelmingly on the well-being of the public, little will change in our lives. As the classic used to say – the uniqueness of a human being is mainly based on the freedom of choice, which is synonymous with freedom, inventiveness and progress. Power is at the forefront of values. To "have power" and to use power is to get used up and use others (Tyburski et al., 2002, p. 388). The essence of power is the power of consumption, which is constantly changing into the consumption of power itself (Tischner, 2015, p. 167).

5. Social factor

Social activity as a relatively new phenomenon in the democratic system is gaining more and more attention. The activity of individuals and the whole society is primarily influenced by motivations, culture and tradition. The increase in social activity increases, people are more and more aware of problems and issues, they feel the need to participate in social life. A good example of a civic attitude are various types of campaigns, programs and rallies, referenda, local initiatives of national and international scope, characterized by openness, creativity and integrity (Bocheński, 1997, p. 17).

The participation of the social factor in the administration of justice is one of the essential areas of civic participation for a common cause. The principle of openness, contained in Art. 45 of the Polish Constitution, is one of the basic pillars of fair conduct functioning in democratic countries.

Openness of proceedings is an institution thanks to which the society can not only learn about the work of the judiciary. Due to the principle of openness, the public has a real influence on shaping the image of judges, prosecutors, attorneys-at-law and legal advisers.

The principle of the audience may be an effective instrument for building public confidence in the judiciary, improving the quality of work of judiciary representatives and increasing the awareness and legal culture of citizens (Skorupka, 2012, p. 29).

There is more and more bold talk about the necessity to involve citizens in the law-making processes, in the decision-making processes regarding the conducted public policies. An example is the introduction of the institution of public hearing in the Sejm into the Polish democratic system in 2006 (Juchacz, 2015). The situation is different in connection with the departure in the Polish Constitution of 1997 from the provision contained in Art. 49 of the Constitution of 1952, which stipulated that "cases in courts are heard and adjudicated with the participation of people's lay judges, except in cases specified in the act". Due to this change, the participation of lay judges in adjudication panels ceased to be the rule and became the exception (Constitutional Tribunal, 2005, p. 9).

Good examples of social activity can also be: a trade union, a sports club, a charity organization, eg Wielka Orkiestra Świątecznej Pomocy, Christmas Parcel. It can also be a political party, a social movement, a political movement or a church or religious organization such as Caritas.

A manifestation of social activity are also social clubs, youth clubs and discos, pensioners associated in a senior club or day care center, humanitarian organizations and a number of non-governmental organizations. Civic activity groups also include deputies and senators, the Catholic Church and Churches of other denominations, committees and extra-parliamentary groups supporting the Sejm and the Senate. The condition of democracy and the activity of individuals depend on all these groups.

The scale of the collective civic activity of Poles can be seen in social organizations with various profiles and areas of activity. The results of the Eurobarometer survey show that only one in four Poles is a member of organizations and associations with specifically defined economic, social, environmental, cultural, sports and other goals, trade unions, professional associations, chambers of commerce, industry and agriculture, and employers' organizations. This places Poland in the 21st place among the 27 countries of the European Union (in general, the percentage of associates in the EU is 43%) (Flash Eurobarometer, 2013, p. 373).

Decision-makers must act morally and be accountable to all citizens. The aspect of democratic control is characteristic of different types of democracy and different governance strategies (Zwoliński, 2010, p. 112). For the proper functioning of the state, complex and

increasingly complicated decisions must be taken. For this you need specialized experts, politicians, professionals and managers. The model of indirect democracy works better today. Through elections, society decides which people are to represent them - to manage the fate of the state (Welzer, 1983). One should not forget that there is always the risk of over-professionalization and politicization of politics, which contributes to the exclusion of citizens from real responsibility and the reign of demagogy on the political scene (Grabowska, 1998, pp. 39-79).

In a given social organism, the key issue is the relationship between the subject of political action and the authority that runs the state. It is important to distinguish between the political and social system which gives the characteristics of a democratic order.

The quality of order is determined by the functionality of the consensus at the local, procedural and political levels. In political practice, many procedural aspects differentiate the forms of democracy in favor of citizens or vice versa (Sartori, 1994, pp. 449-469). "The democratic system is based on the values adopted by the society. It exists thanks to the principles of freedom, equality, proportionality, solidarity and justice (...).

People have to learn tolerance, recognize as natural and desirable the differences in interests and achievements of individuals" (Hook, 1983, p. 31). It is not about the abstract freedom and liberty of the individual, but about the freedom and liberty of many individuals. As much individual freedom as possible, as much state intervention as necessary.

6. Summary

An important element, if not the most important one, in shaping the civil society is the awareness of the individual and his activity in achieving common goals. In a democratic state ruled by law, an initiative supported by the awareness of the rightness of action seems to be the key to success. Everyone should realize that for a good cause sometimes personal interests have to be sacrificed. The fact that the community is constituted by participation and involvement in social life.

People are not bound by the fact that they are similar, but by the fact that they differ. A well-educated, well-informed society that is aware of how much depends on it strengthens democracy and the state functions better for the needs of the individual and the general public. The uniqueness of a human being is mainly based on the freedom of choice, which is synonymous with activity, inventiveness and progress. The higher the level of the individual's awareness, the greater the involvement in social life. People must learn tolerance, recognize as natural and desirable differences of views and tolerance of individual individuals, follow the pattern for the benefit of the public, where my freedom ends, another person's freedom begins. The state should not take away natural powers or hinder the tasks of individual people.

When assessing civic activity, the so-called Bockenford's paradox: "The secularized state is founded on something that it cannot guarantee by itself" (Bockenforde, 1994, p. 120). One should bear in mind that the social system is a primary phenomenon in relation to the political system. As a result of evolution, mankind began to organize itself politically, not the other way around. This cannot be undone, it must be respected.

If societies manage to reach a consensus on all matters and do not lack determination in action, one should be calm about civic activity according to the statement: nothing about us without us. There is enormous potential to increase citizen involvement in social activities, a particular challenge for those who are not indifferent to democracy.

Nobody gives democracy to anyone forever, so you have to systematically talk about it, write about it and be involved in its survival and development, because the community simply pays off. In a democracy on a high level and in high culture, you need to know something, be able to speak and make it a substantive voice. Today, there is no talk of democracy at all, there is talk of democracy separated from the rule of law as artificial intelligence, cyberspace, genetic experimentation, mature patriotism, nationalism and internationalism.

Politics is attempted at every level of human life, almost everyone is involved in it with varying degrees of success, because it does not require any special preparation. The media often claims that if you are not interested in politics, politics will be interested in you. One can get the impression that high culture and a high level of democracy are becoming alien to people, art simply ceases to be needed for us, or democracy and civicity too? May this trend not become a permanent fixture in democracy and culture. We will have such democracy, citizenship and culture as we want and deserve, and what we want and deserve – it is not difficult for everyone to imagine.

References

1. Against the Programs of Books XXII (1977).
2. Aquinas, T. (1967). Summa contra gentiles. In: M. Maneli, *History of politico-legal doctrines*.
3. Berlin, I. (1998). *The Romantic Revolution. A crisis in the history of modern thought*. Res Publica Nowa.
4. Bocheński, J. (1997). *Demokracja.* Razem.
5. Bockenforde, E.W. (1994). *Freedom – the State – the Church*.
6. Boguszewski, R. (2016). The activity of Poles in civic organizations. *Komunikat z Badań No. 13*.
7. Brożek, M. (1969). *History of Latin Literature in Antiquities*. Zarys, National Institute of Ossolińskich.

8. Butterfield, H. (1963). *The Pedigree of Modern Science 1300-1800*.
9. Constitutional Tribunal, 119/10/A/2005, judgment of 29 November 2005, file ref. no. P 16/04, p. 9. Sentence delivered on 9 December 2005 in OJ 241, item. 2037.
10. Cycero, M.T. (1960). *On the State*. Pisma philosophiczne.
11. de Chardin, P.T. (1984). *Man and other writings.* PAX.
12. de Saint-Simon, C.H. (1968). About the industrial system. In: *Chosen writings*.
13. Dierżawin, K.N. (1962). *Wolter*.
14. Durkhein, E. (1965). *Sociology and Its Field of Research*.
15. Flash Eurobarometer (2013). *Europeans' Engagement in Participatory Democracy*, 373.
16. Grabowska, M. (1998). *Demokracja – theories and social attitudes*.
17. Guriewicz, R. (1976). *Categories of Medieval Culture*.
18. Hegel, G. (1889). *Encyclopedia of Philosophical Sciences*.
19. Hobbes, T. (1954). *Lewiatan*.
20. Hook, S. (1983). Rząd with the consent of the ruled. In: *Demokracja and the ideał community*.
21. Juchacz, P.W. (2015). *Deliberative public philosophy. Analysis of the institution of a public hearing in the Sejm of the Republic of Poland from the perspective of a systemic approach to deliberative democracy*. Poznań: Wydawnictwo Naukowe IF UAM.
22. Kaczmarczyk, M. (2007). *Radical functionalism of Niklas Luhmann against the background of contemporary social theory*.
23. Kant, I. (2002). *A Critique of Practical Reason*.
24. Kasprzyk, L. (1967). *Spencer.* Wiedza Powszechna.
25. Kołakowski, L. (2014), *Uncertainty of the era of democracy*.
26. Kroński, T. (1966). *Kant*.
27. Kuzior, A., Zozulak, J. (2019). Adaptation of the idea of phronesis in a contemporary approach to innovation. *Manage. Syst. Prod. Eng., vol. 27, iss. 2*, pp. 84-87.
28. Kuzior, A. (2014). *Aksjologia zrównoważonego rozwoju*. Banská Bystrica: Belianum.
29. Kuzior, A. (2020). Contemporary European Cultural Values in the Context of the Axiology of Sustainable Development. *Sil. Univ. Technol. Sci. Pap. Organ. Manage., No. 148,* pp. 351-363.
30. Locke, J. (1992). *Second Treatise. Essay on the Real Beginnings of Government Scope and Purpose civil society*.
31. Machiavelli, N. (1969). *The Prince*.
32. Peretiatkowicz, A. (1966). *Social Agreement*.
33. Plato. (1958). State. In: *State with the addition of the seven books of "Laws"*.
34. Ranowicz, A. (1961). *Hellenism*.
35. Rousseau, J.J. (1956). The dissertation on the origin and foundations of inequality between people. In: *Three dissertations on social philosophy*.
36. Sartori, G. (1994). *The Theory of Democracy*.

37. Seneca, L.A. (1961). *Moral Letters to Lucylius*.
38. Skorupka, J. (2012). Openness of the criminal trial in the course of its historical changes. In: J. Skorupka (ed.), *Openness of the criminal trial*.
39. St. Augustine (1956). *Aristotle, Nicomachean Ethics. On the State of God*.
40. Suchodolski, B. (1968). *The Birth of the Modern Philosophy of Man*.
41. Szacki, J. (2005). *History of sociological thought*. Warsaw: PWN.
42. Szczucki, L. (1972). *The philosophical and religious thought of the Reformation of the 16th century*.
43. The Holy Scriptures of the Old and New Testaments translated from the original languages.
44. The Millennium Bible (1980).
45. Tischner, J. (2015). *The unfortunate gift of freedom*. Kraków: Znak.
46. Turowski, J. (1994). *Sociology. Great social structures*. Scientific Society of the Catholic University of Lublin.
47. Tyburski, W., Wachowiak, A., Wiśniewski, R. (2002). *History of philosophy and ethics. To the present day. Sources and Comments.*
48. Vico, G. (1966). *New Science*.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SOFTWARE OUTLINES FOR DECISIONS MAKING SUPPORT IN OIL AND GAS ENGINEERING

Mykola CHESANOVSKYY[1*], Kostiantyn KRAVTSIV[2], Volodymyr PROTSIUK[3], Liudmyla POTERIAILO[4]

[1] Ivano-Frankivsk National University of Oil and Gas; nick.chesanovskyy@gmail.com, ORCID: 0000-0002-8687-0837
[2] Ivano-Frankivsk National University of Oil and Gas; kostya.kravtsiv@gmail.com, ORCID: 0000-0002-7916-3659
[3] Ivano-Frankivsk National University of Oil and Gas; v.v.protsiuk@gmail.com, ORCID:0000-0003-0055-2780
[4]Ivano-Frankivsk National University of Oil and Gas; milapoteriailo@gmail.com, ORCID: 0000-0002-0501-592
* Correspondence author

Purpose: The aim of this study is to develop an architecture of enterprise solutions that allow real-time (or simulated) extraction, storage and analysis of parameterized data from high-resolution sensors to more accurately predict the potential course of technological processes in the industry and solving of related logistics tasks.
Design/methodology/approach: The development of an integration architecture based on appropriate Web tools for viewing and collaborating on corporate information of the oil and gas industry will allow full operational decision-making on this basis, guided by the values of relevant controlled parameters and imposed on them and the process as a whole relevant constraints in general are the methodological grounds of the research from the theoretical and subject domain scope. The functionality of the artificial intelligence system should be reduced to sending signals to the controller in order to modify the controlled parameters through the appropriate instructions. At the theoretical level, measurement, interpretation and control will take place either on the surface, or on the bore, or in both places at the same time.
Findings: There were explored software outlines for making possible the creation of the desired findings for new and better business processes and technological innovations in the domestic gas and oil industries based on intelligent information solutions. As proposed in this study, optimal flexibility and forward performance will only be achieved through the use of the cloud as a platform for tomorrow's technological challenges in the oil and gas industry.
Originality/value: The newly developed focus on novel class of increasing domestic business efficiency will generally encourage oil and gas companies to develop their information architecture in the direction of knowledge-based systems and solutions, especially when controlling the drilling of oil and gas wells in terms of incomplete, inaccurate and poorly structured information from sensors.

Keywords: information technology, oil and gas engineering, corporate solution, data, data management, decision making support, knowledge-based technologies.

Category of the paper: research paper.

1. Introduction

The oil and gas industry is increasing the demand for IT architectural solutions. The reference architecture for oil and gas exploration and production must support and respond to the company's production activities and provide the opportunities necessary for efficient and effective management of the industry. Oil and gas exploration and production is a huge, complex business based on data, the number of which is growing exponentially (Rawat, 2014). These organizations work simultaneously with structured and unstructured data. Structured data is processed in applications related to the relevant domains used for geodetic data management, processing and visualization, exploration planning, reservoir modeling, production and other activities related to oil and gas production. At the same time, large amounts of information related to the same activities are formed in unstructured forms, such as e-mails or text messages, word processing of documents, spreadsheets, voice recordings and more (Singh, Pandey, Shankar, Dumka, 2015). Finally, oil and gas organizations also need the ability to connect and integrate large amounts of unstructured data obtained and used from non-domain specific sources, such as Word processing and electronic programs, unified communications, and application collaboration (Nicholson, 2012). This requirement means that much of the information needed to manage mining projects is actually located in non-domain applications and on both local environments and data clouds. This growing amount of data is now typically found in disparate source systems, from software to interpret seismic results to global corporate servers such as of BP, Chevron, Exxon Mobil, etc (Baaziz, Quoniam, 2013). This means that when a geologist studies seismic data for a particular site, and it needs to check the cores again, the information can usually only be accessed through an inconvenient and time-consuming search across different systems, rather than from a single common interface. If such integration exists, it usually works through a point-to-point connection or through intermediate database tables (Andrew, Henderson, Irani, Parker, Sternesky, 2008). These disposable connections add time and cost, and cannot be easily separated or reused in other applications. Various industry enterprises provide data integration frameworks or applications that create a common level of access to help solve the problem for integrating of large industrial data. To solve the industrial production problems of petrophysics, geology, field design, and others, there are usually exist their own systems of analytical modeling, but currently, there are very few solutions for connecting and interacting between these models. Thus, changes in the conclusions of one model are not always brought to others, which can lead to increased inaccuracies, errors and uncertainties in the data themselves and their structure, respectively (Baaziz, Quoniam, 2013). Given the existing IT infrastructure and architecture of industry enterprises, the organization of interaction is very difficult, because there is no convenient, common place where several internal and external software agents can access information stored in the corporate network. For example, an employee of a service company operating on the sites of several energy

companies must have separate authorization data for each system of these joint partnerships (Hollingsworth, 2013). Cloud computing technologies refer to remote centers for storing and accessing data and applications using the Internet, which are designed to save money, in particular by reducing the need to design a large computing infrastructure. The cloud approach is ideal for complex oil and gas exploration and production operations, with a variety of software vendors, multi-parameters environments, and vast amounts of data that require a combination of rigorous security and easy communication with relevant partners (Ferguson, 2012). Cloud infrastructure solutions allow companies to rent only the functionality they need when they need it, and based on each user's individual profile. Cloud support for the latest data standards, for standard and industry data, combined with technologies such as web services, provide easy and secure integration between different instances of cloud hosting services, even those provided by different providers. With the proliferation of devices now available to consumers as well as businesses, especially tablets and smartphones, there is growing pressure on IT departments to maintain the flexibility that mobile devices can provide to end users. This is especially true when working with applications that connect to services and solutions that run in the public cloud. In addition, some hardware manufacturers for these oil and gas production capabilities provide tablet solutions in protected form factors to support long-term survival in harsh operating conditions at drilling sites with extremely high safety requirements. Today, industry enterprises need to consider information from data of any size and any type. In order to get the full value of big data, businesses need a modern data platform to manage data of any type, whether it is structured data such as drill sensor data or unstructured data such as raw seismic data, and of any size: from gigabytes to petabytes (Hems, Soofi, Prez, 2013). Big data solutions should also manage data at rest and on the go, as well as support state-of-the-art equipment such as Hadoop. Finally, whenever you need to access part of a dataset with analytics tools, this platform should have a way to temporarily store other data in an inexpensive, secure cloud storage, in order to reduce data center costs for these potentially vast arrays of data. In particular, source data such as seismic data interpretation data is hosted in the cloud infrastructure, which greatly simplifies full integration into web tools for viewing and collaborating on this information. For example, when a geologist studies seismic data, he can double-check the cores using a single common interface hosted in a web browser. When analytical modeling systems use theoretical disciplines such as petrophysics, geology and field development, all of this will be placed in the cloud in “software as a service” mode, and then full connectivity and interaction is possible, leading to much more accurate decision making in much shorter time (Guanghui, Feng, Hongxu, 2012).

The development of the oil and gas industry has always relied on industrial data to conduct production activities. This industry is one of the few that first introduced the use of low-level data sensors. Oil and gas companies have long been collecting data from their oil and gas wells to monitor the progress of relevant technological operations and to model the life cycle of relevant industrial facilities (Chesanovskyy, Sheketa, Yurchyshyn, 2016). Today, oil and gas

companies collect various types of data rapidly and in huge volumes. This includes data on drilling and extraction of raw materials, GPS and spatial data, seismic data, general industrial data, information on weather conditions (especially in offshore drilling), as well as logging data as histories of field explorations. Most of this data is unstructured or poorly structured, which raises relevant issues about storage, integration and access to such data using traditional and new technologies of databases, data banks, data warehouses, knowledge bases and knowledge-based technologies in general. The oil and gas industry now also covers social media capabilities (Romanyshyn, Sheketa, Poteriailo, Pikh, Pasieka, Kalambet, 2019), such as status updates and social media posts, instant messaging, blogs and wikis. As oil and gas professionals increasingly use these technologies to manage their personal connections, the industry is adapting to networking opportunities to strengthen intersectoral collaboration and to better understand and manage oil and gas exploration and production operations. Using the right combination and application of the technologies described in this study, oil and gas companies will be able to implement an IT infrastructure that will support and respond quickly to all the necessary analytical analysis, the work of individual units and the entire production process as a whole.

2. Page setup, formatting, notes – first level numbering

When using integrated global solutions to analyze data from a variety of sources, drilling anomalies can be identified in real time. This technology can be used to improve the environmental safety of oil rigs and drilling rigs by detecting patterns of emissions before they actually occur, with catastrophic consequences of possible incidents and other manifestations. Oil and gas companies must identify events and patterns that may indicate an imminent security threat or cyber-terrorist acts. Prognostic analysis reveals patterns that can help identify these threats in advance.

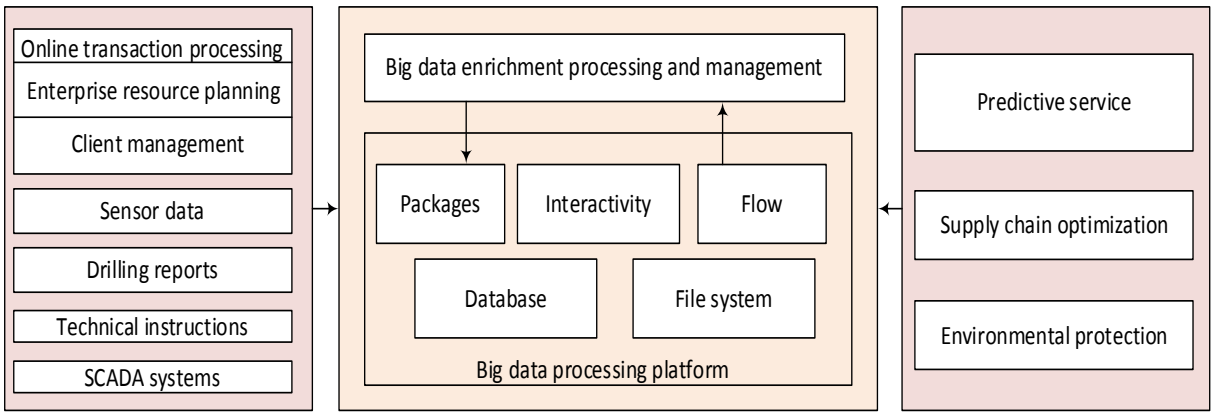


Figure 1. Basic data sources. Source: Author's own elaboration based on: (Ferguson, 2012).

Comprehensive solutions in this class can help identify threats in real time through machine learning and anomaly detection methods that can reduce the likelihood of such precedents (cases) from available sources.

In particular, analysis of seismic data and drilling and production data can help optimize oil production from existing wells. Big data methods can also be used to predict oil production. If the forecast does not correspond to a certain level of production, then a certain adjustment can be made. The proposed solutions can help engineers perform data integration and analysis to increase the bandwidth of data channels from existing wells.

The end user gets a proven, enterprise-class platform that deploys on-site, along with applications, and supports a wide range of mission-critical real-time applications. This system brings unprecedented reliability, ease of use and record speed for databases and streaming applications in a single distribution.

Sensors are increasingly used to monitor the state of exploration, production, transportation and processing of hydrocarbons as shown on figure 2. Real-time monitoring allows to take the precautions that is needed to be taken, which can significantly increase efficiency and reduce potential environmental and technological safety risks in general. Thus, the general method is to help ensure the success of the project and is accordingly performed in the rapid deployment of the project with the appropriate domain step in order to claim success at this stage and adjust the plan as needed. The complete information architecture of a software solution is never built at once, but is developed over many stages by further refinement.

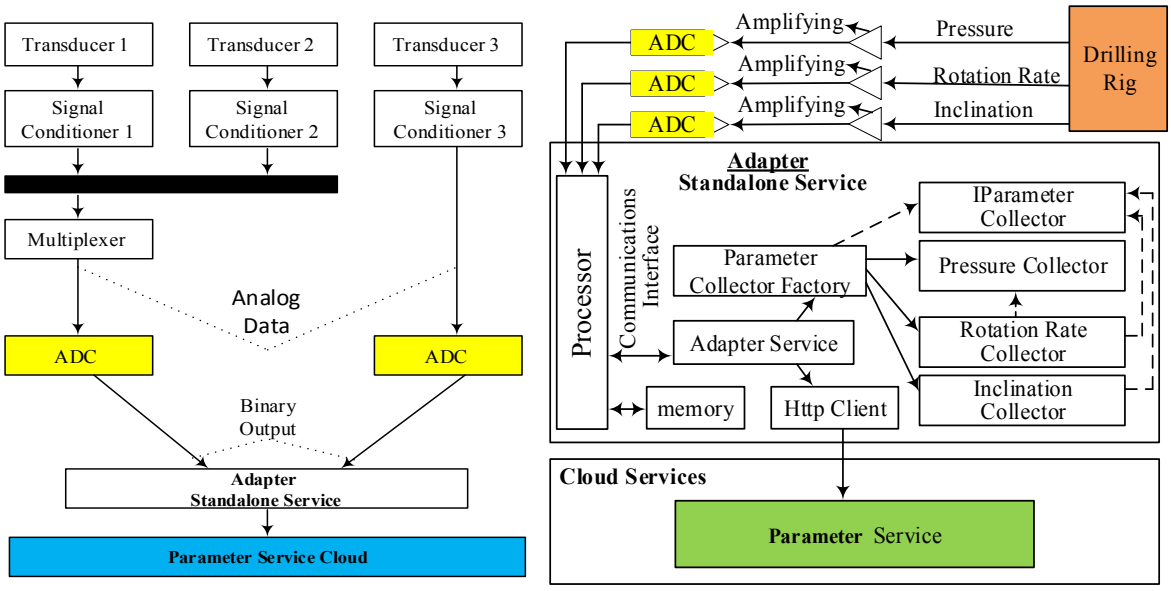


Figure 2. The proposed architectural outline for controlled parameters. Source: Author's own elaboration based on: (Chesanovskyy, Sheketa, Yurchyshyn, 2016).

The use of artificial intelligence techniques in well drilling allows to link aspects of automation with the level of sensors to monitor the progress of the well drilling process, as well as with the level of control systems to optimize the efficiency of the drilling process.

As the information architecture evolves rapidly, the ability to access, analyze, and manage vast amounts of data is becoming increasingly important for oil and gas exploration and production companies. Such companies, in an effort to increase production efficiency and productivity, face a number of challenges, including uncertain and volatile oil and gas prices, changing energy policies, environmental issues such as global warming, and competition, arising from new energy sources, as well as the current operating costs for management and inefficiency of the industry as a whole in Ukraine.

Faced with these problems, many see solutions in “big data” and sensors that can provide that data, which is an important source of information needed to optimize exploration, drilling, production and supply of oil and gas.

New data sources, such as social networks, can provide an important understanding of the mood of local communities in the context of their reform, affected by oil and gas facilities and pipelines. Well-managed real estate of industry companies is also important to maintain a positive reputation when faced with the assessment of financial assets and potential risks.

Thus, the technological process, which uses elements of artificial intelligence, must be able to operate without supervision by the operator.

Oil and gas companies exist in a rapidly changing market. New methods of obtaining energy and its alternative types can enter and are already successfully entering the market and creating excess supply. Political events can create a deficit. Understanding the direction of market pricing and demand in such conditions is crucial. For example, refineries may need to explore other markets (in new niches or other regions) when a local source outperforms demand.

Faced with this uncertainty, many experts continue to emphasize on more effective asset management and control. There is also a need to focus on effective and efficient oil and gas exploration. Maintaining favorable environmental cooperation and good public and state relations remain the priority of doing good business along with obtaining permits for new exploration and production in the event of confirmation of existing reserves.

The types of data used in these analyzes can vary widely, mostly from sensors and other streaming data sources. With the deployment of large scale data management systems, which include traditional data warehouses and new data reservoirs (based on structured and unstructured databases), broader data types can be analyzed to ensure that the business becomes more flexible.

The key challenge remains to transform this growing data avalanche into clear pathways that will affect the energy business as a whole. Oil and gas companies have long focused on improving the efficiency of exploration through advanced analysis tools applied to a variety of data.

Seismic topographic surveys tells where to drill. In today's challenging environment, the cost of new research should not increase, and the success rate needs to be improved to maintain profitability. Similarly, increasing reservoir capacity as part of improvement and development cost are key factors in maintaining profitability:

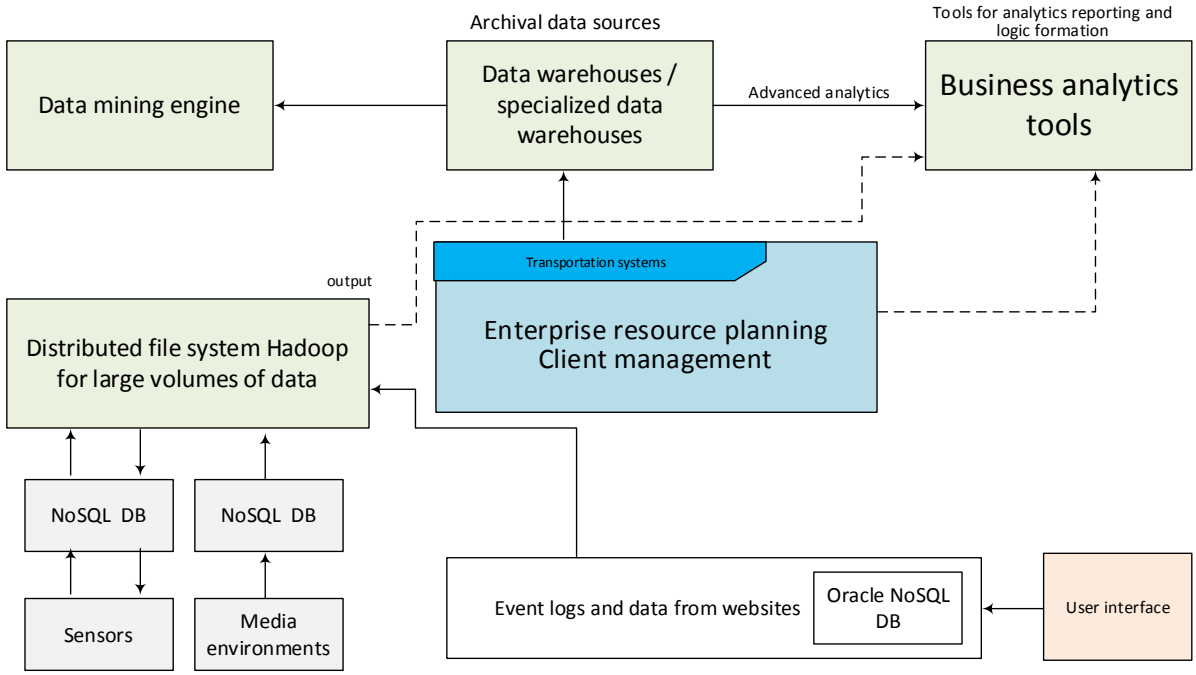


Figure 3. The initial data segregation outline. Source: Author's own elaboration based on: (Hollingsworth, 2013).

Such data have traditionally been analyzed in data warehouses consisting of relational databases. Today, the focus is shifting to data clusters, partly because of their relatively low cost and partly because of the schema-less file system, which is ideal for predictive workload analysis.

The need for operational efficiency at drilling rigs, pipelines and refineries is well understood by industry experts. Data on the status of operations is collected from sensors in real time, which allows to better understand when a particular service should be provided, as well as, by monitoring changes in the status of key components, provide even greater service efficiency and savings. Predictive analytical solutions deployed on large scale data management systems are likely to become common practice to increase overall security, reliability, and reduce the cost of implementing typical industry projects. Such an analysis may also indicate potential safety concerns or the identification of environmental risk factors for accidents and abnormal situations.

Today, predictive analytics programs can also be deployed in data warehouse solutions, such as optimizing the routing of vehicles, process personnel, hydrocarbon exploration and production materials. Such routing is fundamental to ensure the lowest possible cost of delivery while maintaining profitability. It is also important for the timely delivery of spare parts, thus avoiding serious problems with the maintenance and safety of logistics in general.

Oil and gas prices can be very volatile, but their value during the life cycle of the project can determine whether the exploration, production and refining of oil or gas makes financial sense. Forecasting analysts can play a crucial role in gaining an understanding of the likely directions of pricing, determining the right exploration and choosing the level of industrial production. Such data can also provide guidance on the right investment in relevant projects.

Many of the existing business opportunities can be expanded as more diverse data becomes part of the information architecture. IT departments in oil and gas companies typically work with their business lines to create solutions when identifying large scale data projects that provide the following:

1. Improved subsoil exploration pays off faster: oil and gas exploration requires extensive seismic, environmental, and cost analysis of production to determine whether expected returns can be profitable and achievable. Understanding changes in market conditions is also an important factor for project success.
2. Improving production efficiency. Production efficiency is ensured by constant analysis of drilling operations and timely maintenance of equipment. Remote monitoring and analysis are also important to determine the condition of pipelines and refineries. Also, the analysis plays an important role in providing assistance to avoid safety problems, environmental pollution, which may be a by-product of sub-optimal management of technological operations.
3. Cost-effective and timely supply chains and logistics management: delivery of spare parts, consumables, equipment and personnel on time are key while maintaining optimal production capacity and ensuring minimum downtime. Effective logistics management can also provide more cost-effective supply chains.
4. Better market analysis for investment: analysis of current prices and market trends is crucial in determining when to conduct subsoil research, when to start production, when to buy and sell assets, and when to change investment strategies.
5. Improved public relations: understanding public opinion and being able to respond quickly to requests from public and state bodies is extremely important in building trust with the wider community.
6. IT operational efficiency is not something unique for oil and gas companies and is rarely conducted from the standpoint of a pure IT business, but there are possible reasons for use on advanced architectures and it is the need to move data and turn it into "schema-less" – a platform for more efficient processing and involvement of IT resources. Operational efficiency is often difficult to prove, but sometimes this is the initial rationale for which IT companies actually seek to deploy these new and innovative types of solutions in some of the stage of drilling data lifecycle. Improved geological analysis through information and computer modeling of equipment failures and seismic analysis, leads to greater findings and with a more predictable result, as well as improves the planning of industrial drilling wells. Remote operational control and monitoring of pipelines and equipment for lower cost, reduces environmental risk and increases overall safety. Tracking environmental regulations in the area and understanding the potential costs of cleaning the ecosystem is the main directions to move. Sensors on wells that indicate incorrect readings help to anticipate and avoid the risk of accidental failure. Better energy management reduces drilling costs.

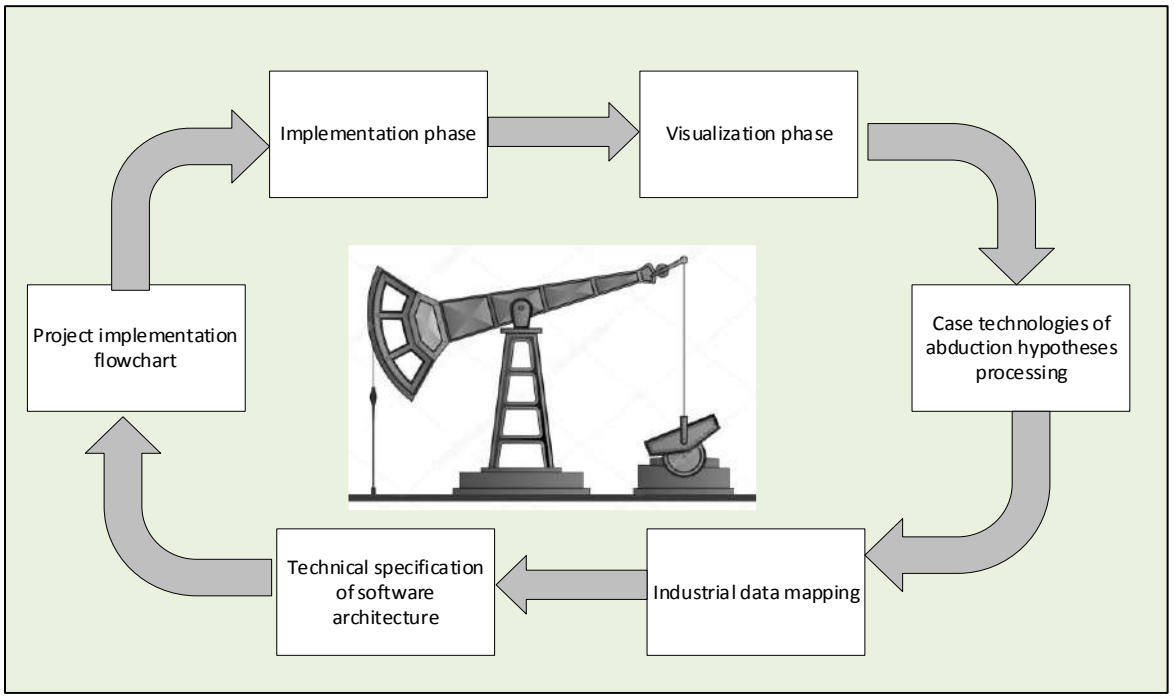


Figure 4. Typical data cycle in the subject domain. Source: Author's own elaboration based on: (Hems, Soofi, Prez, 2013).

Better assets and personnel management can reduce the cost of technological processes in general. To construct a correct economic assessment, it should be assumed that all the values considered in the study, represent the actual cost of well development. Based on these considerations, it is necessary to take into account not only the potential savings from the use of each artificial intelligence system, but also the cost of the well that will be obtained from the use of such systems.

Hadoop-based data reservoirs are usually the most efficient when storing datasets of unknown structure. Characteristics of data, which include how the data was obtained, how it should be formatted, what refresh rate and quality of this data - will help us put in the right place the right technology that is best suited to a particular situation. We need to understand which type of data processing will be most appropriate: real-time or batch processing. Initially, such projects are often considered experimental in terms of implementation, and therefore they can be independent, separate from traditional environments.

The main focus of the proposed study is on analytics and management related to reporting data and parts of the information architecture in general. Where oil and gas companies control and use data from sensors, the discussion of architecture expands to the level of relevant services. This advanced architecture for data collection, security and communication with other parts of the information architecture may require additional consideration in terms of the implementation of its components. The figure shows the main components of a typical information architecture. Data is collected and organized as needed and then analyzed to make meaningful business decisions. The variety of basic platforms provides a crucial role. Management, safety and control are crucial in everything and always come first in oil and gas companies.

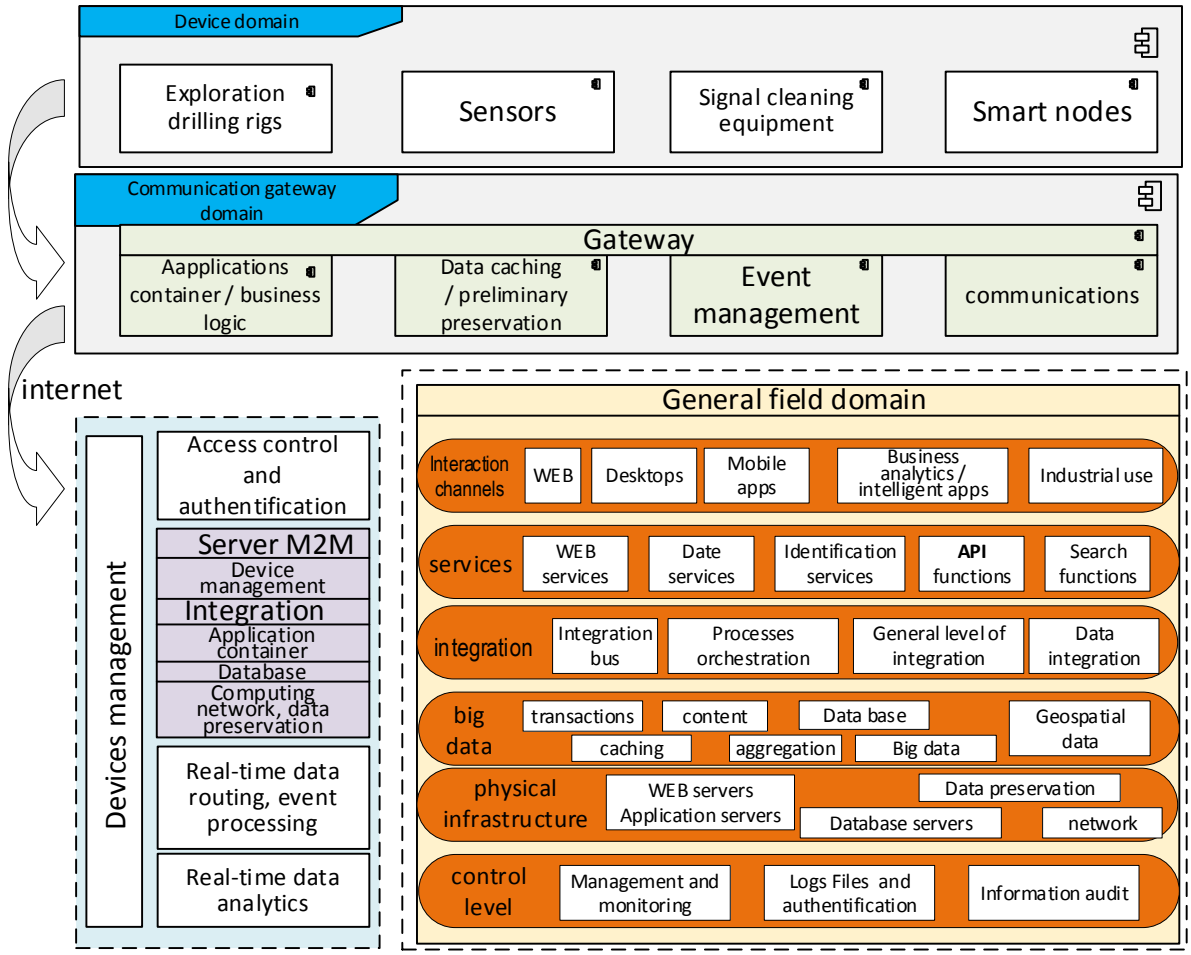


Figure 5. General structure of the data aggregation routines. Source: Author's own elaboration based on: (Baaziz, Quoniam, Vasilak, 2013).

On the figure there conceptualised the levels of detail that can be considered around the delivery of information and its presentation in the system.

The security of the solution is extremely important, as most companies do not want unrecognized third parties to intercept data provided by sensors. Applications that are close to the sensors themselves are often written using event handling engines to take urgent action based on predefined rules. There are also issues with message routing, resource allocation, and aspects of managing such solutions. The level of automation of oil and gas drilling processes is expanding and improving every year. However, the degree of automation and its components are different. Therefore, the application of automation processes to some extent is considered in the control systems of drilling mud, embedding of the casing, as well as other types of drilling operations. Such automation tools are based on a number of measurements performed in modern drilling technologies, which allow to determine the properties of drilling mud, drilling process parameters, to conduct casing research, to measure wells (including measurements during drilling), direct measurements and others.

Today, oil and gas companies analyze data from various sources. These data sources may include:

- Data from low-level sensors during exploration, drilling, production, transportation or refining of oil and gas.
- Traditional corporate data from operating systems.
- Social networks used by company employees.
- Web browsing templates (on corporate information websites).
- Data on announced vacancies of specialists.
- Archival data on exploration, logistics, oil and gas prices.

These measurements generally help process operators in monitoring the progress of the well drilling process. A next figure illustrates a typical map of the capabilities of the proposed architecture for oil and gas companies:

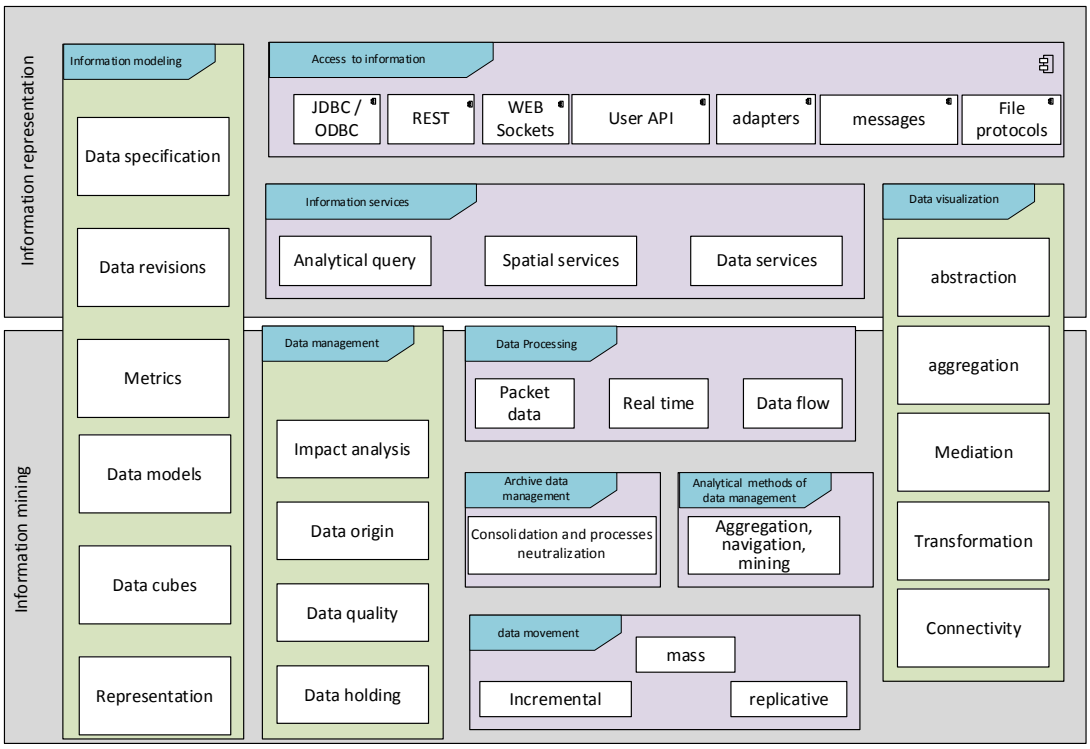


Figure 6. The generalized architecture outlines Source: Author's own elaboration based on: (Baaziz, Quoniam, 2013).

Thus, oil and gas companies need to purchase software from leading software vendors, in the form of modern cloud solutions, to reduce inefficient costs and increase the flexibility of doing business as a whole. Although the term "enterprise software architecture" is widely used, there is no generally accepted definition. However, this essence is crucial for managing the complexity of technological processes in the industry and reducing the time relative to the cost of the proposed solutions, as software becomes increasingly intertwined with business and with the daily work and leisure of people around the world. The corporate architecture framework serves as an important transport information tool for the classification, organization and

structuring of knowledge repositories and related maintenance processes of production processes. They serve to divide a complex production system into interconnected, managed and understood in the future. Information obtained from various sources can be analyzed for specific production purposes, which gives an idea of the work of the production system as a whole.

Thus, the proposed corporate architectures and related systems justify their potential value due to the efficiency and continuous benefits they provide to industry enterprises.

The use of modern cloud solutions for joint work of all departments of the enterprise, increases the speed and ease of cooperation for employees within the organization, as well as authorized external partners, and ultimately allows safe access to general information, and only for the required time. Key performance indicators are used to understand and assess the current and general state of the industry, always readily available when placed in modern cloud applications. The data used to support these key metrics can be processed using the massive computing power available in cloud infrastructures, and thus, system responses will be available quickly and in a timely manner. The basic principles of ascending architecture do not indicate that they do not set out the specifics of the structure and function of the bit structures to achieve the future state described initially. Rather, the ascendancy of architecture describes a set of guiding elements, or principles, that govern it. This descriptive approach not only provides a coherent set of principles for consistent performance, but also provides companies and enterprises with the flexibility to innovate and create competitive differences.

Today, powerful reasons are forcing oil and gas companies to look for a new and more efficient architecture of cloud-based IT infrastructure. Companies are trying to reduce the cost of implementing and maintaining new solutions at all means. This can only be done by making the most of existing investments when purchasing new technology solutions from suppliers. However, so far there have been few indications of how investing in such solutions can take full advantage of existing investment in technology that is already used by relevant IT departments in their organizations. For example, it would be beneficial for a company to know that a vendor's solution uses legacy management solutions from other industry enterprises to facilitate deployment or use of single technology input from already deployed solutions to manage production facility identification and decisions making in general. In addition, due to the widespread use of cloud solutions, capital investment in data centers can be reduced by increasing business flexibility and thus reducing the cost of information support in general.

In today's business and operational environment, companies need to provide more bandwidth for data with fewer resources and strictly time-limited expert working groups. In order to deliver better results faster, geologists and geophysicists and engineers should be able to spend more time on subject-oriented work and spend less time searching for and preparing the data needed for that work. Workflows, managed data events, and automated analysis of such data should help identify potential risks and manage the exploration of the relevant resource or production operations in general.

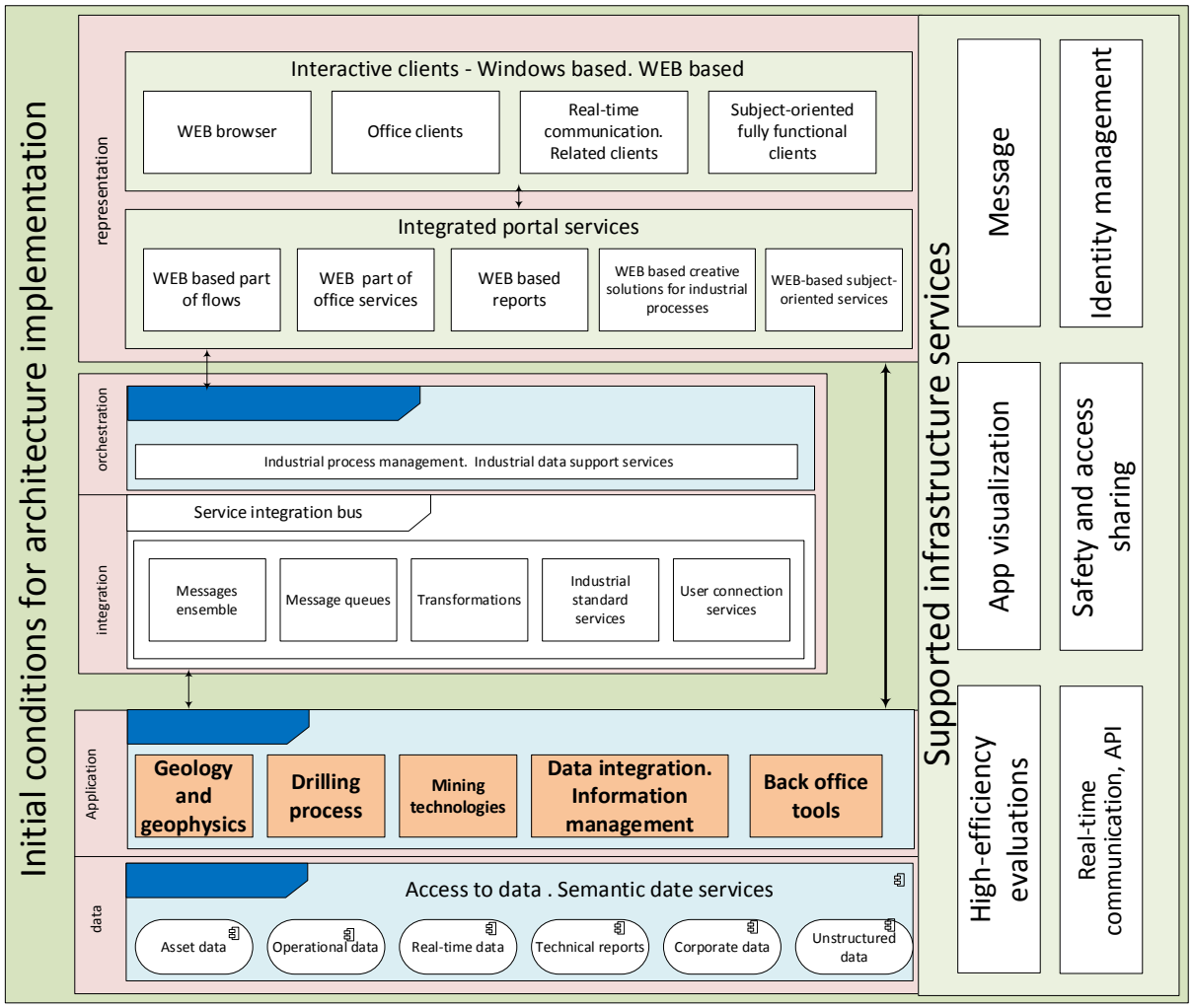


Figure 7. Architectual levels for solution implementation Source: Author's own elaboration based on: (Rawat, 2014).

Specific performers should also have a holistic view that will disclose all relevant data, both structured and unstructured, for a given situation.

Management needs to have refined key performance indicators in order to fully understand the current state and general state of the organization. For example, ideally, managers should be able to see on one screen a portfolio of current opportunities, and see which of the rigs, for example, are ready and which are planned for the coming weeks. With the appropriate details, managers can focus their time on the assessments of teams of performance experts to quickly take action to remedy the situation and return them to the expected level of performance. The oil and gas industry needs an architectural approach that will allow organizations to use more flexible and cost-effective cloud technology that will work in Plug-and-play mode. If a technology vendor designs the best web seismic translator, for example, the architecture must assume that the new solution will be quickly and cost-effectively deployed on other cloud solutions that could use it. This approach lowers the constraints on IT, gives companies access to the best solutions, and can reduce the time it takes to deploy new solutions from a year or months to one month or even days. The integration of

structured and unstructured data is a major challenge. As already mentioned, some new industry standards and technologies now allow for more flexible, prerequisite integration or also cloud architectural solutions needed in the oil and gas industry as a matter of time. On the figure 7, in particular, it is shown a service-oriented computing environment when it includes the integration of domain applications, business performance tools, and inverse applications. All of them are placed in the traditional formal format. There is shown the state of the architecture when it is deployed on a cloud. Using a service-oriented architecture (SOA) approach to the interoperability of components at different levels of the architecture, subordinate enterprises, technology vendors, system integrators, and other partners can be realized all the benefits of this environment. Some key aspects of the designed architecture should be considered and the possible interactions that will occur between the components after their implementation in both local or cloud, and as a hybrid solution (partly local, partly cloudy) should be discussed. The scenarios serve as an example and show how solutions can be delivered using the various components of this architecture. Windows and WEB interactive clients form a presentation layer for the business user architecture, which for the device can use a workstation PC, laptop, touch tablet, smartphone, or a combination of some or all of them at different times, as dictated by user needs and/or location. Integrated portal is presented as a common platform in which geo inspectors, engineers and managers can access all types of IT-based domain processing technologies. The portal establishes a single place where authorized personnel can find and use a wide range of data, including key performance indicators on the control panel, technical programs such as those used to interpret seismic data, log files, field research, exploration reports, and systems business analysis. This Web portal also provides mechanisms that support blogs, wikis, and corporate social networks, such as Yammer, that are used to install and maintain cross-domain shared systems. Instead of logging in to a specific system (such as SAP to access a work order), users simply log in to an integrated portal to access work orders, analytics, and other research or production-related systems. This portal-oriented approach allows experts and managers to focus on drilling resources, technical resources, and redundancy ratios, rather than working on placing data in multiple programs. For example, if there is a problem with drilling rigs, the drilling engineer or operating personnel will be able to quickly and easily use the tools available through the portal to deploy and view all relevant data related to this rig to analyze the problem and create a timely operational solution. Data integration and business process management components are largely the foundation of a more efficient IT architecture, providing a central mechanism for moving data between systems, equipment and other elements of the IT infrastructure using most advanced technologies.

Components of data integration and production processes provides a centralized input data repository with log analysis, work management, spatial, production and control systems. Using defined business rules, this components organizes the movement of data between different systems, including the seismic data warehouse, the operational data store and peer review programs used for information modeling of technological processes in oil and gas engineering.

3. Results

This study presents a thorough analysis of big data functionality and analytical capabilities within a new generation of architecture that can meet the needs of a dynamic market for information software products for the oil and gas industry. It is shown that the speed with which the data describing the technological processes of the industry is generated is constantly increasing, which leads to an increase in the level of need for such data by experts in the field. This increase in data rates and sources, of course, leads to an increase in total data. Industry experts and business analysts want to absorb more and more data at high speeds, store it longer, and want to analyze it as quickly and in depth as possible. The large scale data solutions proposed in this study help oil and gas companies meet these requirements. The introduction of the reference architecture is also presented. The approach and the proposed methodology are the result of the development of customer projects and as a result offer solutions that customers face in the process of planning the architecture and implementation of software applications for the life cycle of oil and gas fields. Creating an integrated information architecture that can handle datasets with a known structure as well as an unknown structure allows to increase the capabilities of existing oil and gas data warehouses to much better, knowledge-oriented industrial data centers. The flow of oil and gas industrial data is increasing exponentially every day. As a result, market operators require software solutions that allow them to operate more efficiently and take advantage of new technologies, including cloud services, cloud applications, mobility, social networks, and platforms that fully unleash the potential of big data. A number of global software vendors are at the heart of, or even ahead of, these technological advances. The proposed study forms a new vision of the problem, which is to form packages for the supply of technologies of this class in the energy sector of Ukraine. It is an indisputable fact that cloud services today are the next generation in information technology and the next step in the industrial pursuit of efficiency and globalization of the energy sector of the state. Oil and gas engineers, industry managers feel a real need to use cloud services in the future, and a significant part is already using private or public data cloud services. Industry customers expect that their computing environments will provide easier access to the large amounts of data needed for rapid decision-making in the oil and gas industry. The proposed architectural framework leads the oil and gas industry to cloud solutions, and from there, will provide a solid foundation for the next generation of oil and gas solutions focused on expertise to a greater extent than on the clouds of big industrial data. Comprehensive solutions help to cost-effectively integrate and analyze a wide range of unstructured data to increase drilling efficiency and overall production productivity while preventing environmental problems and ensuring the safety of technological operations in general. High-availability software tools help you perform remote operations reliably, making them especially valuable. And the features of multi-platforms provide the necessary flexibility to run multiple

applications on a single cluster, within a single unified data space. Data from equipment sensors and geological data can be analyzed to predict equipment failure and to understand which equipment is best for what operating conditions and where it should be installed.

4. Discussion

Convenience and simplicity of information needs are important for many subject matter decisions. Business intelligence is likely to have different business requirements and has different types of analysis and technical skills. They may require a solution ranging from a simple representation for the temporal possibility of queries to predictive analysis. One dimension is usually not suitable for all cases of architecture implementation. While new capabilities in the data management platform can provide more flexibility, the placement of data for such solutions, data types, volumes, and usage of it typically determines the most optimal technology for deploying an application. The best common practice is to eliminate as many data transactions as possible to reduce latency at the application end-user level.

Data security and control issue are also key factors. Oil and gas companies want data to remain closed unless they specifically agree to open it, which is unlikely. Thus, providing access to data is crucial and does not depend on the data management platform, the means and methods of data transmission in use. Data management needs related to the value of data, as well as their accuracy and quality often require close coordination between several lines of IT solutions. Finally, implementation time is important for the success of any oil and gas initiative. There can be used reference architectures, data models, and standard configuration devices. They can accelerate system development and deployment and reduce the risk of incomplete solutions and serious integration issues.

Many of the individual components that make bit control intelligent already exist in some form, and others can be created using existing technology. For example, surface sensors already exist to monitor many important drilling parameters. Accordingly, downhole sensors implemented in modern systems for measuring drilling processes can measure and transmit to the surface data related to the control of the inclination of the wellbore and the parameters of rock formation.

5. Summary

The presented research is aimed to provide an approach to the application of the methods of the latest information architectures for oil and gas companies of Ukraine. These methods demonstrate the expansion of existing software architecture models to meet new and diverse data sources that become part of the information landscape of a typical industry enterprise on the example of regional drilling company. A thorough analysis of the information architecture leads to the consideration of where to host and how to analyze the data. Most oil and gas companies choose to place data where the data will initially minimize data traffic on the network, while data protection will be done in dynamic and static modes. Once data is saved, reporting and predictive analysis are often stored in the same data management system. So far, where part of the data is stored in the cloud there should be a careful consideration of the impact of network bandwidth on the performance of the analysis in places where data from all sources are required. An additional consideration in this paper is the availability of skills required for business analysts and IT organizations in the oil and gas business. However, there is always a requirement to integrate previous solutions that work locally, or between cloud-based, freely distributable solutions, or a combination of both. Therefore, this should be an important factor for companies planning to have a future in the global energy economy, which are technologically based every year much more and more on the means of information intelligent technologies, and knowledge-oriented technologies in general. Future assessment of the state of the software architecture of industry enterprises should include an understanding of the degree of complexity that may be created in the future, as well as the ability of the proposed architecture to overcome it. Competition from oil and gas companies will ensure that using the benefits of these new sources of data and knowledge to increase what is known about this type of business will continue their market leadership and provide significant competitive advantages.

References

1. Andrew, S, Henderson, M, Irani, B, Parker, B, Sternesky, M. (2008). *Digital Oil Field brought from concept to development in a year*. World Oil, pp. 107-110.
2. Baaziz, A., Quoniam, L. (2013). How to use big data technologies to optimize operations in upstream petroleum industry. *International Journal of Innovation, September*.
3. Baaziz, A., Quoniam, L. (2013). The information for the operational risk management in uncertain environments: Case of Early Kick Detection while drilling of the oil or gas wells. *International Journal of Innovation and Applied Studies (IJIAS), Vol. 4, No. 1, Sep*.

4. Baaziz, A., Quoniam, L., Vasilak, V. (2013). Enhancements Case of Early Kick Detection while drilling of the oil or gas wells. *International Journal of Innovation and Applied Studies (IJIAS), Vol. 4, No. 1, Sep*.
5. Chesanovskyy, M., Sheketa, V., Yurchyshyn, V. et al. (2016). *The Formal Structuring of Subject Domain for oil and Gas Industry IT Applications*. Modern problems of radio engineering, telecommunications, and computer science (TCSET): the XIII International Theoretical and Practical Conference, (Lviv-Slavske, 23-26 february). Lviv, pp. 503-505.
6. Ferguson, M. (2012). *Architecting a big data platform for analytics*. Intelligent Business Strategies, October.
7. Guanghui, Xu, Feng, Xu, Hongxu, Ma (2012). *Deploying and researching Hadoop in virtual machines.* Automation and Lotgistics (ICAL) – Zhengzhou, China.
8. Hems, A., Soofi, A. Prez, E. (2013). *Drilling for New Business Value How innovative oil and gas companies are using big data to outmaneuver the competition*. Microsoft, May.
9. Hollingsworth, J. (2013). *Big Data For Oil & Gas*. Oracle Oil & Gas Industry Business Unit, March.
10. Nicholson, R. (2012). *Big Data in the Oil & Gas Industry*. IDC Energy Insights, September.
11. Rawat, N. (2014). Big Data Analytics in Oil & Gas Industry. *International Journal of Scientific & Engineering Research, Vol. 5, Iss. 5, May*.
12. Romanyshyn, Y., Sheketa, V., Poteriailo, L., Pikh, V., Pasieka, N., Kalambet, Y. (2019). *Social-Communication Web Technologies In The Higher Education As Means Of Knowledge Transfer*. Proceedings of the IEEE 2019 14th International Scientific and Technical Conference on Computer Sciences and Information Technologies (CSIT). Vol. 3. 17-20 September. Lviv, Ukraine, pp. 35-39.
13. Singh, S., Pandey, S., Shankar, R., Dumka, A. (2015) *Application of Big Data Analytics to Optimizethe Operations in the Upstream Petroleum Industry*. 2nd International Conference on Computing for Sustainable Global Development (indiacom) – New Delhi, India.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

MANAGEMENT OF TECHNICAL INFRASTRUCTURE DEVELOPMENT AT COMMUNES IN THE MAŁOPOLSKIE PROVINCE IN TERMS OF SOURCES OF FINANCING

Michał CHWASTEK[1], Elżbieta BADACH[2*], Jacek STROJNY[3]

[1] Uniwersytet Rolniczy w Krakowie, Katedra Statystyki i Polityki Społecznej; michal.chwastek@student.urk.edu.pl
[2] Uniwersytet Rolniczy w Krakowie, Katedra Statystyki i Polityki Społecznej; rrbadach@cyfronet.pl, ORCID: 0000-0002-5355-0810
[3] Uniwersytet Rolniczy w Krakowie, Katedra Statystyki i Polityki Społecznej; rrstrojny@cyfronet.pl, ORCID: 0000-0003-4632-8645
* Correspondence author

Purpose: The purpose of the study was to identify the relation between the level of selected financial indicators and changes in ownership of selected elements of technical infrastructure at rural communes in the Małopolskie province.
Design/methodology/approach: The study was based on the data obtained from resources of Statistics Poland and the financial statements of local self-government institutions. Each of the 121 rural communes in the province was characterised with four indicators regarding their financial management. Subsequently, communes were classified using Ward's method into five groups with a uniform set of identified features. Next, each cluster was subject to detailed analysis in terms of changes in ownership of selected elements of technical infrastructure with a concurrent review of financing sources of such changes typical for a given group. Certain patterns of financial management focused on technical infrastructure improvement in a given commune were thus identified.
Findings: The study presents the status of selected network infrastructure as well as components and structure of income of rural communes in the Małopolskie province. On the one hand, communes with the highest population density have the largest economic potential, but on the other, they have significant requirements with regard to technical infrastructure. An important driver for technical infrastructure development are aid funds, including EU funds. Communes with a comparable potential may follow different strategies with regard to investment and financing of deficit. The status of infrastructure and financial standing of a commune are shaped in multi-annual process.
Research limitations/implications: The analysis was performed for the entire population. A more detailed approach would require information on the criteria for selection of the type and scope of investment projects. It would also be appropriate to analyse the financial and economic effectiveness of individual projects.
Practical implications: The contents of the analysis and conclusions will be useful for persons responsible for management at commune level. Identification of the impact of individual factors on the development of technical infrastructure will enable a more conscious and responsible

commune management. This material will surely be found useful by groups focused on local growth planning and management, including distribution of aid funds.
Social implications: The article will have a positive impact on local development, because it will contribute to more reasonable commune management. The awareness of the existing mechanism will also enhance the professionalism of local consultative groups, which represent the community during public consultations regarding planned actions of the local self-government authorities.
Originality/value: The diagnosis of the conditions for infrastructure development in terms of finances of communes is a valuable source of expertise for management personnel.

Keywords: Local development, technical infrastructure, income of communes.

Category of the paper: research paper.

1. Introduction

Technical infrastructure plays a vital role in stimulating social and economic development at the regional, county, and communal level. It is all the more important particularly in remote areas not only because of the development of the agricultural sector, but most of all due to establishment and support of other forms of business and enabling so-called multi-functional development of rural areas (Kocur-Bera, 2011, p. 21).

The Małopolskie province is a region showing significant diversity, not only in terms of landscape, but also economic conditions. The policy of sustainable development requires supporting the development of areas with a weaker economic standing. These include rural communes of the province. They cover a significant part of the province, i.e. 9879 km^2, which represents 65.4% of the total area of the province. According to Statistics Poland data from 2017, rural communes are inhabited by 1 218 260 people.

Those communes are highly polarised in terms of technical infrastructure development. One of the key drivers for its condition and growth is income. Rural communes are also characterised by significant differences in the level of income, in particular of its individual components and its structure. The purpose of the study was to identify the relation between the level of selected financial indicators and changes in ownership of selected elements of technical infrastructure at rural communes in the Małopolskie province.

The scope of tasks of a commune is defined mostly by the Act on Municipal Self-Governments. The implemented tasks require relevant sources of financing. The most important factors determining the scope and effectiveness of tasks pursued by a local self-government are financial conditions. (Sierak, 2011, p. 75). These are specified in the Act on Income of Local Self-Government Institutions. The key groups of income specified in the act are: own income, subsidies, special-purpose grants from the State budget. Income may be provided by non-refundable funds from foreign sources, funds from the budget of the European Union and other funds specified in other regulations (Act on Income of Local Self-Government Institutions,

2018). A particularly important type of income of a commune is own income. These include income from taxes collected by the commune, of which the most important are: agricultural tax, forest tax, vehicle tax, tax on civil law transactions, and tax in the form of a tax card, mining fees and interest in personal income tax and corporate income tax. Own income of communes is very diverse, which is mostly related to their economic potential. The key factor determining the level of income is the economic activity of residents (Hok, 2017, p. 116). It is closely related to the geographical location with respect to large urban centres and major communication routes.

2. Methodology

The study covered 121 rural communes in the are of the Małopolskie province. For each commune five variables were identified, four of which presented financial management at the communes: own income per capita, capital expenditure per capita, property income other than sale of property per capita, and real debt per capita registered as resident of the commune. The firth variable included in the analysis was the average population density, which in previous studies carried out by the authors was identified as a significant factor differentiating communes in their ownership of technical infrastructure. Economic indicators used in the analysis include selected own income of communes: property tax, vehicle tax, income from property, interest in personal income tax, interest in corporate income tax, external funds, including from EU funds, earmarked for the financing of investments in fixed assets. The analysis also drew on the data regarding the amounts of subsidies, debt and cumulative budget performance. The diagnostic variables were selected in line with the relevant recommendations, which specify that the variables should be: universal, measurable, available, of proper quality, interpretable and clear in terms of their interaction (Zeliaś, 2000). The analysis was carried out using Ward's method from the group of cluster analysis methods. The study is based on data sourced from the resources of the Local Data Bank of Statistics Poland and Rb-NDS, Rb-Z statements of self-government units and consolidated balance sheets of local government institutions, with data for 2017, while in the supplementary analyses and in the discussion of results 2010-2017 and 2019 data was used. The variables described above were the starting point for cluster analysis, which was designed to identify groups of communes with similar selected features. Subsequently, the analysis covered (within each of the selected uniform groups) the relation between the financial status of the communes and changes in ownership of technical infrastructure.

Table 1.
Shows key features of the variables used

Variables	Minimum	Maximum	Arithmetic average	Standard deviation	Coefficient of variation
Own income per capita	481,2545	2728,152	1003,98	366,14	0,36
Capital expenditure per capita	260,7338	1527,013	579,66	205,24	0,35
Property income other than sale of property per capita	57,56653	730,075	255,74	138,18	0,54
Real debt per capita	-1130,55	3355,051	662,68	604,81	0,91
Average population density	24	457	135,17	64,47	0,48

Source: own calculations.

The key concept of clustering is to separate objects to a certain number of subsets (whether pre-determined or not) in such a way that objects in the same subset are similar to each other and are dissimilar to those in other groups. Such clustering can tell a lot about the structure of the population (Stanisz, 2007, p. 114). It enables discovering certain regularities regarding the features of the analysed objects, makes it possible to reduce a large set of data to averages from individual groups and characterise those groups with descriptive statistics. Separation of objects into clusters may also be treated as a preliminary step to further multi-dimensional analyses.

In Ward's analysis used in this study, the variance analysis approach is used to estimate the distance between clusters, i.e. divisions are made along the minimum of within-cluster sum of squared variance (Grabiński, 1992). In this method, at each stage, from all possible combinations of cluster pairs such pair is selected, which, after the combination, results in a cluster with a minimum variance. This method is considered as the most effective, although it leads to creation of small clusters (Stanisz, 2007, p. 122).

The set of variables describing the clustered objects should not include strongly correlated variables which carry similar information, because this may distort the structure of clusters (Malina, Zeliaś. 1997). Table 2 presents the level of correlation of variables.

Table 2.
Pearson correlation coefficients for selected variables

Specification	Own income per capita	Capital expenditure per capita	Property income other than sale of property per capita	Real debt per capita	Average population density
Own income per capita	1	0,230112	0,003555	0,129021	0,44872
Capital expenditure per capita		1	0,775167	0,197216	-0,13323
Property income other than sale of property per capita			1	0,239358	-0,4009
Real debt per capita				1	-0,00604
Average population density					1

Source: own calculations.

Due to strong correlation of investment expenditures and property income per capita in the analysed communes, ultimately for the purpose of clustering only four variables were used, disregarding property income.

To bring variables with significant differences in amounts to one scale, they were unified in accordance with the following formula:

$$z_{ij} = \frac{x_{ij}}{\max\limits_{j} x_{ij} - \min\limits_{j} x_{ij}} \quad i = 1,...,5 \;\; j = 1,...121 \tag{1}$$

Such restated variables served as a starting point for cluster analysis carried out using Statistica13.1 software.

3. Results and discussion

As a result of clustering, five clusters of communes with a similar set of analysed features were identified. Table 3 shows the number of communes in clusters and average values of the variables in individual clusters. The identified clusters were then subject to detailed analysis focused on the one hand on indicators showing the quality of financial management in individual commune groups, and on the other on the ownership of selected elements of technical infrastructure.

Table 3.
Average values of selected features in clusters

Cluster	Number of communes	Own income per capita	Capital expenditure per capita	Property income other than sale of property per capita	Real debt per capita	Average population density
1	53	962	514	210	893	146
2	42	802	520	241	229	112
3	12	1 133	871	429	461	66
4	10	1 813	694	215	694	280
5	4	1 277	916	602	2 697	84

Source: own calculations.

Table 4. presents the list of communes included in individual clusters. Strong infrastructure improves the living comfort of residents and encourages them to make investments and conduct economic activity within a well-equipped commune (Krakowiak-Bal, 2007, p. 107). Next to the power grid, the most important element is the water supply system. As can be seen in Table 5, the highest percentage of residents using water supply network is in communes from group 4. This group also has the longest network per 100 km^2. This indicator is at least two times higher for this group than for any other. In all groups, the percentage of residents connected to the water supply system is on average higher than 55%. In recent years, in most

groups the proportion of residents using water supply system grew by some 10 percentage points. The largest increase in the length of the system can be observed in group 5, with more than 31 km/100 km^2. This group, before system extension, had the lowest percentage of residents connected to the water supply system.

Table 4.
List of communes included in individual clusters

Cluster	Name of the commune		
1	Babice	Kłaj	Radgoszcz
	Biały Dunajec	Krościenko n. Dunajcem	Radziemice
	Biskupice	Laskowa	Ropa
	Bochnia	Limanowa	Rzezawa
	Brzeźnica	Lisia Góra	Skrzyszów
	Czarny Dunajec	Łącko	Spytkowice (1211132)
	Czernichów	Łużna	Spytkowice (1218062)
	Dębno	Michałowice	Stryszawa
	Dobra	Mucharz	Stryszów
	Drwinia	Nowy Targ	Szaflary
	Gdów	Osiek	Tomice
	Gnojnik	Pcim	Trzciana
	Gorlice	Pleśna	Tymbark
	Gródek n. Dunajcem	Podegrodzie	Wieprz
	Iwanowice	Polanka Wielka	Wierzchosławice
	Iwkowa	Poronin	Zawoja
	Kamionka Wielka	Raba Wyżna	Żegocina
	Klucze	Raciechowice	
2	Bolesław (1204012)	Korzenna	Niedźwiedź
	Budzów	Kozłów	Olesno
	Bystra-Sidzina	Lanckorona	Przeciszów
	Charsznica	Lipinki	Rytro
	Czorsztyn	Lipnica Murowana	Rzepiennik Strzyżewski
	Gręboszów	Lipnica Wielka	Słaboszów
	Gromnik	Lubień	Słopnice
	Grybów	Łabowa	Sułoszowa
	Igołomia-Wawrzeńczyce	Łososina Dolna	Szerzyny
	Jerzmanowice-Przeginia	Łukowica	Tokarnia
	Jordanów	Mędrzechów	Trzyciąż
	Kamienica	Moszczenica	Wietrzychowice
	Kocmyrzów-Luborzyca	Mszana Dolna	Wiśniowa
	Koniusza	Nawojowa	Zembrzyce
3	Bukowina Tatrzańska	Kościelisko	Pałecznica
	Gołcza	Książ Wielki	Racławice
	Jabłonka	Łapsze Niżne	Sękowa
	Koszyce	Ochotnica Dolna	Szczurowa
4	Bolesław (1212032)	Oświęcim	Zabierzów
	Chełmiec	Siepraw	Zielonki
	Liszki	Tarnów	
	Mogilany	Wielka Wieś	
5	Borzęcin	Łapanów	Jodłownik
	Uście Gorlickie		

Source: own elaboration.

Table 5.
Features of water supply infrastructure by group

Number of cluster	Percentage of residents connected to water supply system	Length of water supply system per 100 km^2	Increase in percentage of residents connected to water supply system in 2010-2017	Increase in length of water supply system per 100 km^2 in 2010-2017
	%	km	%	km
1	66,38	125,79	11,56	22,08
2	57,87	101,04	10,30	15,33
3	63,89	73,17	10,10	9,73
4	90,90	275,87	8,50	30,81
5	55,25	112,73	12,88	31,88

Source: own elaboration.

The sewer system is most developed in communes from group 4, significantly exceeding the indicators of the remaining groups. Its length per 100 km^2 is similar to the length of water supply system. In the remaining communes, with three to four times shorter length per 100 km^2, the percentage of residents using the sewer system is nearly two times lower. The group 5 data is interesting. With a very short length of the system per 100 km^2, the group shows a relatively high percentage of residents connected to the sewer system. This is most likely attributable to the nature of development in those communes. Compact development in part of the commune facilitates a very efficient layout of the sewer system.

Table 6.
Sewage infrastructure characteristics by group

Number of cluster	Percentage of residents connected to sewage system	Length of sewage system per 100 km^2	Increase in percentage of residents connected to sewage system in 2010-2017	Increase in length of sewage system per 100 km^2 in 2010-2017
	%	km	%	km
1	36,24	79,91	13,91	30,40
2	31,65	63,45	15,17	31,21
3	43,98	53,55	12,19	18,02
4	56,55	243,12	21,70	90,42
5	20,23	19,18	2,60	4,93

Source: own elaboration.

Table 7 presents data regarding the gas system. As in the previous cases, group 4 communes have the most developed gas network. Group 3 clearly stands out in that category, where on average the number of residents using the system is the lowest. In recent years, the increase in that group was also the lowest.

Table 7.
Gas infrastructure characteristics by group

Number of cluster	Percentage of residents connected to gas system	Length of gas system per 100 km^2	Increase in percentage of residents connected to gas system in 2010-2017	Increase in length of gas system per 100 km^2 in 2010-2017
	%	km	%	km
1	48,78	141,66	1,02	14,93
2	42,31	117,62	1,55	5,54
3	9,36	14,16	0,44	1,13
4	76,44	301,92	4,54	52,15
5	43,88	137,25	0,75	11,38

Source: own elaboration.

Further in this article an analysis of financial conditions in communes will be presented, in particular their own income, including tax income, and external financing, subsidies and sources of funds covering the budget deficit. To secure funds for the functioning of communes, irrespectively of their economic potential, they are subject to an income equalisation scheme (Kowalczyk et al., 2013, p. 475). Wealthy communes with high tax income are obliged to transfer funds to poorer communes. The funds are provided in the form of subsidies. The basis for calculation of amounts due is the average tax income of each commune, marked as Gg, while the average income in the country, marked as G, is used as a reference for the calculation of the amount of subsidies. Other indicators are less important in the calculation of part of the subsidies, the most significant of which is population density. Table 8 presents the amount of tax income of rural communes in the Małopolskie province in comparison to the average income in the country and the province.

Table 8.
G indicator for rural communes in Małopolskie province in 2019

Specification	G indicator* for 2019 PLN/capita	Number of communes in group
G indicator for country	1 790,33	2478
Average G for communes in Małopolskie province	1 162,98	182
Average G for rural communes in Małopolskie province	1 014,63	121
G indicator range		
Gg > 150%G**	2 807,02	1
100%Gg < G ≤ 150%Gg	2 196,49	5
92%Gg < G ≤ 100%Gg	1 738,62	2
75%Gg <G ≤ 92%Gg	1 533,69	5
40%Gg <G ≤ 75%Gg	985,18	85
Gg ≤ 40% G	608,78	22

Source: own calculation based on https://www.gov.pl/web/finanse/wskaźniki-dochodow-podatkowych-dla, 1.05.2019.

Data in Table 8 clearly shows significant differences in tax income of communes. Only six communes have Gg income of more than 100% of G, i.e. the national average. A vast majority, as many as 85 out of 121 communes, are communes whose tax income per capita falls within the range of 40-75% of G. The group of communes with the lowest income (Gg below 40%) is

quite numerous and includes 22 communes. The equalisation subsidy scheme is applied so that communes with very diverse economic potential could have access to similar funds per capita. Failure to implement such a measure would cause a very dangerous trend. Residents of less urbanised areas would move to wealthier communes with higher potential. Naturally, such situations do occur, but they are mitigated by the subsidy system and other mechanisms as part of local development policy. In reality, subsidies can also have an adverse effect – communes limit their efforts to increase own income, for example by not taking up growth-oriented initiatives, knowing that higher own income would reduce the subsidy. Table 9 presents tax income and subsidies received in groups under review.

Table 9.
Average tax income and subsidies in 2017 by group

Number of cluster	Own tax income	General subsidy, net of education portion	Total income and subsidies	Change in subsidies in 2017-2010
	[PLN/capita]			
1	891	511	1 401	32
2	688	691	1 379	71
3	864	635	1 499	40
4	1 771	82	1 853	-27
5	875	603	1 478	-67

Source: own elaboration.

Most communes, apart from several communes with the highest income of more than 100% of G, have similar income per capita, which results from, among other things, the operation of the subsidy scheme. Group 4 stands out from all the others. The group comprises 10 wealthy communes, i.e. five communes located around Kraków: Liszki, Wielka Wieś, Zabierzów, Zielonki, Siepraw. Next ones are located next to large cities: Chełmiec near Nowy Sącz, Oświęcim-rural commune, Tarnów-rural commune, Bolesław – Olkusz county, located next to Olkusz, which has mines within its limits. The issue of the amount of own income and subsidy scheme is not always understood properly by both decision-makers and publicists. There are numerous publications evaluating the quality of management at communes, where one of the basic criteria is the amount of tax income. This criterion is appropriate, but for comparing the potential of communes. However, it does not tell much about the quality of management. The subsidy scheme itself assumes that communes have different characteristics, and thus they present a different level of competitiveness. The quality of management should be measured in different categories. As can be seen based on calculations, with subsidies taken into account most communes have similar funds per capita, but they still show significant differences.

In the analysis of the average income within individual clusters, it can be noticed that group 4 significantly stands out from the others. These are communes neighbouring Kraków and other large cities. They had the highest income per capita already in 2010. Compared to other groups, the average income in these communes was nearly two times higher. In 2010-2017, income in all groups grew considerably. A comparable increase in income was recorded in group 4 and 5. The higher income in communes from group 5 is caused by

an increase in subsidy income, while in communes from group 4 it resulted from higher tax income. As can be seen, the largest item of income was tax income, accounting for 63-78% percent of the total. Many local self-governments seek to rise tax income, so that in the future they will not have to be too dependent on subsidies.

Table 10.
Average income in communes by group

Number of cluster	Own income in 2010	Own income in 2017	Change in own income in 2010-2017	Own tax income in 2017	share of tax income in own income [%]
	[PLN/capita]				%
1	703	1 162	459	891	76,63
2	621	926	305	688	74,34
3	852	1 228	376	864	70,38
4	1 465	2 261	796	1 771	78,34
5	700	1 377	677	875	63,53

Source: own elaboration.

Table 11 presents the amount of property tax, vehicle tax and income from property. Property tax is the most important and most efficient source of income generated locally (Czempas, 2009, p. 22). The property tax is the indicator of economic growth of a commune. It is mainly related to construction of buildings and economic activity. It must be noted that tax rates for buildings and land used in economic activity are many times higher than for property used for residential purposes.

Table 11.
Average income from property tax, vehicle tax and property income by group

Number of cluster	Property tax [PLN/capita]			Vehicle tax [PLN/capita]			Income from property [PLN/capita]		
	2010 r.	2017 r.	Change [%]	2010 r.	2017 r.	Change [%]	2010 r.	2017 r.	Change [%]
1	152	232	52,94	18	24	34,81	37	33	-11,80
2	98	155	58,79	21	30	42,76	27	34	26,25
3	156	290	86,57	16	23	41,97	58	57	-0,38
4	309	487	57,51	19	22	14,56	78	139	79,01
5	159	263	65,68	17	34	94,64	73	118	62,29

Source: own elaboration.

The amount of property tax income is closely related to population density and location of a commune. The highest population density of approximately 280 residents per km^2 is recorded in communes from group 4. Income from vehicle tax relates to ownership of trucks, trailers, semi-trailers and buses by entities registered in the communes. Very often, those entities operate within the commune, where they have their registered office. However, it is often the case that high income from vehicle tax results from the fact that the registered office of a transport company whose business consists in national and international shipping is located in a given commune. It is likely that the increase in income in communes from group 5 was caused by establishment of an entity or entities with a large number of vehicles used for the provision of transport services. In the area of vehicle tax, communes compete with each other by offering

attractive tax rates. Large transport companies with a large number of vehicles are willing to move their registered office to a commune with lower rates only to generate tax savings. Income from property mainly includes rental and lease income, and again group 4 shows the highest amount in that category. Compared to 2010, the amount doubled. Relatively high income from property is also generated by communes from group 5.

A very considerable item of tax income is interest in personal income tax and corporate income tax. Table 12 presents average income in individual groups. Group 4 again outperforms others significantly. This confirms the fact that this type of income is the most significant in municipalities and units neighbouring large cities (Sekuła, 2014, p. 243). As regards personal income tax, the difference is more than twofold, while in the case of corporate income tax the difference between groups is from 12 to 6-fold. A very important factor is the change of the amount of tax income: income from personal income tax doubled over eight years. Income from corporate income tax grew the fastest, i.e. by 115%, in group 4. In group 3 a 22% drop in average income from corporate income tax was recorded, but it still remained relatively high compared to other groups other than group 4.

Table 12.
Average income in analyzed communes from their interest in personal income tax and corporate income tax by group

Number of cluster	Interest in personal income tax [PLN/capita]			Interest in corporate income tax [PLN/capita]		
	2010 r.	2017 r.	Change [%]	2010 r.	2017 r.	Change [%]
1	269	543	102,09	4	7	63,52
2	195	411	110,89	2	4	76,55
3	177	379	113,65	10	8	-22,25
4	599	1 092	82,31	23	50	115,19
5	232	433	86,39	3	4	37,86

Source: own elaboration.

Property income mainly represent subsidies to investment projects and income from the sale of property and other less important income, e.g. from conversion of perpetual usufruct right. Income from property is a separate category and is not included in property income. Significant items in this category are funds from state programmes and co-financing from EU funds. Table 13 presents the structure of average property income. It is related to investment processes and capital expenditure. The high correlation of the two variables required one of them to be eliminated from the set of variables used for clustering. Data in the table shows that in recent years communes from group 5 incurred the highest capital expenditure per capita, followed by group 3. Communes from this group were also characterised by high income from subsidies, including under EU programmes. An obvious leader in terms of percentage of received support for investment projects was group 5. Support accounted for more than 65% of the total cost. The wealthiest communes received the lowest support per capita.

Table 13.
Amount of capital expenditure and co-financing of capital expenditure in groups

Number of cluster	Average capital expenditure in 2010-2017	Average property income, net of sale of property, in 2010-2017	Average income from EU funds earmarked for investment projects	Share of subsidies in capital expenditure	Share of EU subsidies in capital expenditure
	[PLN/capita]			%	
1	514	210	62	40,84	11,99
2	520	241	71	46,29	13,70
3	871	429	133	49,26	15,24
4	694	215	88	31,04	12,74
5	916	602	181	65,71	19,73

Source: own elaboration.

Most of the funds received as subsidies are awarded in competition procedures. Well-designed investment projects, aligned with objectives of programmes under which support is awarded, well-prepared design and application documents increase the changes for receiving aid. Depending on the programme, aid intensity is within the range 35-85%. The issue of submitting an application and acquiring subsidies to investment projects by communes is rather complex. Communes have different strategies in that respect, from very reluctant, where communes are virtually uninterested in applying for external funds, to very active communes. There are communes which almost always submit their application, many times creating projects that specifically meet the criteria of the call for applications. Unfortunately, communes focused on acquiring external funds not always take into account the priority of needs and the financial and economic justification of the pursued projects.

Communes' revenue mainly include proceeds from loans and bank borrowings. Loans are always advanced for a specific project, usually for environmental protection objectives. In recent years, funds were also awarded as part of loans for revitalisation projects. Loans bear low interest. The most significant source of loans to communes are Provincial Funds for Environmental Protection and Water Management and the National Fund for Environmental Protection and Water Management. Very often after a project is completed and once the achievement of the assumed objective is confirmed, part of the loan principal is cancelled. When planning expenses which are higher than income, to finance the deficit communes usually cover it with bank borrowings (Brzozowska, 2018). When a commune wants to take out a bank borrowing, it must carry out a public procedure. A commune's debt is generally subject to specific limits. (Dworakowska, 2016, p. 146). Just a few years ago, a simple rule was in effect, under which the amount of debt could not exceed 60% of income of the unit. As of 1 January 2014, each commune must meet an individually specified debt ratio. (Act on Public Finance, 2009, Art. 243.1). The current individual debt limits are not linked to expenses related to projects financed with EU and EFTA funds, as was previously the case. As a result of the changes, in practice local self-government units can incur new financing only for investment purposes (Kluza, 2019, pp. 37-38). Table 14 presents communes' debt per capita.

Table 14.
Debt of rural communes in Małopolskie province by group

Number of cluster	Debt per capita in 2010	Debt per capita in 2017	Difference in debt in 2010-2017	Change in debt	Cumulative budget performance per capita in 2017
	[PLN/capita]			%	[PLN/capita]
1	875,72	1 023,69	147,97	16,90	-839,03
2	591,12	410,62	-180,49	-30,53	-163,73
3	705,56	656,64	-48,92	-6,93	-440,22
4	829,31	963,84	134,53	16,22	-597,72
5	1 571,46	2 743,48	1 172,03	74,58	-2 200,90

Source: own elaboration.

The communes with the highest debt are communes from group 5. Their debt nearly doubled over the last two years. In 2017, it was more than PLN 2,743 per capita. This group is also characterised with the highest capital expenditure and the highest amount of external funds received. Nonetheless, the burden related to the need to cover the share of own funds, given the relatively low income, may result in the fact that communes from this group can find it difficult to meet their liabilities. Communes from group 2 invested in a sustainable manner, reduced their debt in the period of positive economic conditions without refraining from further investments. Communes from group 3 maintained debt at a relatively similar level, incurring significant capital expenditure and heavily relying on external financing. In group 4 debt increased. This is the group with the highest potential which accomplished the most projects. This results from a very high population density. The share of external funds in the financing of investment projects was the lowest in those communes. When referring to debt, note must be taken of the indicator of cumulative budget performance. This is an item of equity and liabilities of the consolidated balance sheet of a local self-government unit. The item is the sum of budget performance in previous years. As presented in Table 10, the cumulative budget performance is the highest in group 2, with the lowest indicator recorded in group 5. Another group of communes with a large cumulative deficit is group 1. A very interesting issue is that among all communes there is a very high polarisation of the cumulative budget performance. The worst performance is posted by the Raciechowice commune with PLN -3,216 per capita, while the best performance is seen in the Trzyciąż commune, at PLN 1,960 per capita.

4. Conclusions

Rural communes of the Małopolskie province show a diverse economic potential resulting from their location with respect to large cities and communication routes. Communes with a large economic potential have a high tax income per capita.

Despite large differences in tax income, communes have similar funds per capita at their disposal due to the operation of the subsidy scheme.

Communes follow different investment strategies. To implement their investments in fixed assets, most local governments rely on co-financing and bank borrowings.

Providing utility services to residents in heavily urbanised communes requires significant capital expenditure resulting from the need build systems with a high density.

The cumulative budget performance and debt are not related to the economic potential of communes but to their management strategy.

The status of infrastructure and financial standing of a commune are shaped in multi-annual process.

References

1. Act on Income of Local Self-Government Institutions (2018). *Ustawa o dochodach jednostek samorządu terytorialnego,* tj. z dnia 5 lipca 2018 r. (Dz.U. z 2018 r. po. 1530) z późn. zm.
2. Brzozowska, K. (2018). Zadłużenie jednostek samorządu terytorialnego w Polsce na tle długu publicznego kraju. *Ekspertyzy i opracowania, Narodowy Instytut Samorządu Terytorialnego, Vol. 68*.
3. Czempas, J. (2009). Podatek od nieruchomości-ważne źródło dochodów gmin. *Świat Nieruchomości, 2(68)*. KrakówŁ Wydawnictwo UE, pp. 22.
4. Dworakowska, M. (2016). Limity zadłużenia jednostek samorządu terytorialnego w zmieniającym się otoczeniu gospodarczym. *Ekonomiczne Problemy Usług, 125*, pp. 137-148.
5. Grabiński, T. (1992). *Metody taksonometrii.* KrakówŁ Wydawnictwo Akademii Ekonomicznej.
6. Hok, B. (2017). Wybrane czynniki finansowe do oceny zamożności jednostek samorządu terytorialnego na przykładzie gmin wiejskich i miejsko-wiejskich województwa zachodniopomorskiego. *Zeszyty Naukowe Wydziału Nauk Ekonomicznych, 1(20),* pp. 111-127.
7. https://www.gov.pl/web/finanse/wskaźniki-dochodow-podatkowych-dla, 1.05.2019.
8. Kluza, K. (2019). *Zadłużenie jednostek samorządu terytorialnego w Polsce.* Instytut Rozwoju Miast i Regionów.
9. Kocur-Bera, K. (2011). Rozwój infrastruktury na przykładzie wybranych gmin wiejskich. *Infrastruktura i Ekologia Terenów Wiejskich, Vol. 1*, pp. 29-37.
10. Kowalczyk, R., Mastalski, R., Fojcik-Mastalska, E. (2013). *Subwencja ogólna.* Prawo finansowe. Warszawa: Wolters Kluwer Polska.

11. Krakowiak-Bal, A. (2007). Wpływ infrastruktury na rozwój przedsiębiorczości w gminach wiejskich wybranych powiatów województwa małopolskiego. *Inżynieria Rolnicza, 7(95)*, pp. 101-108.
12. Malina, A., Zeliaś, A. (1997). O budowie taksonomicznej miary jakości życia. *Taksonomia, Vol. 4*, pp. 238-262.
13. Sekuła, A. (2014). Analiza dochodów z udziału we wpływach z podatku dochodowego od osób fizycznych w gminach województwa pomorskiego. *Finanse publiczne, Prace Naukowe, nr 346.* Wrocław: Uniwersytet Ekonomiczny, pp. 235-245.
14. Sierak, J. (2017). Regionalne zróżnicowanie wielkości i dynamiki dochodów gmin i miast na prawach powiatu – analiza wskaźnikowa dla lat 2000-2014. *Finanse komunalne, 1-2.*
15. Stanisz, A. (2007). *Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny*. Kraków: StatSoft.
16. Zeliaś, A. (2000). Dobór zmiennych diagnostycznych. In: A. Zeliaś (ed.), *Taksonomiczna analiza przestrzennego zróżnicowania poziomu życia w Polsce w ujęciu dynamicznym*. Kraków: Wydawnictwo Akademii Ekonomicznej, pp. 36-42.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

CORPORATE SOCIAL RESPONSIBILITY CONCEPT

Halina CHWISTECKA-DUDEK[1*], Aleksandra KORENKIEWICZ[2]

[1] AWSB University, Dąbrowa Górnicza; chwistecka.dudek@gmail.com, ORCID: 0000-0002-8549-5844
[2] PhD student at AWSB University; aleksandra.korenkiewicz@interia.com
* Correspondence author

Purpose: The purpose of this paper is to present selected theoretical aspects of the concept of corporate social responsibility and the stakeholder theory that is closely related to it, targeted at liability with respect to specific stakeholder groups.
Design/methodology/approach: The literature research and the critical analysis of both, the national and foreign subject literature have been used as the research methodology.
Findings: Social responsibility is a concept in compliance with which companies, whilst designing their development strategy, take social groups, i.e. interests of selected groups of stakeholders, into account in their activities. This requires identification of diverse stakeholder groups, determination of the degree of their significance and proper management of relations with them. Thus, the concept of social responsibility is a process as part of which the companies manage their relations with stakeholders who may influence their economic success.
Practical implications: The practical implications concern taking into consideration the application of the CSR principles in managers' decisions and treating the conception in strategic aspects.
Originality/value: The discussed issue belongs to one of the newest trends in management sciences and fits into the current conception of sustainable development. Proper integration of social values with the strategy allows developing and maintaining long-term competitive advantage. Therefore, the CSR conception is a long-term process of managing relations with groups of stakeholders in order to generate value for them and for enterprises' owners.

Keywords: Corporate social responsibility, concept, stakeholders, management, relations.

1. Introduction

Corporate social responsibility (CSR) is one of the recent concepts in management sciences which assumes that a company's success depends, among others, on the ability of building proper bonds and relations with diversified stakeholders from the environment.

Socially responsible enterprises are focused on their stakeholders – both internal and external – i.e. such entities and pressure groups that are related to their operation. Such approach

was reflected in the stakeholder theory and in the trend of perceiving social responsibility as an obligation of enterprises to take the economic, environmental and ethical aspects into account in their operation.

It may be assumed that corporate social responsibility is related to the concept of management oriented at an understanding - a broadly understood idea of a consensus - in contrast to actions that are exclusively meant to offer results (profits).

The goals of an enterprise should therefore reflect a certain balance between striving for safe (satisfactory) profit and the feeling of social responsibility and readiness to accommodate it. The discussion on corporate social responsibility may be treated as a certain form of response to one of the major dilemmas both in the theory of management and in business ethics. How to realise strategic priorities in the area of social responsibility, simultaneously maximising profits for the company and the society? Is the role of business reduced only to efficient engagement of resources to maximise profits, or does it also include searching for solutions that are beneficial for all stakeholders? In this manner, the science of social responsibility is becoming the theory of an enterprise's ethical operation, whereas a practical dimension of business responsibility boils down to searching for a dynamic balance in time and space for stakeholders. Thus, it may be assumed that CSR has a strategic and dynamic character and relies on ongoing improvement and constant cooperation with all stakeholders. A significant feature of such concept is its interdisciplinarity, manifesting the necessity of integration and conversion of knowledge from various areas of sciences, as well as economic practice. Social responsibility is the object of interest of numerous scientific disciplines: sociology, political sciences, psychology, economy or management sciences. It is included in the theory and concept of enterprise management, which testifies (Sokołowska, 2013) to:

- close relation of CSR with practice;
- treating the strategic dimension of CSR as a condition necessary to implement the concept;
- having proper methods and tools at one's disposal in the form of codes, standards and reports, as well as the possibility of using (as part of management integration) other supporting concepts, methods, techniques and management tools;
- possibility of managing corporate social responsibility as a sequence of specific activities related to classic management functions (identification of CSR areas and entities, its' planning, organisation, formation and control); furthermore, the functions of managing social corporate responsibility permeate organic functions of an enterprise and are integrated with them;
- CSR may be treated as a meta-level of the management system, which means that with adequate "socio-organisational maturity", it may become a leading management concept.

The core of the idea of corporate social responsibility is the responsibility of managers for activities in the following dimensions: economic, environmental and ethical, which means observance of the 3xE principle. Implementation of these principles requires an open and constructive dialogue with stakeholders; therefore, it is believed that the stakeholder theory is the foundation of CSR, whereas the management of stakeholder relations is essential in meeting the goals of an enterprise.

2. Identification of Corporate Social Responsibility

It is most often assumed that CSR includes conscious and voluntary activities consistent with the generally adopted standards and principles; it is a set of the organisation's obligations to protect and to reinforce the society in which it functions. CSR is "sensitivity to the issues of the external environment, such as social or environmental sensitivity, as well as the capacity for keeping a balance between the interests of customers, employees and shareholders, as well as provision of certain services for the benefit of the local community" (Żemigała, 2007).

M.E. Porter and M.R. Kramer (Porter, and Kramer, 2003, p. 37) treat CSR as an "element of thought-through strategy of a company's operation, institutionalised and rationalised, which may become the new source of its competitive advantage"[1].

C.B. Bhattacharya et al. (2011) pinpoint the rapidly changing approach to the CSR concept, emphasising that:

- CSR is treated more and more frequently as a business opportunity and not as an obligation;
- Initially, the number of stakeholders was small, whereas nowadays, the significant impact of diversifying the groups of stakeholders on the meeting of CSR assumptions is emphasised;
- The CSR concept is more and more frequently treated as a strategic aspect of a company's operation.

Selected definitions of CSR are presented in the table below (Table 1).

[1] A broad range of CSR definitions was presented by Dahlsrud, 2008, pp. 1-13; Freeman, Hasnaoui, 2011, pp. 419-443 and Marrewijk, 2003.

Table 1.
Selected definitions of social responsibility

Author	Content
Carroll, A.B. (1991, pp. 39-48)	The entire range of business operation oriented at: profitability, observance of the law, ethical conduct and being a good citizen (...) consists of various types of liabilities which, to a varying degree, are related to social requirements.
Garriga, E., Mele, D. (2004)	Framework of behaviour with respect to human rights, employee rights and respect for the environment.
McWilliams, A., Siegel, D. (2001)	Engaging in activities used for the future social welfare, exceeding the exclusive interest of the organisation and legal requirements.
Xueming, L., Bhattacharya, C.B. (2006, pp. 1-18)	Activities and state related to the perception of social obligations and liabilities towards stakeholders.
Friedman, M. (1970, pp. 32-33, 122-126)	Social responsibility is activity not intended to maximise profits, taking into account benefits of social groups that are not shareholders of companies (...) whereas sole liability of business towards the society is maximisation of profit of shareholders, in observance of the law and ethical customs in the country.
Sen, S., Bhattacharya, C.B. (2001, pp. 225-243)	The obligation of taking actions that protect and improve both the generally understood overall social welfare, as well as interests of an organisation into account.
Rok, B. (2001, p. 32)	Corporate social responsibility is a philosophy of carrying out production and service activities oriented at building sustainable, positive relations with all the interested parties: it designates the features of the management systems ensuring the desired course of processes or activities that are salient on account of the goal of management.

Note. Prepared on the basis of Carroll, 1991; Garriga, Mele, 2004; McWilliams, Siegel, 2001; Xueming, Bhattacharya, 2006; Friedman, 1970; Sen, Bhattacharya, 2001; Rok, 2001.

According to the definitions presented above, the issue of corporate social responsibility does not have a uniform conceptual frame. However, the multitude of definitions functioning in reference books allows for specifying some common constituents of the CSR concept:

- It refers to the role of business in the society and expectations of the society with respect to enterprises.
- It is perceived as a voluntary concept of action both consistent with the law and exceeding the legal requirements.
- It refers to the role of management and entrepreneurship.
- It focuses attention on the impact of business operation on the society.
- It refers to measurements and improvement of functioning in a social, environmental and economic dimension, contributing to sustainable development (Hąbek, Szewczyk, 2010).

Uniting elements are relations between the organisation treated as an entity cooperating with the environment and jointly contributing to the common welfare and the society.

It is assumed that social responsibility is perception of a company as an integral element of the society functioning in a socially responsible manner, i.e. fulfilling specific requirements with respect to the society. This is the name of the concept in line with which business responsibility entails something more than only bringing profit to shareholders. It refers to the manner in which business decisions influence entities from the environment, participating in the management process. This is primarily perception of effects of own decisions and taking responsibility for them; it also entails being guided by respect for the society's welfare, even if

it requires sacrificing short-term profits. Such approach facilitates sustainable development of a company, consisting in optimum use of its resources and competence held and allows for gaining competitive advantage based on non-economic factors.

3. Stakeholder Concepts

Social responsibility is focused on responsibility towards owner groups, i.e. shareholders, stockholders and owners who, in fact, are investors (shareholders) and other stakeholders, who are directly or indirectly related to the organisation and who influence the effects of its operation. This second group includes: employees, customers, suppliers, cooperating partners, competitors, local communities, etc.

Individual groups have diverse expectations with respect to the organisation, therefore two concepts are identified that refer to stakeholders: the shareholder value and the stakeholder value (Jurek, and Kornacka, 2005).

The shareholder value is narrowed down to the maximisation of profits for shareholders, stockholders and owners and does not include – in any special way – other stakeholders. Potential attempts at implementing social purposes are treated as a threat to the efficiency of operation of an enterprise. Such approach is strongly rooted in the economic system of the United States and Great Britain, where special role is played by institutional investors, namely insurance, investment and pension funds that have an immense financial potential.

Western European countries and Japan are dominated by the stakeholder value concept, which is focused on the meeting of interests of numerous groups influencing (directly or indirectly) the effects of operation. Such concept occurs in two main versions:

- in a broad range, "stakeholders" include owners and providers of capital, customers, cooperating partners, suppliers, public institutions and competitors;
- in the narrow sense, the "stakeholder" groups do not include competitors, as they are not treated as entities indispensable for survival and success of an enterprise (Evan, Freeman, 1993).

Each of the above-listed groups has specific expectations in reference to an enterprise and, on the other hand, behaviour of such group influences the degree of fulfilment of its goals:

- Owners, on account of the invested capital, expect income (dividend) equal at least to the market interest rate, and on the other hand, they are not interested in exercising power, which may lead to conflicts during performance of social goals which cause a reduction of profits.

- Customers expect benefits resulting from the fact of purchasing a product (high quality, low price); indirectly, they finance the development of new products and services. There are also interests of customers which may be contradictory with the goals of managers.
- Employees primarily expect adequately high salaries and employment stability. A conflict between the interests of employees and the management results from a dual aspect of employees' income which is, simultaneously, a basis for their consumption, but also an element of the enterprise's cost. Employees also expect certain safety, fringe benefits and satisfactory jobs. Thus, responsibility is understood broadly, as security of employment, social recognition, possibility of promotion and self-development.
- The influence of suppliers and the enterprise's contractors is mainly expressed in partial determination of the quality and the price of the final product. If they are perceived as valuable stakeholders, they may count on regular orders and high prices as relations with them are salient for the enterprise's growth.
- Local community expects participation in the life of the environment. The local community and the society grant rights to location and draw benefits from taxes and economic and social expenses incurred by a company. In turn, a company cannot expose a local community to an unjustified risk of destruction of the natural environment, storage of toxic waste, etc.

In the concept of stakeholder value, the primate of one group of stakeholders over another is not specified; it is also impossible to meet all desires of every group of stakeholders at the same time, especially when such interests are in conflict. The managers' task is to keep balance among several contradictory interests of stakeholders. When the balance has been disrupted, the company's development may be at risk, e.g. when salaries are too high and the quality of products is too low, the company loses customers, suppliers suffer and shareholders are starting to sell their shares, causing a drop in the prices of shares and hindering procurement of new capital at convenient terms. Therefore, it is believed that the goal of managers is to act in the long-term interest of the company that they are managing, understood as a forum of interaction among stakeholders.

The presented shareholder value and stakeholder value concepts – in spite of being frequently juxtaposed – are subject to the process of convergence. Convergence of both theories takes place and consists in perceiving the fact that it is in the shareholders' interest to take interests of other "interested parties" into account and to promote long-term relations of trust and cooperation among them. Finding a common area of reference for both theories is quite easy. If it is assumed that a company should act in the interest of its shareholders (in particular in the long-term context), it is impossible to overlook the interests of other social groups. Such situation makes the managers liable for making decisions taking both the net economic calculation, as well as the context of social responsibility into account. This means that the situation in which managers of the modern companies find themselves in is exceptionally

difficult: on the one hand, they should try to implement strategies guaranteeing development and growth of competitiveness on a global scale, and on the other, they should meet social goals. Hence, it may be concluded that a challenge for a modern business is to strive for accomplishing a balance and a symbiosis in relations with stakeholders (Clark, 1999).

4. Management of Stakeholder Relations

The most general definition of stakeholders was formulated by Freeman (2010), according to whom a stakeholder is any person or group who may exert pressure on a given organisation, or on which such organisation exerts pressure. Thence, stakeholders have their share in activities of an organisation and possibilities of influencing its development (Savage, Whitehead, Blair, 1991).

In Polish reference books, stakeholders are defined as groups, institutions and organisations that fulfil two conditions: they have their "stake" in the operation of an organisation and they are capable of exerting pressure on the organisation (Obłój, 2001).

We assume that stakeholders are persons, groups of persons and specific entities who - based on feedback - enter, either directly or indirectly, into an interaction with an organisation, fulfilling their goals. Relations may have the form of interests, rights or shares.

Andriof, Waddock (2002) believe that in the concept of "groups" that have diversified expectations, often contradictory, and that create a network of interactions with an organisation, it is necessary to account for two main aspects: legitimisation and dependence on power. The first aspect may be examined from the point of view of contracts, exchange, legal titles, moral rights, status of undertaken risk; whereas the other indicates domination of an enterprise or domination of stakeholders, alternatively their inter-dependence.

Stakeholders are assigned with specific attributes by determining their impact (power) and significance (role that they have in activities of an organisation) in categories:

- strong - weak (Michaell, Agle, Wood, 1997);
- power, legitimacy and urgency, whereas the joint level of these attributes translates to the degree of importance and salience of a given stakeholder for an organisation (Pfeffer, Salancik, 2003).

Power refers to the actual possibility of stakeholders' influence on decisions and functioning of an organisation. A.T. Lavrence and J. Weber (2008) distinguished the following types of power:

- voting power, which refers to shareholders and stockholders;
- economic power, which refers to such groups of stakeholders as investors and shareholders, customers, business partners, contractors and employees;

- political power, referring to public administration, institutions and social organisations, NGOs, etc. which may influence the establishment of new laws and provisions via lobbying;
- legal power, which is potentially within reach of all stakeholders, as any entity may demand liability from an enterprise for violation of applicable legal provisions.

Legitimacy refers to the base of relations of stakeholders with an organisation, which may be legal (e.g. employment contract, commercial contract), moral (ethical norms and standards, universal values, i.e. honesty, empathy, solidarity, etc.) or customary (customs and habits respected in a given culture).

Urgency refers to situations where relations of stakeholders with an organisation or their expectations depend on the passage of time and are particular or even critical for them. This is a degree to which the claims of stakeholders require an immediate reaction – a high degree denotes priority of a given group in the hierarchy of essential activities of an organisation (Savage, Whitehead, Blair, 1991). This is about a strategic analysis of stakeholders which should respond to three groups of questions:

- within the scope of analysis of groups of interests: who are our stakeholders, what impact do they have on the entity (taking into account the political, economic and social aspects) and how do the stakeholders perceive such impact?
- as part of analysis of values: what are the most important organisational values, what are the values for key members of the management, what are the values of key stakeholders?
- in the area of social issues: which most important issues will refer to the society in the next 10 years (economic, political, social, technological, etc.) in which manner do such issues influence the entity and its stakeholders? (Freeman, 2010, Post, Preston, Sachs, 2002).

Depending on the attributes held, the power of impact of a given stakeholder on the organisation will vary. The managers' task is to identify individual groups and their demands and subsequently determine the hierarchy on which satisfaction of their needs depends. This is quite difficult as attributes of stakeholders are not assigned to them in a fixed way: they may lose or gain some of them. Apart from it, stakeholders may, but do not have to be aware and even if they are aware of holding specific attributes, they do not always decide to use them.

Classification of stakeholders and determination of the hierarchy of their importance are necessary in the process of managing relations with them.

According to J.S. Harison, C.M. St. John (1994) stakeholder management is: communication, negotiation, management of relations with them and motivating them to actions and behaviour beneficial for an organisation.

In turn, R.E. Freeman (2010) believes that management of relations with stakeholders requires the following skills:

- analysis of who the stakeholders are and their expectations;
- building strategies of processes and procedures fulfilling the stakeholders' expectations;
- building relations with stakeholders which will allow for pursuing the organisation's mission.

The process of managing stakeholders includes the following stages:

- identification of an organisation's stakeholders;
- diagnosis and classification of stakeholders;
- formulation of a strategy of upgrading and changing current relations with key stakeholders and improvement of the general standing of an organisation;
- efficient implementation of such strategies (Bukowska 2008).

The starting point in this process is recognition and determination of all stakeholder groups, whereas it is possible to indicate some universal groups, which include: employees, customers, owners, business partners, competitors, administrative authorities, media or local communities. Apart from it, every organisation should identify specific stakeholders, proper only for itself, depending on the industry, legal and organisational form and range of operation, e.g. banks – financial supervision authorities, stock companies – stockholders, and international corporations – legal entities or social organisations characteristic for them. The second stage is classification of stakeholders on account of diverse criteria; it refers to the formulation and choice of a strategy of managing relations with specific groups of interest. Taking the concept of corporate social responsibility into account, organisations can choose one of the following strategies:

1. passive, which consists in ignoring the signals from stakeholders and lack of any reaction to their demands and pressure;
2. reactive, which assumes responding and reacting to the expectations and pressure of stakeholders only when it is considered necessary;
3. pro-active, where needs and expectations of stakeholders are monitored to foresee and discover problems and prepare proper programmes of activities in advance, allowing for efficient and immediate reaction;
4. interactive, which consists in constant communication with stakeholders, holding a dialogue and fostering close cooperation for the purpose of identifying their expectations, preferences and potential problems in a manner that they can be jointly solved in an amicable manner (Adamczyk, 2009).

Another stage is efficient implementation of strategies taking into account stakeholders' expectations. The typology of strategies of managing stakeholder relations is presented by M. Banks and D. Vera (2007).

The process of managing relations with stakeholders is of unique importance in reference to, e.g., public organisations, which primarily exist to satisfy the expectations of their stakeholders. H. Rainey (1997) claims that public institutions emerge and exist by satisfying interests of these groups that are the suppliers of resources and are thus sufficiently strong to influence the functioning of an organisation.

Organisations that manage relations with stakeholders stand a greater chance of accomplishing their goals, as acceptance of their activities on the part of stakeholders may significantly affect the level of performance of an organisation's strategy. The interests of stakeholders form a part of the organisation's strategy, thence their key significance, and the necessity of identifying them and building strategies of stakeholder relations management. Proper choice of a strategy may allow for procuring valuable partners who support the organisation's activities by, e.g., making resources available (Agle, Mitchell, Sonnenfeld, 1999). Therefore, stakeholders should be treated as a significant element, determining an organisation's success. However, it should also be noted that managing relations with stakeholders, even though indispensable in the operation of every enterprise, may generate a number of ethical dilemmas, related to the categorisation of stakeholders and the necessity of marginalising certain groups. Furthermore, a high number of stakeholders results in the necessity of adopting proper relation management strategies, at least in reference to the groups of key stakeholders.

Corporate social responsibility and the stakeholder theory closely related to it form a part of a broad current called sustainability, where a specific strategy of economic operation is sought which allows for combining economic, social and environmental goals and for minimising the negative impact of an organisation on the environment, and thus contributes to maintaining durability with harmonious development of the world (Marrewijk, Werre, 2003).

In the modern times, the question is not really whether CSR should be applied, but the degree to which such concept should be implemented to the benefit of an enterprise and its stakeholders. The CSR concept should find its fixed place both in the process of formulation and implementation of the strategy of enterprises and economic policy.

5. Conclusions

Corporate social responsibility reflects one of the most recent approaches in management sciences and is included in the specific concept of enterprise management. It assumes that success of an enterprise also depends on the ability of building relations, as well as managing them in reference to specific stakeholder groups. In spite of the fact that the CSR concept evokes controversies, the arguments of both the followers and the opponents show that the core of the discussion are various modes of its understanding rather than the necessity of applying it.

References

1. Adamczyk, J. (2009). *Społeczna odpowiedzialność przedsiębiorstw.* Warszawa: PWE.
2. Agle, B.R., Mitchell, R.K., Sonnenfeld, J.A. (1999). Who matters to CEO? An Investigation of Stakeholders Attributes and Salience, Corporate Performance and CEO values. *Academy of Management Journal, No. 42*.
3. Andriof, J., Waddock, S. (2002). Unfolding Stakeholder Engagement. In: J. Andriof, S., Waddock, B., Husted, S.S. Rahma (eds.), *Unfolding Stakeholder Thinking.* Sheffield: Greenleaf Publishing.
4. Banks, M., Vera, D. (2007). *Towards a Typology of Stakeholder Management Strategies*. Philadelphia: Academy of Management Conference.
5. Bhattacharya, C.B., Sen, S., Korschun, D. (2011). *Leveraging Corporate Responsibility. The Stakeholder Route to Maximazing Business and Social Value.* Cambrigde: Cambrigde University Press.
6. Bukowska, U. (2008). Proces zarządzania interesariuszami. *Zeszyty Naukowe Uniwersytetu Ekonomicznego, nr 784.* Kraków.
7. Carroll, A.B. (1999). Corporate Social responsibility. *Evolution of a Definition Business & Society, 38, September*.
8. Carroll, A.B. (1991). *The Pyramid of Corporate Social Responsibility: Toward the Moral management of Organizational Stakeholders.* Business Horizons.
9. Clark, S. (1999). Considering your stakeholders: Don't forget, you are not alone. *Houston Business Journal, vol. 30*.
10. Dahlsrud, A. (2008). How Corporate Social Resposibility is Defined: an Analysis of 37 Definitions. *Corporate Social Responsibility and Environmental Management, No. 15.*
11. Evan, W., Freeman, R.E. (1993). A stakeholder Theory of the Modern Corporation; Kantain Capitalism. In: G.D. Chryssides, J.H. Kaler (eds.), *An Introduction to Business Ethics*. London: Chapman and Hall.
12. Friedman, M. (1970). The Social Responsibility of Business is to Increase its Profits. *New York Times Magazine, September*.
13. Freeman, E. (2010). *Strategic Management. A Stakeholder Approach.* Cambridge University Press.
14. Freeman, R.E., Hasnaoui, A. (2011). The Meaning of Corporatesocial Responsibility: The vision of four nations. *Journal of Business Ethics, Vol. 100*.
15. Freeman, R.E. et al. (2010). *Sakeholder Theory. The State of the Art*. Cambridge: Cambridge University Press.
16. Garriga, E., Mele, D. (2004). Corporate Social Responsibility: a Theories: Mapping the Territory. *Journal of Business Ethics*.

17. Harrison, St. John, C.H. (1994). *Strategic Management of Organizations and Stakeholders: Theory and Cases.* St. Paul, MN: West Publishing Company.
18. Hąbek, P., Szewczyk, P. (2010). *Społeczna odpowiedzialność a zarządzanie jakością.* Gliwice: Wyd. Politechniki Śląskiej.
19. Jurek, M., Kornacka, D. (2000). Aktualność teorii społecznej odpowiedzialności przedsiębiorstwa. *Przegląd Organizacji, 5*.
20. Lavrence, A.T., Weber, J. (2008). *Business &Society. Stakeholders, Ethics, Public Policy*. New York: McGraw-Hill.
21. Marrewijk, M. (2003). Concepts and Definitions of CSR and Corporate Sustainability: Between Agency and Communion. *Journal of Business Ethics*.
22. Marrewijk, M., Werre, M. (2003). Multiple Levels of Corporate Sustainability. *Journal of Business Ethics No. 44*.
23. McWilliams, A., Siegel, D. (2001). Corporate Social Responsiblility: a Theory of the firm perspective. *Academy of Management Review, vol. 26.*
24. Obłój, K. (2007). *Strategia organizacji w poszukiwaniu trwałej przewagi konkurencyjnej*. Warszawa: PWE.
25. Pfeffer, J., Salancik, G.R. (2003). *The External Control of Organizations – A Resource Dependence Perspective*. Stanford University Press.
26. Porter, M.E., Kramer, M.R. (2003). *The Competitie Advantage of Corporate Philantropy. Business Harvard Review on Corporate Responsibility*. Harvard Business school Press.
27. Rainey, H. (1997). *Understanding and Managing Public Organization*. San Francisco: Jossey-Bass.
28. Rok, B. (2001). *Więcej niż zysk, czyli odpowiedzialny biznes. Programy, strategie, standardy.* Warszawa: Forum Odpowiedzialnego Biznesu.
29. Savage, G.T., Nix, T.W., Whitehead, C.J., Blair, J.D. (1991). Strategies for Assessing and Managing Organizational Stakeholders. *Academy of Management Executive, Vol. 5, No. 2*.
30. Sen, S., Bhattacharya, C.B. (2001). Does doing good always lead to doing better? Consumer reactions to corporate social responsibility. *Journal of Marketing Research, Vol. 38*.
31. Sokołowska, A. (2013). *Społeczna odpowiedzialność małego przedsiębiorstwa. Identyfikacja – ocena – kierunki doskonalenia.* Wrocław: Wyd. UE.
32. Xueming, L., Bhattacharya, C.B. (2006). Corporate Social Responsibility, Customer Satisfaction, and Market Value. *Journal of Marketing, Vol. 70, No. 4*.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

AGGRAVATION OF BABY BLUES SYMPTOMS AND ATTACHMENT STYLE IN MARRIAGE

Marianna DĄBROWSKA-WNUK[1*], Anna PŁOTEK[2]

[1] Wyższa Szkoła Bankowa w Poznaniu, WZ w Chorzowie; marianna.dabrowska-wnuk@chorzow.wsb.pl, ORCID: 0000-0003-0242-5013
[2] NZOS Ośrodek Terapii i Psychoedukacji „KOMPAS" w Będzinie; anpajak@gmail.com
* Correspondence author

Purpose: The aim of the article is to present one of the most common disorders of the postpartum period, which is baby blues, and the quality of relationships in a marital relationship as a predictor of the severity of the symptoms of this disorder.
Design/methodology/approach: The study presents the results of research based on the analysis of dependencies between the aggravation of baby blues symptoms and attachment style in marriage. A group of 75 women who had given birth within less than six months took part in the study, which utilised Plopa's Questionnaire of Attachment Styles (KSP) and a Questionnaire on the Aggravation of Baby Blues Symptoms (KNOBB).
Findings: The study confirmed a negative relation between a secure attachment style and the intensification of maternal blues symptoms, and a positive relation where the anxious-ambivalent style is considered. The highest degree of correlation between attachment styles and postpartum blues symptoms was observed with respect to the social sphere and, further, to the emotional sphere and maternal role competence.
Practical implications: The results presented point to the significance of the relationship with the life partner (father of the child) as an adjustment resource. The knowledge gained may serve for practitioners who develop informational, preventive and intervention programs for women who experience difficulties in adjusting to parenthood.
Originality/value: The problem of postpartum disorders fits into the general category of mental health. Dealing with it is important from the standpoint of proper diagnosis and treatment. The presented content is intended to raise the level of social awareness and inspire to search for other factors important from the point of view of the process of adapting to the maternal role.

Keywords: maternal blues in women, baby blues, maternity, attachment style.

1. Introduction

From the life-span developmental perspective, giving birth to a child and taking on a parental role is treated as a natural subsequent stage of a long-term developmental process. It is one of the developmental tasks that are typical of early adulthood. The personal and social significance of this event and the series of changes arising from it altogether enable us to categorise childbirth as an event of fundamental significance, referred to in psychology as a developmental crisis or critical event (Kubacka-Jasiecka, 2010; Trempała, 2011). As a turning point of major importance from the perspective of an individual woman's lifetime, maternity is a series of strongly emotional experiences incomparable to any other, which fits into the woman's course of life as an event that is an expected watershed moment in its nature (Budrowska, 2000; Bartosz, 2002; Kuryś, 2010). Since it radically destabilises how an individual functions in their environment and requires mental adjustment, it is also described as a readjustment life event (Sobolewski, Strelau, Zawadzki, 1999). The sudden transformation into a different role than the one fulfilled up to a given moment always yields a spectrum of diverse and often ambivalent experiences, the intensity and complexity of which is determined by the novelty of the situation (Mercer, 1986; Deave, Johnson, Ingram, 2008; Kuryś, 2010; Javadifar et al., 2016).

The disruptive nature of childbirth is emphasised especially when it concerns the birth of the individual's first child, which involves the transition to parenthood (i.e. a transition from a married to a parental couple) (Matuszewska, 2003; Kornas-Biela, 2009; Plopa, 2011; Bakiera, 2013)[1]. It is in that moment that the dynamic of developmental changes is the highest, and the experiences that accompany them are the most difficult, as evidenced by mothers' and fathers' reports alike (Matuszewska, 2003; Nyström, Ohrling, 2004; Deave, Johnson, Ingram, 2008; Plopa, 2011; Sousa e Silva, Carneiro, 2014). Most first-time parents experience difficulties relating to their lack of knowledge of various aspects of parenthood. This especially pertains to the rules and requirements of daily childcare and (with time) the necessity of taking routine action oriented at satisfying the infant's needs (Turner, Helms, 1999; Fillo et al., 2015). Especially in mothers' perception, this leads to them feeling that they have a limited ability to enjoy free time, and, consequently, feeling tired, tense, and exhausted (Nyström, Ohrling, 2004).

[1] With births of subsequent children, gaining knowledge and embedding behaviours with time becomes a more structured activity, which is favourable for the creation of specific cognitive and action schemes. Thus, subsequent transitions into parenthood should themselves constitute more stable periods of parental functioning and should inhibit the determined functional balance less than the initial transition to parenthood (Matuszewska, 2003).

Even though the (first) child undeniably and fundamentally transforms and restructures the lives of both partners (Belsky, Rovine, 1990; Cowan, Cowan, 2000; Belsky, Kelly, 1994; Ostoja-Zawadzka, 1999; Guttmann, Lazar, 2004; Ahlborg, Strandmark, 2006; Sousa e Silva, Carneiro, 2014), it disproportionately and even more radically disturbs the balance and reorganises the lives of mothers. Women experience a larger number of changes, which are more pervasive for them than for men. We can also observe more areas of life that these changes pertain to, from physical aspects, through different social and professional situations, to the redefinition of the woman's identity (Mercer, 1986; Notman, Lester, 1988; Cowan, Cowan, 2000; Gurba, 2003; Matuszewska, 2003; Kuryś, 2010; Bakiera, 2013; Javadifar et al., 2016). Already when pregnant, women invest more in adjusting themselves to their parental role, anticipating larger changes in many areas of their lives (Pancer, 2000). These changes cause a psychological transformation which results in a specific attitude that is necessary for the development of a mother identity together with emotions and behaviours related to maternity (Cowan, Cowan, 2000). The woman's desire to go through this transformation and become a mother may be strong and deeply felt, but may, simultaneously, give rise to concern and ambivalence towards the impending changes. Prospective mothers therefore experience a range of positive emotions, but also feelings of anger, fear, sadness, or hostility (Trad, 1990). In the first moments after giving birth, happiness, elation, relief, calm and interest in the newborn child are accompanied by fatigue, pain, fear, and sometimes also a feeling of guilt if a child is born ill or premature (Ronin-Walknowska, 2010). We may thus see that there are two sides to the challenges a new mother has to face. On the one hand, adjusting to changes initiated by childbirth is a positive disintegration (Kornas-Biela, 2009) that improves the general wellbeing of an individual and also that of a married couple, and leads to a new quality of attitude towards oneself, others, and the world; on the other hand, the adjustment in question is a source of problems and difficulties, being also one of the most stressful and demanding changes in one's life (Alizade, 2006; Kubacka-Jasiecka, 2010; Kuryś, 2010; Fillo et al., 2015; Deave, Johnson, Ingram, 2008).

The relationship between women's wellbeing and mental health, and their sex and gender roles has been empirically confirmed (Russo, Green, 2002). Therefore, stress is closely related to the role of a mother, and is an integral element of the maternal experience through various stages of a child's development (Mercer, 1986; Deave, Johnson, Ingram, 2008). Women are particularly vulnerable to its consequences during the postpartum period, which is a period of dynamic morphological and functional changes in a woman's body that occur six to eight weeks after childbirth (Ronin-Walknowska, 2010).

Pregnancy and childbirth have an immense impact on the body and mentality of new mothers, making them less mentally resilient and more prone to stress. Potential stressors that women experience in early maternity include the biological changes in their bodies, such as the somatically burdensome physical effort of labour and delivery, sudden hormonal changes, lactation, breast engorgement and related ailments, as well as fatigue, lack of sleep or changing

circadian rhythms. Another group of (mental) stressors covers women's emotional lability, irritability, breastfeeding stress and anxiety, as well as changes in how women experience events, and changes pertaining to their sexuality. In turn, social stressors result from the necessity to take on new responsibilities, a new role in the family, and the mothers' social, financial, and professional situation (Makara-Studzińska, Prażmowska, Iwanowicz-Palus, 2009; Krzyżanowska-Zbucka, 2010).

The emotions experienced in early maternity are also the effect of the inevitable confrontation with the applicable archetype of the woman as a mother (Alizade, 2006). The degree in which society values maternity affects how mothers are perceived by women and how other people react to them (Redshaw, Martin, 2011). Culturally, maternity is treated as a nominal trait of a woman, a condition of deeming her (socially) normal. As an expression of social ennoblement, it is, therefore, a kind of pressure that allows women to enjoy social life, support, and privileges (Budrowska, 2000). At the same time, Budrowska (2000) observes that maternity is often glorified, both in media and intergenerational discourse. This is because it is a common conception that women do not have significant difficulties in fulfilling themselves in the role of a mother due to the fact that having a child is biologically natural for them (Bielewska-Batorowicz, 2006). In line with generally understood criteria, maternity involves ensuring love and reliability, maintaining the child's trust, meeting their needs with affection, and being constantly available for them at one's own cost (Alizade, 2006). Consequently, the expectations and mental pictures that new mothers have with respect to maternity are often far removed from their real experiences. Each pregnancy and childbirth are different, as are the situations respective families find themselves in. These discrepancies affect experiences in early parenthood (Lilja, Edhborg, Nissen, 2012). Comparing one's situation after childbirth with an idealised image of maternity circulated in the media may lead to disappointment and frustration (Krzyżanowska-Zbucka, 2010). Studies show that the inadequacy of expectations with respect to real parental experiences increases depressive symptomatology and causes worse adjustment in the relationship (Harwood, Mc Lean, Durkin, 2007).

The social pressure for manifesting solely the positive emotions towards a newborn baby might render it impossible for women to express contrary and ambivalent impulses, as such are regarded as unacceptable and improper for new mothers (Trad 1990). It turns out, however, that these are common, and sometimes regarded as normative due to their frequency.

The most considerable emotional changes occur in the first few days and weeks after childbirth. In this period, the risk of serious mental disorders, and especially that of emotional disorders of various intensity, becomes several times higher (Wasielewska-Pordes, 2000; Makara-Studzińska, 2009; Krzyżanowska-Zbucka, 2010; Ronin-Walknowska, 2010). A postpartum emotional change may display itself as an innocuous and temporary depressed mood but may also amount to a permanent disorder or even mental illness.

Interest in postpartum mood disorders is nothing new. Instances of such disorders have been indicated already in antiquity, thereby conditioning the historically grounded perception of women as beings that are at the mercy of their fluctuating reproductive cycle. The 19th century saw first scientific studies devoted to postpartum mood disorders (Snow, 2010), whereas the 1980s were a decade of growing interest in women's mental health during pregnancy, childbirth, and the postpartum period (Hanley, 2009). Brockington (2004) listed over 30 different postpartum disorders. It is generally assumed that disorders related to pregnancy and childbirth are those mental changes that occur up to one year after childbirth, although such changes are sometimes diagnosed after a longer period (Hanley, 2009). Postpartum mental disorders are most often distinguished into three categories, by type, intensity, and symptom duration: baby blues (25-85%), postpartum depression (10-20%), and psychosis (0.1-0.25%) (Makara-Studzińska, 2009).

The most common and most observed disorder is baby blues, also called postpartum or maternity blues. On average, it is experienced by 80 to 85% of mothers (Wasielewska-Pordes, 2000; Henshaw, Foreman, Cox, 2004; Burt, Hendricks, 2005). The term describes a mild self-limiting affective disorder, which is, as such, a part of the woman's physiological reaction to childbirth. It is sometimes treated as the final response to the stressful situation of pregnancy and childbirth. Baby blues develops between the first and the fourteenth day after pregnancy, reaching its peak by day 3 to 7. It lasts around ten days to two weeks, and sometimes a month (Krzyżanowska-Zbucka, 2008), although some women experience baby blues for as long as three months (Jaeschke, Siwek, Dudek, 2012).

Clinically speaking, baby blues is a subdepressive mood. Epidemiological studies show that typical symptoms include: a mild depressive mood, tearfulness, emotional lability, hypochondriactic attitude, fatigue, lack of energy, sadness, nervousness, irritability, embarrassment, hypersensitivity, a feeling of exhaustion, difficulties sleeping, loss of appetite, difficulties related to concentration, memory and logical thinking, confusion, feeling of being lost, concern, incorrect interpretation of children's behaviours, and sometimes the loss of interest in the child and a feeling of hostility towards the husband. These symptoms are mild and temporary, often subsiding on their own, and it is most often the case that they do not significantly disturb the manner in which a woman functions. The symptoms may, however, worsen the quality of a woman's life. In such cases, maternity does not yield the natural and expected gratification lying in the pleasure derived from being in contact with the child or breastfeeding. Mothers feel incompetent, lost, "degenerate", and guilty of not feeling the full scope of love towards their baby (Henshaw, Foreman, Cox, 2004; Krzyżanowska-Zbucka, 2008; Makara-Studzińska, 2009).

This state does not require pharmacological treatment. What often suffices is rest, understanding, support from the closest friends and family, and a sense of security provided. Educational efforts covering women and the closest family members serve as the basis of assistance for postpartum blues. The emotional, valuing, or informational support given makes

it possible to reduce the symptoms present or, in other cases, refer mothers to a psychologist. Due to the common nature of baby blues, the relatively small intensity of the condition, and its short duration, it is often neglected by midwifes and even mothers themselves. In general, the rule is to wait the baby blues out. However, the symptoms present should not be ignored, as there is a real risk that they may worsen, leading to a full-blown depression (Krzyżanowska-Zbucka, 2008; Makara-Studzińska, 2009). It has been empirically proven that women who experience extended cases of baby blues are almost three times as likely to fall into postnatal depression (PND), with depressive symptoms being more severe and lasting longer (Lilja, Edhborg, Nissen, 2012). 20% of women with baby blues go through considerable depression within one year of childbirth (Stewart, Robertson, Phil, Dennis, Grace, Wallington, 2003), which puts at threat the process of developing attachment, and opens up the possibility that the child might not undergo proper social and emotional environment (Makara-Studzińska, 2009; Behringer, Reiner, Spangler, 2011).

Physiological pregnancy and proper child delivery in themselves do not constitute the reason for perinatal mental disorders, although various factors leading to them may arise in their course (Kaźmierczak et al., 2014). The list of obstetric risk factors includes psychiatric conditions (e.g. a personal or family history of mental disorders or alcohol/drug use), factors related to the pregnancy (the pregnancy being unwanted or endangered, traumatic experiences in past pregnancies, difficult birth or birth injury), and psychosocial factors unrelated directly to the pregnancy or childbirth (e.g. dysfunctional family relationships or a poor financial situation) (Krzyżanowska-Zbucka, 2010).

The proneness to develop baby blues is not directly related to the history of mental disorders, environmental stressors, cultural context, or the question of breastfeeding, but these may have effect on whether baby blues leads to significant depression. The largest risk group includes women who tend to cope with events passively, display difficulties in adjusting to and accepting themselves in the role of a mother, plan on returning to professional activity shortly after childbirth, and report a lack of satisfaction in their relationship with their partner (Ehlert, et al., 1990). The applicable psychological and social context determines, after all, the meaning and results of procreative efforts, including the state of the parents' mental health (Russo, Green, 2002).

Researchers have indicated that the marital relationship/partnership is one of the potentially sensitive areas that modify the process of adjusting to maternity, including the issue of perinatal mood disorders (Green, Kafetsios, 1997; Pilkington et al., 2015). This is illustrated by, among others, Jay Belsky's process model of determinants of parenting, and Christoph M. Heinicke's parenthood model (Kaźmierczak, 2015), both of which treat the quality of marriage as significant as far as functioning as a parent is concerned.

Development-wise, adjusting to changes initiated by childbirth is a sensitive period for the whole family system. Entering into parenthood is one of the most considerable challenges, as childbirth may strongly impact the family dynamic and family ties (Ahlborg, Strandmark,

2006). It is currently assumed that the relationship between the quality of parenthood and that of marriage is circular in nature. The manners in which the man and woman function in both subsystems at the same time are interdependent, and affect the development of the child. Satisfying relations between spouses serve as the foundation for the family, and are a necessary resource in coping with the requirements of parenthood (Plopa, 2005, 2011; Bakiera, 2006).

How parents cope with the new situation is directly related to mutual attachment, treated as one of the psychological dimensions that describe the subjective assessment of a marriage. Attachment is defined as a state where a person experiences a strong desire to remain close in contact with another, specific individual (Plopa, 2005). Referring to John Bowlby's theory (2007), we have to assume that the ability to create close relationships and emotional ties lies in the nature of every human being, and attachment in childhood is, in itself, a matrix of ties manifest in adulthood (Rostowski, 2003; Plopa, 2005; Józefik, Iniewicz, 2008; Liberska, Suwalska, 2011). The subject of attachment in adults are, most of all, spouses. Attachment displays itself most often when adults experience intense emotions and stress (Marchwicki, 2004), childbirth being an example of such a situation.

Cindy Hazan and Phillip Shaver (1987) (Rostowski, 2003; Liberska, Suwalska, 2011) observed analogies between attachment relations in childhood and adulthood, determining relations in romantic relationships that are key for attachment theory. Focusing on the emotional and behavioural aspect, like Ainsworth, they distinguished the following attachment styles: secure, anxious-ambivalent, and avoidant.

From the perspective of changes initiated by childbirth, it is assumed that the secure attachment style allows treating the relationship between the partners as a resource that facilitates adjusting oneself to the applicable critical event. This adjustment is easier when the relationship is based on the feeling of security, trust and self-confidence, when it is characterised by a high degree of openness, affection, good communication and satisfaction derived from the relationship with the partner, who is seen as available and supportive in difficult and highly significant situations. In turn, as can be assumed, this adjustment is much more difficult if the relationship is based on the lack of security, as is the case with the anxious-ambivalent attachment style. This style is characterised by worrying about such matters as sustaining the relationship and losing the partner. Experiencing an excessive need to be close to the partner causes the individual to idealise their environment and set unrealistic expectations. In situations where they are distant from their partner, they excessively experience jealousy, suspicion, anger, sadness, and fear. They display strong and ambivalent tendencies for controlling their own emotions, and, at the same time, exaggeratedly engage themselves in the relationship. For them, love is obsessive in nature. It is characterised by expectations of unity and unconditional reciprocity. Difficulties in adjustment to parenthood may also be expected where the relationship is based on the lack of tendency to develop close and open relationships with the partner, which is what characterises the avoidant attachment style. The source of mental comfort in this style is a clear delineation of boundaries (also with respect

to intimacy and emotionality), the lack of which causes irritation and embarrassment. Distance in the relationship is reflected by the need to have rational and controlled communication, deprived of spontaneity and openness to intimate dialogue (Plopa, 2005, 2005a, 2008, 2014; Łoś, 2010; Byra, Parchomiuk, 2015).

Based on the conclusions reached in the studies and the theoretical assumptions, we may therefore assume that there is a significant relation between the quality of marriage and how women adjust themselves to the changes initiated by childbirth in the very earliest phase of maternity (i.e. the postpartum period). Aggravation of baby blues symptoms is considered here as an indicator of adjustment to changes (dependent variable), while the attachment style in marriage is the indicator of marriage quality (independent variable). Therefore, the aim of this study is to prove the relationship between the worsening of baby blues symptoms and the various attachment styles in marriage.

2. Methodology of own research and results

75 women in a marital relationship (N = 61; 81.3%) or partnership (N = 14; 18.7%) with their most recent (only or subsequent) child born almost four months before the study (*M* = 3.97 months, *Min* = 0.40; *Max* = 6.00, *SD* = 1.66) took part in the research. These were mothers of either one child (N= 48; 64%) or from two to five children (N = 27; 36%). The vast majority of them (N = 67; 89.3%) planned their most recent pregnancy and considered their wellbeing during pregnancy to have been good or average (N = 72; 94.7%), giving a similar assessment with respect to labour and delivery (N = 63; 84%). The average age in the test sample was *M* = 29.6 years (*Min* = 22.00; *Max* = 42.00, *SD* = 4.10). The study participants were well educated, with three in four (N = 57) having obtained a tertiary degree. The women were inhabitants of cities (N = 59; 78.7%) and rural areas (N = 16; 21.3%) of the Upper Silesian Urban Area, which was the area where the study was conducted.

The scientific tools used were for the purposes of this research were the Questionnaire of Attachment Styles (*Kwestionariusz Stylów Przywiązaniowych* or *KSP*) as devised by Mieczysław Plopa (2005, 2008), and the Questionnaire on the Aggravation of Baby Blues Symptoms (*Kwestionariusz Nasilenia Objawów Baby blues* or *KNOBB*). KSP consists of 24 statements which include subscales (8 items each) for the respective three attachment styles (secure, anxious-ambivalent, and avoidant). The reliability of the questionnaire was determined by measuring its internal consistency with Cronbach's alpha, which amounted to 0.729-0.845, depending on the attachment style. *KNOBB*, in turn, consists of 36 self-assessment statements which include subscales (12 items each) for three areas: the emotional sphere, the social sphere, and maternal role competence. These statements describe feelings, attitudes and behaviours of mothers present within a few weeks after delivery. The reliability of the questionnaire was

determined by measuring its internal consistency with Cronbach's alpha, which amounted to 0.915-0.923, depending on the areas of baby blues symptoms, and to 0.963 for the general score. A personal questionnaire was used to obtain details on the social, demographic, and procreative situation of the participating mothers.

IBM SPSS Statistic 22 was used for statistical calculations. To verify whether the variables are characterised by normal distribution, the Kolmogorov–Smirnov test was carried out. The results show that secure and anxious-ambivalent attachment styles have normal distribution as variables (from $p < 0.060$ for the secure style to $p < 0.064$ for anxious-ambivalent), whereas the other variables are not characterised by normal distribution. Because of this, further analyses were carried out using nonparametric statistical methods, and the Spearman's rank correlation test was applied. All results with a bilateral significance of $p < 0.05$ were deemed statistically important. Those in the range of $p < 0.051$ to $p < 0.09$ were considered as being within the statistical trend.

3. Research results and discussion on the results

The results of this research are presented in the Tables below.

Table 1 contains results illustrating the relation between the secure attachment style and the worsening of baby blues symptoms.

Table 1.
The relation between the secure attachment style and the aggravation of baby blues symptoms (N = 75)

Worsening of baby blues symptoms	**r_s**	**p**
Emotional sphere	-.256	.027
Social sphere	-.486	.000
Maternal role competence	.227	.050
General score	-.348	.002

A statistically significant relation between the secure attachment style in marriage and the aggravation of baby blues symptoms has been evidenced. There is a low correlation between the attachment style and symptoms regarding the emotional sphere and maternal role competence, as well as for the general score. A medium correlation with respect to social (relationship-related) sphere can be observed.

Table 2 contains results illustrating the relation between the anxious-ambivalent attachment style and the worsening of baby blues symptoms.

Table 2.
The relation between the anxious-ambivalent attachment style and the aggravation of baby blues symptoms (N = 75)

Worsening of baby blues symptoms	**r_s**	**p**
Emotional sphere	.468	.000
Social sphere	.629	.000
Maternal role competence	.412	.000
General score	.553	.000

A statistically significant relation between the anxious-ambivalent attachment style in marriage and the aggravation of baby blues symptoms has been evidenced. There is a moderate correlation between the attachment style and symptoms regarding the emotional sphere and maternal role competence, as well as for the general score. A high correlation with respect to social (relationship-related) sphere can be observed.

Table 3 contains results illustrating the relation between the avoidant attachment style and the worsening of baby blues symptoms.

Table 3.
The relation between the avoidant attachment style and the aggravation of baby blues symptoms (N = 75)

Worsening of baby blues symptoms	**r_s**	**p**
Emotional sphere	.445	.000
Social sphere	.653	.000
Maternal role competence	.410	.000
General score	.540	.000

A statistically significant relation between the avoidant attachment style in marriage and the aggravation of baby blues symptoms has been evidenced. There is a moderate correlation between the attachment style and symptoms regarding the emotional sphere and maternal role competence, as well as for the general score. A high correlation with respect to social (relationship-related) sphere can be observed.

The results obtained confirm the correlation between the quality of marriage and the worsening of baby blues symptoms, a correlation made by the women participating in the study through a subjective assessment. In line with the assumptions, it has been shown that women with high scores for the secure attachment style experience baby blues symptoms in a less aggravated way than those whose attachment style is non-secure. For them, high scores for the anxious-ambivalent and avoidant attachment styles are positively correlated to a high degree of aggravation of baby blues symptoms in all three highlighted aspects of functioning (i.e. the emotional sphere, the social sphere, and maternal role competence) as well as with respect to the general score. Thereby, the value of marriage as a resource that makes it easier to adjust to changes caused by childbirth has been confirmed. The new mothers' experiences of postpartum blues symptoms are lesser in relationships that are based on the feeling of security and satisfaction derived from the partner being available, especially in situations which are seen

as fundamental and difficult. Mutual openness, affection, and support lower the tension, facilitating the adjustment to changes that occur. The lack of security that is common for the other (anxious-ambivalent and avoidant) attachment styles enables, in turn, the aggravation of baby blues symptoms.

The Results of research available in the literature show links between attachment styles and ways of coping in difficult situations. Adults who display a secure attachment style have the competences to cope with emotional difficulties more efficiently. Especially in women, the activation of this attachment style manifests itself in having more thoughts about intimacy and love, which builds up the feeling of autonomy and independence, as well as lowers stress levels. In turn, the anxious-ambivalent attachment style involves a passive way of coping with stress, which is concentrated on emotions and the internal experience of distress. This manifests itself in negative ruminations, emotions, and memories. This attitude fosters the conviction of not being accepted by others, and intensifies the pressure related to the emotions felt (Mikulincer, Orbach, 1995). Anxiety related to abandonment stops the development of autonomy and leads to a dependent attitude. Consequently, the marital relationship and family do not constitute a source of satisfaction and self-esteem. This makes it more difficult to take on and fulfil developmental tasks (Kozińska, 2013). Women with the avoidant attachment style display a mechanism of compulsive self-reliance. They emphasise their autonomy at the cost of rejecting support and relationships based on closeness and love. They tend to stifle and force out pessimistic thoughts, depreciate the role of the stress source, and inhibit the expression of bleak experiences. At the same time, they present a heightened level of anxiety and a considerable feeling of loneliness (Kozińska, 2013). They do not have a non-ambiguous and consistent way of coping, particularly with respect to negative emotions and stress. They may display ambivalence towards others (aggressiveness or withdrawal), and are especially prone to disorders and dissociation (Żechowski, Namysłowska, 2008). Those who are characterised by a non-secure attachment style tend to process information negatively (i.e. read more negative than positive signs, and expect more negative social interactions) (Dykas, Cassidy, 2011). This seems to explain why they tend to experience baby blues symptoms, especially with respect to their emotions and the way they function in a relationship.

Among the three areas distinguished, in which baby blues symptoms become manifest, relatively the strongest links have been observed between both the secure and the non-secure attachment styles and the social (relationship-related) sphere, with correlations being moderate and high, correspondingly. This sphere describes the experiences of the new mother in relationships with the people closest to her, and especially with her partner, the father of the child. Contrary to women with a secure attachment style, those with a non-secure (i.e. anxious-ambivalent or avoidant) style view their partners as unsupportive and unwilling to understand and empathise with them to a larger degree. In their perception, these partners are responsible for their malaise, and are insufficiently engaged in nursing and caring for the child. Mutual relations are seen as strained, with quarrels and misunderstanding being more likely to

arise. There is distance and lack of interest regarding intimate relations, and a sense of lower physical attraction. The non-secure attachment style is also correlated with the aggravation of those symptoms that pertain to the mothers' relationships with other people from their closest environment. The mothers in question are more irritated by visits from guests and interferences in childcare on the part of their family members (e.g. their mother or mother-in-law). They also feel not understood by their closest friends and family members, and overburdened by domestic responsibilities. Apart from the social sphere, statistically significant correlations for all three attachment styles have also been observed with respect to the emotional sphere and maternal role competence. It has been shown that non-secure attachment styles cause certain symptoms to manifest themselves in a more aggravated manner. These include: lack of optimism and hope for the future, withdrawal into oneself, feeling of loneliness, sadness and blues, apathy and indifference, concern and anxiety, tearfulness, fear, unsubstantiated panic, tiredness and fatigue caused by day-to-day responsibilities, irritability, emotional lability, and a lack of control over one's life. In turn, with respect to maternal role competence, women with an anxious-ambivalent or avoidant attachment style indicated greater difficulties in adjusting to the role of the mother. The participants experienced helplessness and doubt regarding their ability to nurse and care for their baby. They also had lower self-esteem, and a lower perception of their resources and competences. They miss the life before pregnancy, show a lack of the expected happiness and satisfaction derived from taking on a maternal role, and experience difficulties in establishing contact with the child, as well as reflecting and understanding their needs and emotions. They are also more worried about their child's wellbeing – this being connected to the feeling of guilt that they are not sufficiently good as a mother, not as good a mother as others.

Researchers who have preoccupied themselves with attachment show that the attachment style has an impact on the perception of parenthood and on satisfaction derived from it (np. Lubiewska, Derbis, 2016). Women with an anxious attachment style derive less satisfaction from being a parent (Kohn et al., 2012). Both during pregnancy and within one year from giving birth, they experience considerable stress and worry about their child, as do women with an avoidant attachment style, who also see high parental stress (Trillingsgaard et al., 2011). Women with a developed secure style have it easier to accept the fact that they become mothers and to adjust to changes arising from that role (Chrzan-Dętkoś, Łockiewicz, 2015). There is furthermore evidence confirming a neurobiological basis that differentiates women and their relations with their child by attachment style (Zdolska-Wawrzkiewicz, Bidzan, Chrzan-Dętkoś, 2018).

Researchers are more and more often taking interest in the subject of attachment in reference to procreation, also in the context of romantic relations (Zdolska-Wawrzkiewicz, Bidzan, Chrzan-Dętkoś, 2018). The results presented in this article point to the significance of the relationship with the life partner (father of the child) as an adjustment resource. Women's perception of their relationship as based on security is a factor that facilitates

adjustment to parenthood. Considering the context of the quality of marriage is incredibly important in the early stages of transition to maternity. This is because the partner plays a significant role in generating and mitigating postpartum disorders. The quality of the relationship may therefore be treated as a factor that allows predicting baby blues symptoms. As indicated in reference books, the intensity and duration of those symptoms is key for the emerging relationship between the mother and the newborn, and determines both the presence of postpartum depression and (*vice versa*) the quality of the relationship (Chrzan-Dętkoś, Kalita, 2019; Bakiera, 2006).

The knowledge gained may serve for practitioners who develop informational, preventive and intervention programs for women who experience difficulties in adjusting to parenthood, pointing to areas of the relationship with the partner that require more attention and potential changes. At the same time, it shows that early maternity is a time where women give themselves the right to emotional ambivalence, and do not try to build their own image based solely on an idealised picture of the maternal role, free of any weaknesses or flaws.

The problem of postpartum disorders fits into the general category of mental health. Dealing with it is important from the standpoint of proper diagnosis and treatment. The basis for potential efforts lies, however, in proper education that raises social awareness of how common the difficulties experienced are, and in the search for factors that are important when it comes to women's adjustment to the maternal role.

References

1. Ahlborg, T., and Strandmark, M. (2006). Factors influencing the quality of intimate relationships six months after delivery-first-time parents' own views and coping strategies. *Journal of Psychosomatic Obstetrics & Gynecology,* 27, 163-172. doi: 10.1080/01674820500463389.
2. Alizade, M. (2006). *Motherhood in the Twenty-First Century*. London: Karnac Books.
3. Bakiera, L. (2006). *Rodzina z perspektywy socjologicznej i psychologicznej: ciągłość i zmiana.* Poznań: Wydawnictwo Naukowe UAM.
4. Bakiera, L. (2013). *Zaangażowane rodzicielstwo a autokreacyjny aspekt rozwoju dorosłych*. Warszawa: Difin.
5. Bartosz, B. (2002). *Doświadczenie macierzyństwa. Analiza narracji autobiograficznych*. Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.
6. Belsky, J., and Kelly, J. (1994). *The transition to parenthood: how a first child changes a marriage*; *based on a landmark study*. London: Vermillion.

7. Belsky, J., and Rovine, M. (1990). Patterns of Marital Change across the Transition to Parenthood: Pregnancy to Three Years Postpartum. *Journal of Marriage and Family*, *52(1),* 5-19. doi: 10.2307/352833.
8. Bielawska-Batorowicz, E. (2006). *Psychologiczne aspekty prokreacji*. Katowice: Wydawnictwo „Śląsk".
9. Bowlby, J. (2007). *Przywiązanie*. Warszawa: PWN.
10. Brockington, I. (2004). Postpartum psychiatric disorders. *Lancet*, *363(9405),* 303-310. doi: 10.1016/S0140-6736(03)15390-1.
11. Budrowska, B. (2000). *Macierzyństwo jako punkt zwrotny w życiu kobiety*. Wrocław: Monografie FNP.
12. Burt, V.K., and Hendrick, V.C. (2005). *Clinical manual of women's mental health.* Washington: American Psychiatric Publishing.
13. Byra, S., and Parchomiuk, M. (2015). Przywiązanie a satysfakcja małżeńska współmałżonków osób z niepełnosprawnością ruchową. *Studia nad Rodziną, 37,* 199-220. doi: 10.21697/snr.2015.37.2.10.
14. Chrzan-Dętkoś, M., and Kalita, L. (2019). Rola wczesnej interwencji psychologicznej w profilaktyce i terapii depresji poporodowej. *Psychoterapia*, *1(188),* 47-61. doi: 10.12740/PT/106445.
15. Chrzan-Dętkoś, M., and Łockiewicz, M. (2015). Maternal romantic attachment, and antenataland postnatal mother-infant attachment in a sample of Polish women. *European Journal of Developmental Psychology*, *12(4),* 429-442. doi: 10.1080/174056 29.2015.1036024.
16. Cowan, C.P., and Cowan, P.A. (2000). *When partners become parents: The big life change for couples*. New York: Harper Collins.
17. Deave, T., Johnson, D., and Ingram, J. (2008). Transition to parenthood: the needs of parents in pregnancy and early parenthood. *BMC Pregnancy and Childbirth,* https://doi.org/10.1186/1471-2393-8-30.
18. Dykas, M.J., and Cassidy, J. (2011). Attachment and the processing of social information across the life span: theory and evidence. *Psychological Bulletin*, *137(1),* 19-46. https://doi.org/10.1037/a0021367.
19. Ehlert, U., Patalla, U., Kirschbaum, C., Piedmont, E., and Hellhammer, D.H. (1990). Postpartu blues: salivary cortisol and psychological factors. *Journal of Psychosomatic Research*, *34(3),* 319-325. https://doi.org/10.1016/0022-3999(90)90088-L.
20. Fillo, J., Simpson, J.A., Rholes, W.S., and Kohn, J.L. (2015). Dads doing diapers: Individual and relational outcomes associated with the division of childcare across the transition to parenthood. *Journal of Personality and Social Psychology*, *108(2),* 298-316. https://doi.org/10.1037/a0038572.

21. Green, J.M., and Kafetsios, K. (1997). Positive experiences of early motherhood: Predictive variables from a longitudinal study. *Journal of Reproductive and Infant Psychology, 15*(2), 141-157. https://doi.org/10.1080/02646839708404540.
22. Gurba, E. (2003). Wczesna dorosłość. In: B. Harwas-Napierała, and J. Trempała (Eds.), *Psychologia rozwoju człowieka* (pp. 202-233). Warszawa: PWN.
23. Guttmann, J., and Lazar, A. (2004). Criteria for marital satisfaction: does having a child make a difference? *Journal of Reproductive and Infant Psychology, 22*(3), 147-156. https://doi.org/10.1080/02646830410001723733.
24. Hanley, J. (2009). *Zaburzenia psychiczne w ciąży i połogu*. Wrocław: Urban&Urban.
25. Harwood, K., Mc Lean, N., and Durkin, K. (2007). First-time mothers' expectations of parenthood: What happens when optimistic expectations are not matched by later experiences*? Developmental Psychology*, *43(1),* 1-12. doi: 10.1037/0012-1649.43.1.1.
26. Henshaw, C., Foreman, D., and Cox, J. (2004). Postnatal blues: a risk factor for postnatal depression. *Journal of Psychosomatic Obstetrics & Gynecology*, *25(3-4),* 267-272. doi: 10.1080/01674820400024414.
27. Jaeschke, R., Siwek, M., and Dudek, D. (2012). Poporodowe zaburzenia nastroju. *Neuropsychiatria i Neuropsychologia*, *7(3),* 113-121.
28. Javadifar, N., Majlesi, F., Nikbakht, A., Nedjat, S., and Montazeri, A. (2016). Journey to motherhood in the first year after child birth. *Journal of Family & Reproductive Health, 10(3),* 146-153.
29. Józefik, B., and Iniewicz, G. (2008). *Koncepcja przywiązania od teorii do praktyki klinicznej*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
30. Kaźmierczak, M. (2015). *Oblicza empatii w procesie adaptacji do rodzicielstwa*. Warszawa: SCHOLAR.
31. Kaźmierczak, M., Gierszewska, M., Gebuza, G., Mieczkowska, E., and Banaszkiewicz, M. (2014). Analiza wybranych zmiennych determinujących występowanie zaburzeń nastroju po porodzie. *Medycyna Ogólna i Nauki o Zdrowiu*, *20(4),* 390-395.
32. Kohn, J.L., Rholes, S.W., Simpson, J.A., Martin, A.M., Tran, S., and Wilson, C.L. (2012). Changes in marital satisfaction across the transition to parenthood: The role of adult attachment orientations. *Personality and Social Psychology Bulletin*, *38(11),* 1506-1522. doi: 10.1177/0146167212454548.
33. Kornas-Biela, D. (2009). *Pedagogika prenatalna, nowy obszar nauk o wychowaniu.* Lublin: Wydawnictwo KUL.
34. Kozińska, B. (2013). Koncepcja rodzicielskiego coachingu regulacji emocji w świetle teorii przywiązania. *Ruch Pedagogiczny, 4,* 39-53.
35. Krzyżanowska-Zbucka, J. (2008). *Problemy emocjonalne kobiet w okresie około-porodowym.* Warszawa: Fundacja Rodzić po Ludzku.
36. KrzyżanowskaZbucka, J. (2010). Okołoporodowe zaburzenia psychiczne a krzywdzenie dzieci. *Dziecko Krzywdzone*, *3(32),* 43-53.

37. Kubacka-Jasiecka, D. (2010). *Interwencja kryzysowa. Pomoc w kryzysach psychologicznych.* Warszawa: Wydawnictwa Akademickie i Profesjonalne.
38. Kuryś, K. (2010). *Urodzenie pierwszego dziecka jako wydarzenie krytyczne w życiu kobiet i mężczyzn.* Kraków: Impuls.
39. Liberska, H., and Suwalska, D. (2011). Style przywiązania a relacje partnerskie we wczesnej dorosłości. *Psychologia Rozwojowa*, *16(1),* 25-39.
40. Lilja, G., Edhborg, M., and Nissen, E. (2012). Depressive mood in women at childbirth predicts their mood and relationship with infant and partner during the first year postpartum. *Scandinavian Journal of Caring, 26(2),* 245-253. doi: 10.1111/j.1471-6712.2011.00925.x.
41. Łoś, Z. (2010). Dyskusyjnie o klasyfikacji i pomiarze wzorców przywiązania. *Psychologia Rozwojowa, 15(2),* 61-75.
42. Lubiewska, K., and Derbis, R. (2016). Relations between parenting stress, attachment, and life satisfaction in mothers of adolescent children. *Polish Journal of Applied Psychology*, *14,* 87-112.
43. Makara-Studzińska, M. (2009). Zaburzenia psychiczne u kobiet w okresie okołoporodowym. In: M. Makara-Studzińska, and G. Iwanowicz-Palus (Eds.), *Psychologia w położnictwie i ginekologii* (pp. 206-226). Warszawa: PZWL.
44. Marchwicki, P. (2004). Style przywiązania a postawy rodzicielskie. Doniesienie z badań. *Roczniki Psychologiczne*, *7(2),* 81-103.
45. Matuszewska, M. (2003). Funkcjonowanie w rolach rodzicielskich jako źródło rozwoju młodych dorosłych. In: B. Harwas-Napierała (Ed.), *Rodzina a rozwój człowieka dorosłego* (pp. 25-46). Poznań: Wydawnictwo Naukowe UAM.
46. Mercer, R.T. (1986). *First-time Motherhood: Experiences from Teens to Forties*. New York: Springer.
47. Mikulincer, M., and Orbach, I. (1995). Attachment styles and repressive defensiveness: The accessibility and architecture of affectivememories. *Journal of Personality and Social Psychology*, *68,* 917-925. https://doi.org/10.1037/0022-3514.68.5.917.
48. Notman, M.T., and Lester, E.P. (1988). Pregnancy: Theoretical considerations. *Psychoanalytic Inquiry*, *8,* 139-159. https://doi.org/10.1080/07351698809533715.
49. Nyström, K., and Ohrling, K. (2004). Parenthood experiences during the child's first year: literature review. *Journal of Advanced Nursing*, *46(3),* 319-30. doi: 10.1111/j.1365-2648.2004.02991.x.
50. Ostoja-Zawadzka, K. (1999). Cykl życia rodzinnego. In: B. de Barbaro (Ed.), *Wprowadzenie do systemowego rozumienia rodziny* (pp. 18-30). Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
51. Pancer, S.M. (2000). Thinking ahead: Complexity of expectations and the transition to parenthood. *Journal of Personality*, *68(2),* 253-280. doi: 10.1111/1467-6494.00097.
52. Pilkington, P.D., Milne, L.C., Cairns, K.E., Lewis, J., and Whelan, T.A. (2015). Modifiable partner factors associated with perinatal depression and anxiety: A systematic review and

meta-analysis. *Journal of Affective Disorders*, *178,* 165-180. doi: 10.1016/ j.jad.2015.02.023.

53. Plopa, M. (2005). *Więzi w małżeństwie i rodzinie. Metody badań*. Kraków: Impuls.
54. Plopa, M. (2005a). *Psychologia rodziny: teoria i badania*. Kraków: Impuls.
55. Plopa, M. (2008). *Kwestionariusz Stylów Przywiązaniowych (KSP). Podręcznik*. Warszawa: Vizja Press&IT.
56. Plopa, M. (2011). Rodzicielstwo jako wyzwanie dla małżeństwa: perspektywa teorii systemowej. In: H. Liberska and A. Malina (Eds.), *Wybrane problemy współczesnych małżeństw i rodzin* (pp. 15-41). Warszawa: Difin S.A.
57. Plopa, M. (2014). Więzi w małżeństwie i rodzinie w perspektywie teorii przywiązania. In: I. Janicka, and H. Liberska (Eds.), *Psychologia rodziny* (pp. 141-166). Warszawa: PWN.
58. Redshaw, M., and Martin, C. (2011). Motherhood: a natural progression and a major transition. *Journal of Reproductive and Infant Psychology*, *29,* 305-307. https://doi.org/10.1080/02646838.2011.639510.
59. Ronin-Walknowska, E. (2010). *Połóg.* In: G.H. Bręborowicz (Ed.), *Położnictwo i ginekologia* (pp. 419-433). Warszawa: PZWL.
60. Rostowski, J. (2003). Style przywiązania a kształtowanie się związków interpersonalnych w rodzinie. In: I. Janicka, and T. Rostowska (Eds.), *Psychologia w służbie rodziny* (pp. 19-31). Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
61. Russo, N.F., and Green, B.L. (2002). Kobiety a zdrowie psychiczne. In: B. Wojciszke (Ed.), *Kobiety i mężczyźni: odmienne spojrzenie na różnice* (pp. 303-353). Gdańsk: GWP.
62. Snow, S. (2010). Zdrowie psychiczne w okresie okołoporodowym. In: J. Edwins (Ed.), *Praktyka zawodowa. Biblioteka Położnej* (pp. 187- 208). Warszawa: PZWL.
63. Sobolewski, A., Strelau, J., and Zawadzki, B. (1999). Kwestionariusz Zmian Życiowych (KZŻ): Polska adaptacja kwestionariusza „Recent Life Changes Questionnaire" (RLCQ) R.H. Rahe'a. *Przegląd Psychologiczny, 42(3),* 27-49.
64. Sousa e Silva, C., and Carneiro, M. (2014). Adaptation to parenthood: the birth of the first child. *Revista de Enfermagem Referencia, 4(3),* 17-26. doi: 10.12707/RIII13143.
65. Stewart, D.E., Robertson, E., Phil, M., Dennis, C.L., Grace, S.L., and Wallington, T. (2003). *Postpartum depression: literature review of risk factors and interventions*. Toronto, Canada: University Health Network Women's Health Program. http://www.who.int/ mental_health/prevention/suicide/lit_review_postpartum_depression.pdf.
66. Trad, P.V. (1990). On becoming a mother: In the throes of developmental transformation. *Psychoanalytic Psychology, 7(3),* 341-361. https://doi.org/10.1037/h0079217.
67. Trempała, J. (2011). *Psychologia rozwoju człowieka*. Poznań: Wydawnictwo Naukowe UAM.
68. Trillingsgaard, T., Elklit, A., Shevlin, M., and Maimburg, R.D. (2011). Adult attachment at thetransition to motherhood: Predicting worry, health care utility and relationship

functioning. *Journal of Reproductive and Infant Psychology*, *29(4),* 354-363. https://doi.org/10.1080/02646838.2011.611937.

69. Turner, J.S., and Helms, D.B. (1999). *Rozwój człowieka*. Warszawa: WSziP.
70. Wasielewska-Pordes, M. (2000). *Depresja porodowa u kobiet*. Kraków: Radamsa.
71. Zdolska-Wawrzkiewicz, A., Bidzan, M., and Chrzan-Dętkoś, M. (2018). Więź z własną matką a stawanie się matką– zagadnienia teoretyczne. *Polskie Forum Psychologiczne*, *23(3),* 557-571.
72. Żechowski, C., and Namysłowska, I. (2010). Teoria przywiązania a rozwój zaburzeń psychicznych. In: B. Józefik, and G. Iniewicz (Eds.), *Koncepcja przywiązania. Od teorii do praktyki kliniczne* (pp. 52-74). Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

METRISABILITY OF MANAGING OF STREAM-SYSTEMIC PROCESSES

Radosław DROZD[1*], Jan PIWNIK[2]

[1] Gdansk University of Technology, Department of Industrial Management; rdrozd@zie.pg.gda.pl, ORCID: 0000-0003-1797-4488
[2] Centralny Ośrodek Badawczo Rozwojowy Aparatury Badawczej i Dydaktycznej COBRABID Sp. z o.o.; piwnik@cobrabid.pl
* Correspondence author

Purpose: This paper pursuits the possibilities of applying a mathematical description to the management of a manufacturing process, based on a stream-systemic model.
Design/methodology/approach: To achieve the planned goal, in order to properly describe the manufacturing system management, six process stream functions were introduced. Non-dimensional flows of these functions in time can be empirically defined during the manufacturing process. They are interpreted as non-dimensional expenses. Maximum values for these functions in properly-managed processes equal one. Also, a global management function was introduced, being a sum of areas of circle sections delineated by functions of the streams and their respective weights. Stream weights in the manufacturing process signify the processes' roles and importance in the system. The paper also provides a vector representation of a manufacturing process as a sum of stream vectors with their associated weights.
Findings: The global function of process management and the process vector provide the possibility to optimize the process, allow for control, and are closely associated with final product quality. The structure of the suggested management functions allows for optimization and process control. It is also strictly associated with manufacturing quality. The presented metrizability method of manufacturing process management can also be applied to the analysis of non-metrisable product manufacturing.
Originality/value: The article may be a recommendation for manufacturing companies. The structure of the suggested management functions allows for manufacturing companies optimization, process control and manufacturing quality.

Keywords: metrizability, stream-systemic processes.

Category of the paper: Research paper.

1. Introduction

Both in Poland and on the international level, no subject literature exists so far which would be taking a complete view on the metrisability of managing stream-systemic processes (Sikora, Strada, 2005). The notion of metrisability of managing stream-systemic processes is new in itself, and may be found in subject literature on that part of the manufacturing process which is responsible for the stream outlays in the researched manufacturing process (Świderski, Waszkiewicz, Robak, 2010).

The important factors bearing major impact on the metrisability of managing stream-systemic processes in product manufacturing are:

a) raw material quality parametres and costs (Toko, 2000),
b) precision and control of dosing ingredients (Skolik, 2011),
c) technology recipe and composition of substitutes (Wiśniewska, Malinowski, 2011),
d) repetitiveneness of the design-specific features of products within the manufacturing process (Stewart, Feinle-Bisset, Golding, Delahunty, Clifton, Keast, 2010),
e) high reliability of the technological installation (Gawęcki, Baryłko-Pikielna, 2007).

Among the abovementioned factors which are closely related to metrisability, the quality of the final product is essential (Holm, Brun, 2000). As an example, let us take metrisability of product manufacture quality, which may be defined as a degree of healthiness, sensory attractiveness, and accessibility within a wide consumer and social scope (Dillon, Goldstein, 2000). This degree will be valid only within the boundaries of capabilities offered by the raw materials, technology, and price (Balon, Dziadkowiec, 2015).

Designing and delivering of manufacturing processes (Borkowski, Ulewicz, 2009), necessitates deciding upon the algorithms (Pająk, 2006) within the whole manufacturing process (Durlik, 2007).

A rational algorithm, i.e. a recipe for the shape of the process, order of steps (organisational, technological, and other) (Biazzo, Bemardi, 2003) is possible if, and only if, a mathematical model (Zwolińska,2016) exists for the part of the operator that acts on the streams within a system, which is responsible for the interconnections of stream expenses at specific times). This is the main of this paper. Therefore, the below mathematic equations for management are based on widely understood systems engineering (Zwolińska, 2016) with the natural consequences of relativism, complexity, and the resultant pragmatism and limitations. For this reason, we further discuss the metrizability (Ahire, Dreyfus, 2000) of the part of the system which is responsible for the distribution of stream expenses after a specific concept for manufacture has been adopted (Mehrabi, Ulsoy, Koren, 2009). Figure 1 presents the macroscopic sequence of steps in the system.

The acceptance of a concept entails defining detailed procedures for the order of mutual relations of the system components (Kleniewski, 2004); these ought to take into account the structure, technology, and manufacturing process organization (Romanowska, Trocki, 2004).

The below mathematical models for the $\hat{O}_{DS.}$ management operator (cf. Figure 1) can be applied to the manufacture of physical goods as well as production of non-material goods. Differences in management will only be related to the dominance of certain streams over others, with the resultant configuration of interconnections (Drozd, Piwnik, 2019).

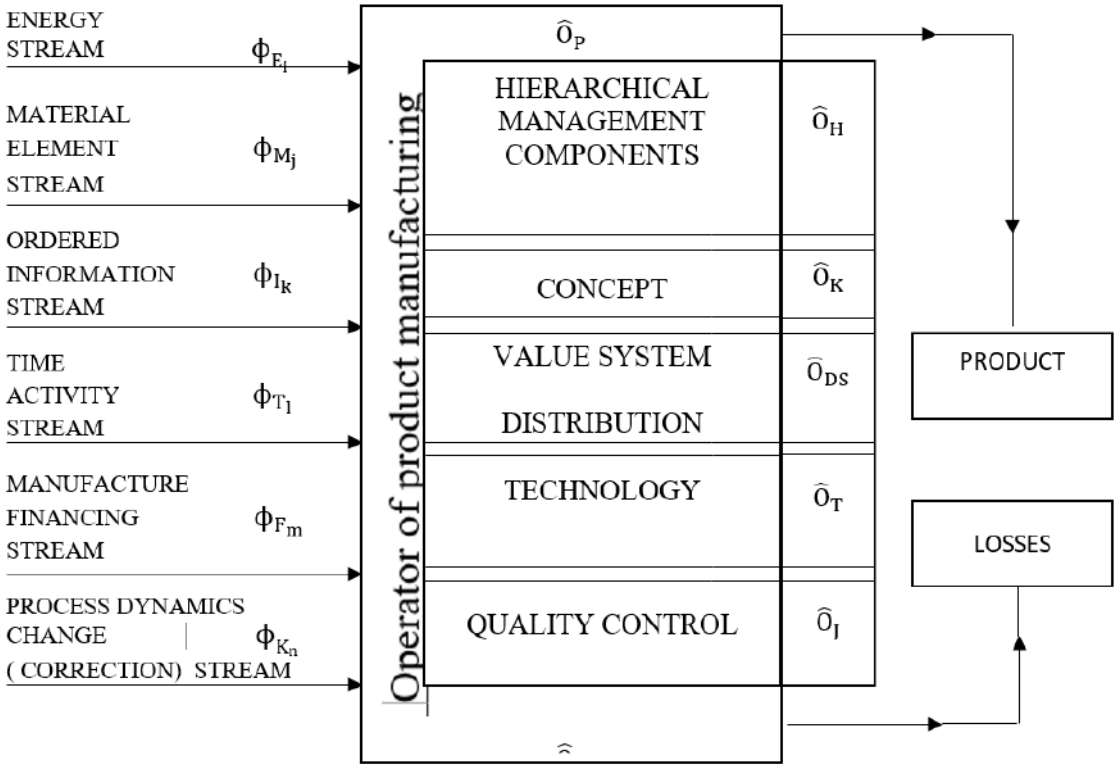


Figure 1. $\hat{O}_P$ manufacturing structure $\hat{O}_P = \hat{O}_H + \hat{O}_K + \hat{O}_{DS} + \hat{O}_T + \hat{O}_J$. Source: own study.

Subject literature as well as industry practice lack ideas for management that apply a mathematical representation to a combination of process streams. The below mathematical models of the management process allow the assessment of such representation, both in a scalar and vector manner, which in turn enables mathematical description of the interconnections between management and manufacturing quality (Drozd, Piwnik, 2019).

2. Structure of technological (manufacturing) process

A general overview of the technological (manufacturing) system analysed in this article can be seen in Figure 1.

The manufacturing operator's $\widehat{O}_P$ activity area is supplied by six streams, "supply inputs". The ϕ_{E_i} energy stream is a necessary i-element set converting energy and is expressed by the amount of energy in time. Therefore, it is a set of elements that convert various types of energy (mechanical, electrical, heat, chemical, etc.). All the elements are described with kilowatt amounts.

The ϕ_{M_j} material stream is a j-element set that guarantees complete support of materials to deliver a project. These will be raw materials, machines, installations, and other objects. It is expressed by the number of elements in time.

The ϕ_{I_k} ordered information stream is a k-element set of specialist knowledge. These are instructions, guidelines, orders, analytical formulas, heuristic elements, and other segments of modern knowledge that translate to the highest efficiency of the system. This stream is described using amounts of information in time.

The ϕ_{T_l} time activity stream is an l-element set of the sequence of activity order relations between streams in time. The elements of this set also define timespans for individual operations and tasks as well as those of other events that result in the delivery of ϕ_{T_l} concept and design stream assumptions. The stream is quantified by a number of ordered operations in time.

The ϕ_{F_m} manufacture financing stream is an m-element stream describing the cost of individual stream relations, tide trends, and other costs of reliable system operation. The stream is quantified by sums of expenses in time.

The ϕ_{K_n} correction stream is an n-element set containing forced and unexpected changes to the defined concept of manufacturing process dynamics. It is characterised by high sensitivity to the correct flow of the five abovementioned streams. The elements of this stream are corrections of faulty relations and those of the interconnections between the elements of the (Drozd, 2019):

- ϕ_{E_i} energy stream,
- ϕ_{M_j} material component stream,
- ϕ_{I_k} ordered information stream,
- ϕ_{T_l} time activity stream,
- ϕ_{F_m} manufacturie financing stream.

The ϕ_{K_n} stream is quantified by the number of corrections to relations and order in time.

Taking into account the above stream characteristics, we shall proceed to our understanding of a system and definition thereof.

A technological (manufacturing) or production process is a directed activity of an operator, driven at streams that produce an ordered set of relations between stream elements; all results in the emergence of P^* product as well as inevitable losses. Therefore, the central idea of a system is the set of relations between stream components.

Within the system, all the relations are active, i.e. each has their own tasks to perform. Therefore, a system is an intentional set of active relations between the elements of its streams.

The further part will be devoted to the process of managing the said system. This is visualised in Figure 1, following the concept phase.

Management of the manufacturing system is performed by the $\hat{O}_{DS}$ operator, an integral part of the $\hat{O}_P$ global system operator. The $\hat{O}_P$ can be represented using the following symbols:

$$\hat{O}_P = \hat{O}_H + \hat{O}_K + \hat{O}_{DS} + \hat{O}_T + \hat{O}_J \quad (1)$$

where:

$\hat{O}_H$ - operator acts on hierarchical management,

$\hat{O}_K$ - operator defines the concept of product manufacture, including the complete design that contains construction, technology, and quality control,

$\hat{O}_{DS}$ -operator is related to management,

$\hat{O}_T$ - operator is linked to manufacturing technology,

$\hat{O}_J$ - operator is associated with quality control and monitoring.

Placement and marking of the individual operators are shown in Figure 1.

3. Structure of the management operator

The stream-systemic process management operator located following the concept stage (cf. Figure 1) is further understood as the $\hat{O}_{DS}$ management operator. Its structure is shown in Figure 2.

The above suggests that the activity of the $\hat{O}_{DS}$ operator does not include the stages of hierarchical management and concept. It is strictly associated with the delivery of product manufacturing technology and quality control thereof.

The limitations are the result of difficulties in metrisable description of processes of concept creation and decisiveness of hierarchical management that are part of operation of large corporations

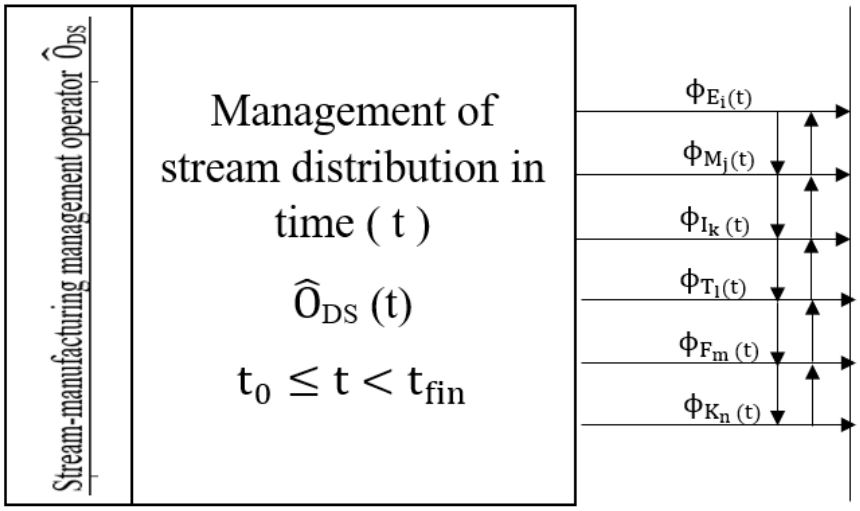


Figure 2. Structure of the $\widehat{O}_{DS}$ stream-manufacturing management operator. Source: own study.

High quality of the final product, fastest adjustments to the dynamically changing environment, and other factors that allow for the use of opportunities may be achieved upon the model of managing technology and quality control being metrisable.

The metrisability of such a model primarily means strict distribution of stream expenses in time, defined by the $\widehat{O}_K$ concept operator. Simultaneous, defined in time as $\mathbf{t_0 \leq t < t_{fin}}$, and strictly controlled stream expense, as well as the interconnections between streams make for an innovative, rational platform of modern manufacturing process management. The description of management function in time is a difficult task, thus some simplifications are necessary.

The further part of this article shows suggestions for the characteristics of processes of stream distribution and their connection with the manufacturing process.

4. $\widehat{O}_{DS}$ management operator function

Figure 2 shows the idea of system stream distribution. All the interconnections between streams are visible, i.e. intended flows of all the combinations of system elements in defined time.

We will introduce non-dimensional connections as the fundamental functions that describe the controlled stream expenses in time; these take into account the ratios of the actually expended amounts of stream elements to the same values that were defined by the norm of product concept.

These will be the following non-dimensional values that define the activirt of system streams in time $t_0 \leq t < t_{fin}$:

1. Non-dimensional momentary energy expense stream

$$r_e(t) = \frac{\int_{t_0}^{t} \phi_{E_i}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{E_i}^{n}(t)\cdot dt} \tag{2}$$

2. Non-dimensional momentary material expense stream

$$r_m(t) = \frac{\int_{t_0}^{t} \phi_{M_j}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{M_j}^{n}(t)\cdot dt} \tag{3}$$

3. Non-dimensional momentary ordered information expense stream

$$r_{ui}(t) = \frac{\int_{t_0}^{t} \phi_{I_k}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{I_k}^{n}(t)\cdot dt} \tag{4}$$

4. Non-dimensional momentary activity in time expense stream

$$r_T(t) = \frac{\int_{t_0}^{t} \phi_{T_l}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{T_l}^{n}(t)\cdot dt} \tag{5}$$

5. Non-dimensional momentary finance expense stream

$$r_f(t) = \frac{\int_{t_0}^{t} \phi_{F_m}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{F_m}^{n}(t)\cdot dt} \tag{6}$$

6. Non-dimensional momentary correction expense stream

$$r_k(t) = \frac{\int_{t_0}^{t} \phi_{K_n}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{K_n}^{n}(t)\cdot dt} \tag{7}$$

The defined non-dimensional momentary expenses of streams in time can be experimentally measured during the course of the process. Their proper measurement values ought to be close to unity, while improper values diverge from unity. The latter means inconsistency of the actual activities with the defined recipe for the process

The **rz** indices in Formulas 2-7 are actual flows, while the **n** indices stand for normative flows.

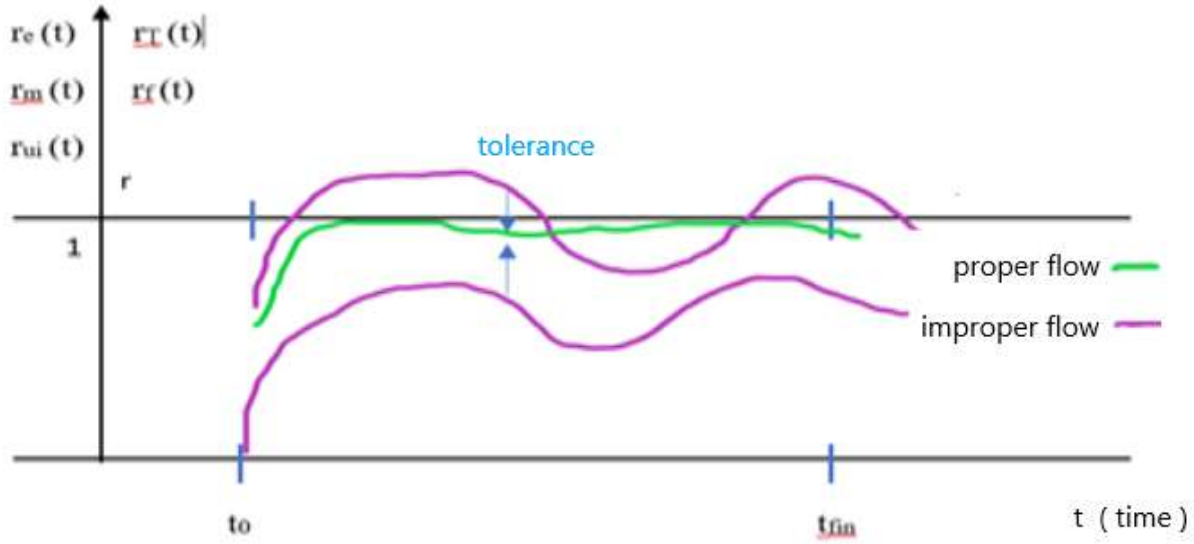


Figure 3. Proper and improper flows of the management function. Source: own study.

Figure 3 provides an example illustration of proper and improper flows of the management operator function in time. The actual and normative values need to be provided during the process, as specific numbers illustrating elements of streams consumed at small time intervals.

5. Constructive connections of the $\widehat{O}_{DS}$ management operator

In order to show the interrelations between the functions of management operators, we will additionally introduce the notion of the weight of the functions within the manufacturing process.

The sum of all the measures of the weighs equals 100%, or 1. The individual weights of management functions are assigned the symbols of: α_e, α_m, α_{ui}, α_T, α_f, and α_k and are translated to the non-dimensional stream functions. We can assume that the role of each stream in the manufacturing process is equal, however, a possibility of defining unequal roles exists.

Let us formulate a scalar connection between the stream functions and their weights. The global management operator Z(t) function is:

$$\mathbf{Z_g(t) = r_e^z(t)\frac{\alpha_e}{360} + r_m^z(t)\frac{\alpha_m}{360} + r_{ui}^z(t)\frac{\alpha_m}{360} + r_T^z(t)\frac{\alpha_T}{360} + r_f^z(t)\frac{\alpha_f}{360} + r_k^z(t)\frac{\alpha_k}{360}}$$

The geometric interpretation of the $Z_g(t)$ function is shown in Figure 4.

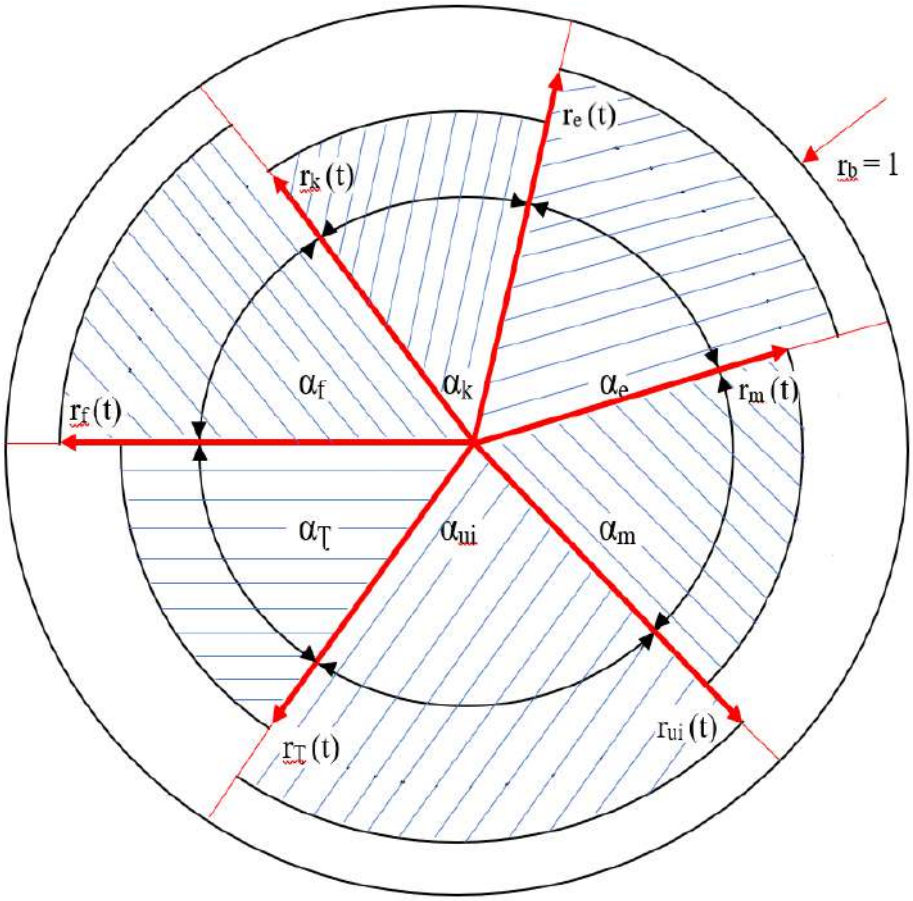


Figure 4. Area shares of non-dimensional streams within the manufacturing process. Source: own study.

The Z(t) function defines the ratio of the sum of the circle sections with the experimentally-defined radius length to the weight for the area of the circle with the radius $r_b = 1$.

The values of the $Z_g(t)$ function are between 0 and 1 $[\ \mathbf{0 \leq Z_g(t) \leq 1}\ ]$.

The global $Z_g(t)$ function may be a constitutive, scalar characteristics of the process flow. It combines the flows of all the stream functions and their weights. The values for the $Z_g(t)$ function can be found in the set: [0,1].

Proper flow of the process in time t signifies that the value of $Z_g(t)$ equals 1 with some deviation $Z_g(t) \approx 1$.

Following the assumption of the presence if weights of stream functions, it is also possible to construct vector representations of the global $\vec{\mathbf{z}}_\mathbf{g}(t)$ management function. This is illustrated in Figure 4 where, within a rectangular grid (x, y) vectors of stream functions are presented:
$\overrightarrow{\mathbf{r_e}}, \overrightarrow{\mathbf{r_m}}, \overrightarrow{\mathbf{r_{ui}}}, \overrightarrow{\mathbf{r_T}}\ \overrightarrow{\mathbf{r_f}}, \overrightarrow{\mathbf{r_k}}$

The x axis shows the weights which are in the continuum of [0,1].

The y axis shows values of stream functions.

Upon summarising all the vectors, we get:

$$\vec{\mathbf{z}}_\mathbf{g}(\mathbf{t}) = \overrightarrow{\mathbf{r_e}}(\mathbf{t}) + \overrightarrow{\mathbf{r_m}}(\mathbf{t}) + \overrightarrow{\mathbf{r_{ui}}}(\mathbf{t}) + \overrightarrow{\mathbf{r_T}}(\mathbf{t}) + \overrightarrow{\mathbf{r_f}}(\mathbf{t}) + \overrightarrow{\mathbf{r_k}}(\mathbf{t})$$

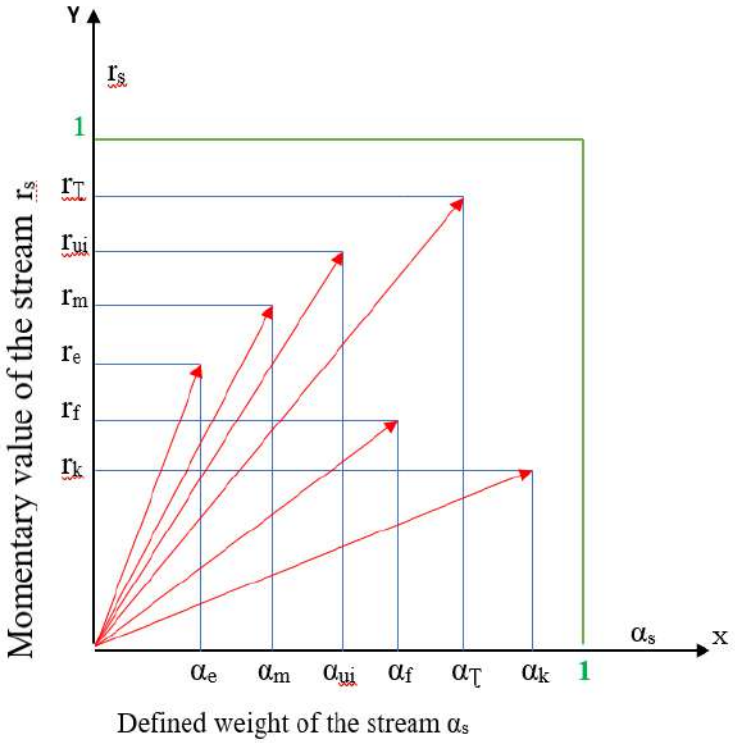


Figure 5. Vectors of non-dimensional streams in the manufacturing process: $0 \leq r_s \leq 1, 0 \leq \alpha_s \leq 1$. Source: own study.

There is also a possibility to define a singular vector $\vec{z}_g(t)$ related to the sum of the modules of the stream vectors and the maximum values of stream functions.

The vectors in Figure 5 correspond to momentary values of the states of manufacturing processes.

The global function Z_g (t) and the global vector $\vec{z}_g(t)$ are metrisable representation of manufacturing process management. Their values and flows may be defined experimentally during the manufacturing process.

The structure of these functions allows for the management and control of the manufacturing process. The flow of the scalar function $Z_g(t)$ and the global vector $\vec{z}_g(t)$ can also e used for quality control of the final product.

6. Summary

The paper presents a method for metrisability of product manufacturing process management. The mathematical description concept was based on systemic process analysis. Mathematical formulas for six functions of the manufacturing process were suggested, thus interpreting momentary expenses within the streams. A form of the management operator function was presented which takes into account the weight of individual streams. The function

is interpreted as a geometric sum of areas of circle sections, each of the sections representing the weight and value of stream functions.

The paper also presents a vector representation of manufacturing process management as a sum of stream vectors.

Non-dimensional global function for manufacturing process management $Z_g(t)$ and a manufacturing process management vector $\vec{z}_g(t)$ take into account the activity of any number of streams, together with their weights (roles).

The flow values of the function $Z_g(t)$ and the vector $\vec{z}_g(t)$ in time can be defined experimentally.

The structure of the suggested management functions allows for optimization and process control. It is also strictly associated with manufacturing quality.

The presented metrizability method of manufacturing process management can also be applied to the analysis of non-metrisable product manufacturing.

References

1. Ahire, S.L., Dreyfus, P. (2000). The impact of design management and process management on quality: an empirical investigation. *Journal of Operations Management, Nr 6*.
2. Balon, U., Dziadkowiec, J.M. (2015). Zachowania konsumentów na rynku soków – wyniki badań. In: T. Sikora (ed.), *Jakość z punktu widzenia konsumenta i organizacji. Rynek soków, nektarów i napojów*. Kraków: Wyd. AKAPIT.
3. Biazzo, S., Bemardi, G. (2003). Process management practices and quality systems standards. Risks and opportunities of the new ISO 9001 certification. *Business Process Management Journal, no. 2*.
4. Borkowski, S., Ulewicz, R. (2009). *Systemy produkcyjne.* Warszawa: Wydawnictwo Instytutu ORGMASZ.
5. Dillon, W.R., Goldstein, M. (2000). *Multivariate Analysis*. New York, US: Wiley.
6. Drozd, R. (2019). Niezawodność maszyn produkcyjnych w branży piekarniczej – zagadnienia teoretyczne i praktyczne. *Aparatura Badawcza i Dydaktyczna, ABID, 3*, Warszawa.
7. Drozd, R., Piwnik, J. (2019). Koncepcja niezawodności strumieniowo-systemowej na przykładzie branży piekarniczej. *Aparatura Badawcza i Dydaktyczna, ABID, 3*, Warszawa.
8. Drozd, R., Piwnik, J. (2019). Modele matematyczne jakości procesów na przykładzie branży piekarniczej. *Aparatura Badawcza i Dydaktyczna, ABID, 4*.
9. Durlik, I. (2007). *Inżynieria produkcji, cz. 1. Strategia i projektowanie systemów produkcyjnych.* Warszawa: Wydawnictwo Placet.

10. Gawęcki, J., Baryłko-Pikielna, N. (ed.) (2007). *Zmysły a jakość żywności i żywienia.* Poznań: Wyd. Akademii Rolniczej w Poznaniu.
11. Holm, C., Brun, R. (2000). *Principal Component Analysis.* LINTRA package, CERN.
12. Kleniewski, A. (2004). Podejście procesowe. Punkt widzenia audytora. *Problemy Jakości, nr 6.*
13. Mehrabi, M., Ulsoy, G., Koren, Y. (2000). Reconfigurable manufacturing systems: Key to Future Manufacturing. *Journal of Intelligent Manufacturing, nr 4.*
14. Pająk, E. (2006). *Zarządzanie produkcją. Produkt, technologia, organizacja*. Warszawa: PWN.
15. Romanowska, M., Trocki, M. (2004). *Podejście procesowe w zarządzaniu.* Warszawa: Wydawnictwo SGH.
16. Sikora, T., Strada, A. (2005). *Safety and Quality Assurance and Management Systems in Food Industry: An Overview. The Food Industry in Europe.* Athens: Agricultural University of Athens.
17. Skolik, A. (2011). *Smak w analizie sensorycznej.* WUE w Poznaniu.
18. Stewart, J.E., Feinle-Bisset, C., Golding, M., Delahunty, C., Clifton, P.M., Keast, R.S.J. (2010). Oral sensitivity to fatty acids, food consumption and BMI in human subjects. *British Journal of Nutrition, vol. 104.* London, UK.
19. Świderski, F., Waszkiewicz-Robak, B. (2010). *Towaroznawstwo żywności przetworzonej z elementami technologii.* Warszawa: Wyd. SGGW.
20. Toko, K. (2000). *Biomimetic sensor technology*. US: Cambridge University Press.
21. Wiśniewska, M., Malinowska, E. (2011). *Zarządzanie Jakością Żywności, Systemy, Koncepcje, Instrumenty.* Warszawa: Difin.
22. Zwolińska, B. (2016). *Matematyczny model analizy strumienia jakości*. Autotusy.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

CONCEPT OF MANAGING QUALITY IN BAKING INDUSTRY, IN VECTOR REPRESENTATION

Radosław DROZD

Gdansk University of Technology, Department of Industrial Management; rdrozd@zie.pg.gda.pl,
ORCID: 0000-0003-1797-4488

Purpose: The goal of the article is to present an innovative process of managing quality in baking industry, in vector representation.
Design/methodology/approach: To achieve the planned goal, the author presents an innovative metrisable method of describing a manufacturing process. The article formulates vector representations of a manufacturing process, based on systems engineering models, as well as presents constitutive relations, as three vectors that combine: effects of quality as the product feature vector, loss vector, and input stream vector. The quality management process in baking industry is a purposeful process of an operator, acting on streams that represent an ordered set of relations between their elements, leading to the emergence of a product and inevitable losses. Each of the said streams will contain quantities of activities in time, relevant to its character. The types of activities within each stream will determine the goal of the operator's activity. The complete set of the input streams is represented by the operator's vector, formed from the sum of the individual input vectors. The activity of the manufacturing process operator results in the emergence of a product, described by six vectors that describe quality of a bakery product: nutritional value, taste, healthiness, attractiveness, durability, freshness. The losses are represented by four vectors: ecological, human resources, energy losses, and safety.
Findings: The author introduced an innovative metrisable method of describing a manufacturing process. The idea of vector structure of a manufacturing process allows to formulate quantitative relations between the activity of input streams, elements of product quality, and measurable effects of losses. The structure was basis for the formulation of the concept of the process of managing product quality in the baking industry in a vector representation. The application of systems engineering allows for a measurable answer to the fundamental questions of the goal of the manufacturing process, its efficiency in the context of combining all the elements, including product quality, as well as other improving activities.
Originality/value: The article may be a recommendation for manufacturing companies. The new idea for a metrisable vector structure of a manufacturing process has been designed with the baking industry in mind, but the whole system's construction makes it applicable to analyse other processes, in e.g. information production, didactics, strategy, etc., as it imposes no limitations on the character of the process, which may also be of immaterial production character.

Keywords: managing quality, vector representation, baking industry.

Category of the paper: Research paper.

1. Introduction

A modern company requires metrisable technical, market, economic, social, and ecologic evaluation, one that takes into account varied aspects experienced by the customers. The necessity for a complex evaluation calls for the search for methods of globally describing of the flow of manufacturing processes, based on advanced system engineering models (Gomółka, 1999; Luhmann, 2012; Powierża, 1997; Sienkiewicz, 1997; 1998). The application of systems engineering allows to "measurably" answer the fundamental questions related to the goal of the manufacturing process, its efficiency as a combination of all elements, product quality included, and varied improving activities (Dwiliński, 2020; Kijowski, 2004; Lisiecka, 2001; Sadowska, 2000; Wiśniewska, and Malinowski, 2011). At the same time, mathematical models of systems engineering allow to construct multi-criterion indicators and the use thereof in optimising the subsequent technological, organizational, and other steps (Drozd, and Piwnik, 2019, Drozd, 2020).

The placement of the issue of quality is in strong connection with combining all the elements of the manufacturing process.

This article presents a concept of a quality management process in the baking industry, in a vector representation.

In order to make the remaining material more accessible, the author follow the definition of quality in the understanding proposed by systems engineering. Thus, quality will mean a collective general characteristics of the manufacturing process which expresses the degree to which the expectations towards the process have been met.

In case of bakery products, quality is determined by nutritional value, taste, healthiness, attractiveness, durability, and freshness (Balon, Dziadkowiec, Sikora, 2016; Gambuś, Litwinek, 2011; Gawęcki, Jędryka, 2001; Gawęcki, Baryłko-Pikielna, 2007; Madej-Lachowska, Szwedziak, Polańczyk, Piechaczek, 2015; Skolik, 2011; Taniewski, Malinowski, 2009).

These will make the new metrisable method of describing the manufacturing process.

Vector representations of the manufacturing process will be set up, based on systems engineering. Also, constitutive relations will be introduced, as three vectors of a contemporary manufacturing system, combining the effects of the product quality vector $\vec{P}$, loss vector $\vec{S}$, and input streams vector $\vec{\phi}$. Scalar, mixed, and vector products of these vectors may form constitutive formulas of the processes. Interrelations of the three state vectors, $\vec{\phi}$, $\vec{P}$, $\vec{S}$, provide a possibility for metrisable complex analysis and assessment of the manufacturing process.

The article also provides practical formulas for providing vector values of the process.

Quality has been defined with three modules of orthogonal Cartesian space vectors. This means the weight of the role of the modules is identical and equals 1. The resultant vector represents global quality assessment.

2. Vector structure of the manufacturing process in the baking industry

The vector structure of a manufacturing process founded on systems engineering allows to formulate quantitative relations between the action of input streams, features of the product, and effects of losses, and the relation between the distribution of stream processes in time, product, and losses as vector functions. This is a new innovative approach found in subject literature. Lack of such analyses so far is noticed not only in Poland but also in more developed economies, making this a valid research gap identified by the author.

The starting point is the new description concept – vector fields of the action of the system streams, features of the product, and character of losses.

The presented vector description of the functioning of a manufacturing process does not impose limitations on the character of the process, as non-material production can also be described.

Vector relations between the distribution of streams, features of the product, and types of losses are scalar, vector, and mixed products of the vectors representing the activity of the streams $\vec{\phi}$, product $\vec{P}$, and losses $\vec{S}$.

The relations between the vectors $\vec{\phi}$, $\vec{P}$, $\vec{S}$ reflect the synchronism and the unambiguity of the manufacturing process, symbolically representing the relations as:

$$\hat{O}_p(\phi_{E_a}, \phi_{M_b}, \phi_{F_c}, \phi_{I_d}, \phi_{Z_e}, \phi_{W_f}, \phi_{T_c}, \phi_{K_h}) \rightarrow \hat{P} + \hat{S} \quad (1)$$

These relations as well as an overview for further analysis of bakery product manufacturing process are presented in Figure 1.

The starting point for the definition of the manufacturing process in the baking industry was the establishment of the set of relations between the elements of the following streams:

- energy stream, ϕ_{E_a},
- material element stream, ϕ_{M_b},
- manufacturing financial stream, ϕ_{F_c},
- ordered information stream,ϕ_{I_d},
- manufacturing process management stream, ϕ_{Z_e},
- controlled process output stream, ϕ_{W_f},
- timed activity stream, ϕ_{T_g},
- process dynamics change (correction) stream, ϕ_{K_h}.

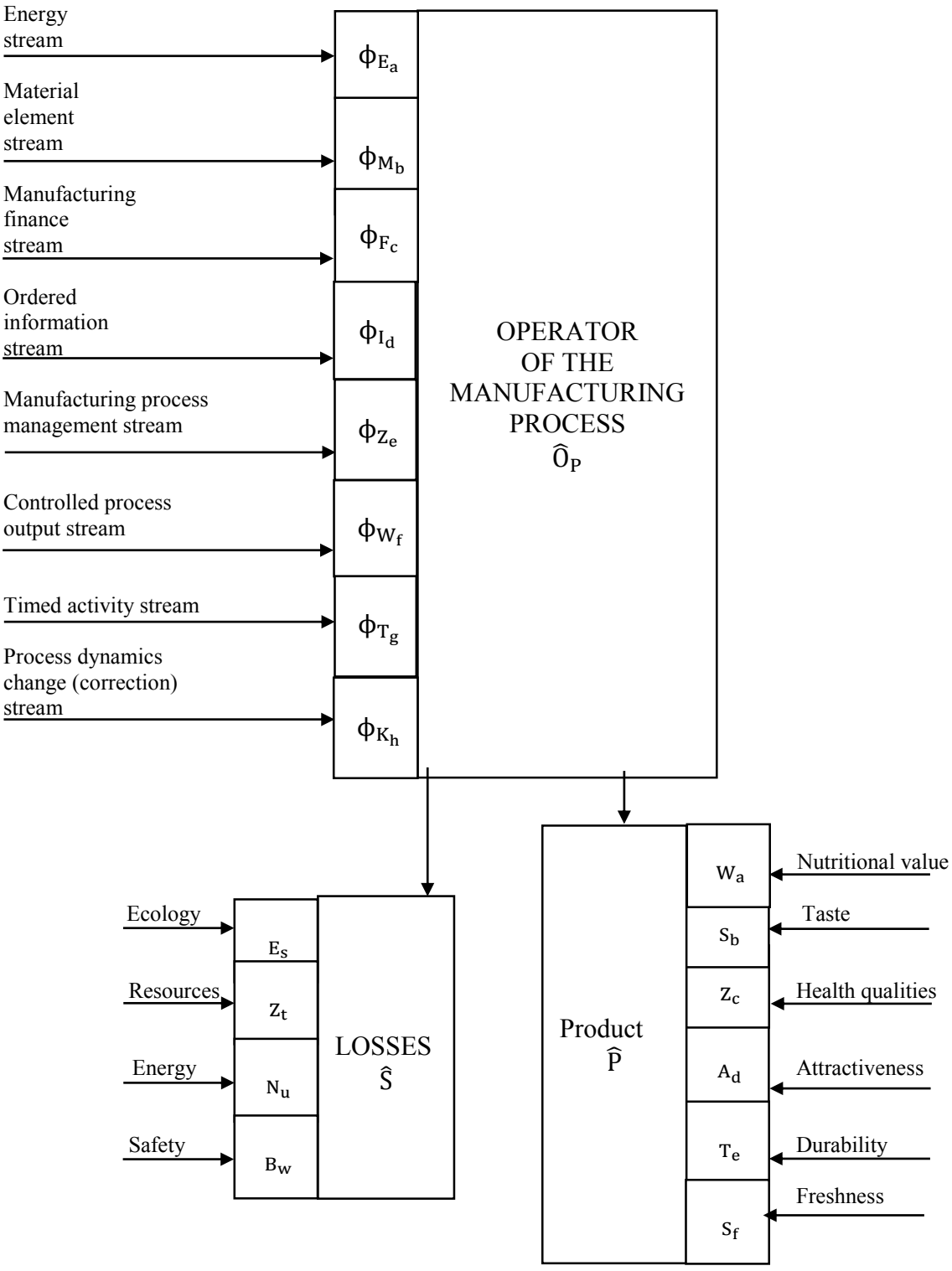
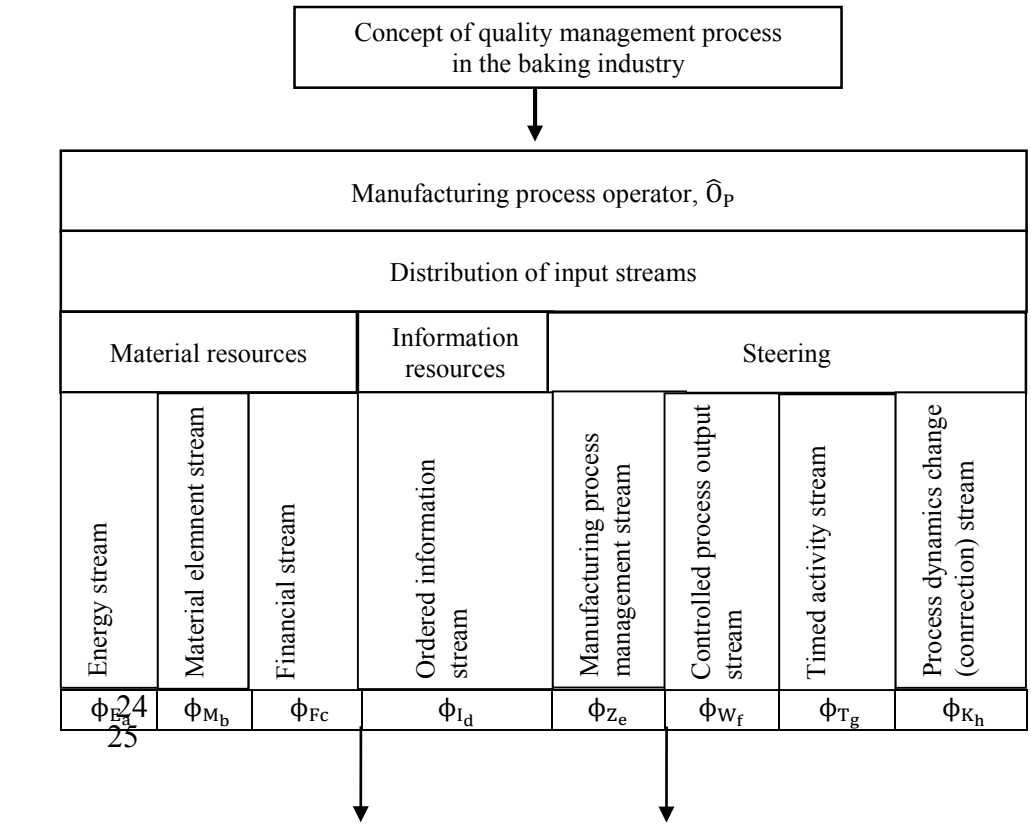


Figure 1. Structure of bakery product manufacturing process. Source: own study.

The area of the activity of the manufacturing process operator $\hat{O}_P$ is supplied with eight input streams. The type and amount of streams, as well as their weights, constitute the character of this process, whose goal is the quality management process. Individual streams, powering the manufacturing process operator are presented in figure 2.



24
25

Losses	**S**
Ecology - agro-climatic conditions	E_s
Human resources - resource selection - process output	Z_t
Energy - energy losses - voltage outages	N_u
Safety - health - machine breakdowns	B_w

Product	**P**
Nutritional value	W_a
Taste	S_b
Healthiness	Z_c
Attractiveness	A_d
Durability	T_e
Freshness	S_f

Figure 2. Vector structure of bakery products manufacturing process. Source: own study.

1. The energy stream ϕ_{E_a} is the necessary set of a-elements converting different kinds of Energy (mechanical, electrical, heat, pneumatic, etc.) Baking industry is heavy on energy and consumes 12.5% of energy needed for all the food industry. The energy stream ϕ_{E_a} will be represented by the vector $\vec{r}_e$.
2. The material energy stream ϕ_{M_b} is a necessary set of b-elements securing the materials needed for the manufacturing process. These are: raw materials, buildings, machines, installations, media, and other objects. The stream ϕ_{M_b} is measured in a number of elements in time, and its vector representation is $\vec{r}_m$.
3. The finance stream ϕ_{F_c} is a set of c-elements that define costs of activity of defined stream relations, trends, and other outlays for the activity on the process on the product

requirements. The stream ϕ_{F_c} is measured in outlays of resources in time. The vector of the ϕ_{F_c} is designated as $\vec{r}_f$.

4. The ordered information stream ϕ_{I_d} is a set of d-elements of strict theoretical and empirical knowledge. These are instructions, guidelines, management, orders, algorithms, patents, and other segments of contemporary knowledge that translate to the highest efficiency of the process. The stream ϕ_{I_d} is measured in amount of information in time and its vector representation is $\vec{r}_i$.
5. The manufacturing process management stream ϕ_{Z_e} is a set of the activities of e-elements that satisfy optimal selection of technological parameters and maintaining their stability in order to achieve the desired quality of the final product. The stream ϕ_{Z_e} is measured in number of activities in time w and vector representation in the form of $\vec{r}_z$.
6. The stream of controlled process output ϕ_{W_f} is a set of f-elements of control of individual phases of the manufacturing process and interoperational control of semi-finished product quality. The stream ϕ_{W_f} is measured in number of control elements and its vector representation is $\vec{r}_w$.
7. The stream of timed activity ϕ_{T_g} is a set of g-elements of order of the activity of relations between streams in time. These also define duration times for individual operations and tasks that secure the completion of the streams' concept and design assumptions. Therefore, the timed activity stream is one of the crucial success indicators for changes within the business. The stream ϕ_{T_g} is measured in number of ordered operations in time and its vector representation is $\vec{r}_t$.
8. Process dynamics change (correction) stream ϕ_{K_h} is a set of activities of h-elements marking forced and unpredictable changes to the defined concept of the manufacturing process. The stream is characterised by high sensitivity to proper flows of all the other streams. The stream ϕ_{K_h} is measured by the number of relations and order corrections in time and its vector representation is $\vec{r}_k$.

The combined streams that supply the manufacturing process is represented by the vector $\vec{\phi}$. It is a sum of all the component stream vector, as shown in Figure 2.

The method for constructing vector streams is described in section 1.3.2.

The activity of the manufacturing process operator $\hat{O}_P$ results with the product $\hat{P}$ and losses $\hat{S}$.

The product $\hat{P}$ is described by six vectors:

- nutritional value vector $\vec{w}_a$,
- taste vector $\vec{s}_b$,
- healthiness vector $\vec{z}_c$,
- attractiveness vector $\vec{a}_d$,

– durability vector $\vec{t}_e$,
– freshness vector $\vec{s}_f$.

The method for constructing the $\vec{P}$ product vector is described in section 1.3.3.

The loss stream $\hat{S}$ is described by four vectors:

– ecological vector $\vec{e}_s$,
– resource vector $\vec{z}_t$,
– energy loss vector $\vec{n}_u$,
– safety vector $\vec{b}_w$.

The resultant loss vector $\vec{S}$ is a sum of the four component vectors, as shown in Figure 2.

The method of defining loss vectors is described in section 1.3.4.

According to the presented concept of the process of managing quality in a bakery, the manufacturing process is a purposeful activity of the manufacturing operator $\hat{O}_P$ on the streams representing an ordered set of relations between stream elements, resulting in the emergence of the product $\hat{P}$ and inevitable losses $\hat{S}$.

The manufacturing operator space is supplied by eight streams, i.e.:

– three material resource streams: energy, material element, and finances;
– one information stream – the ordered information stream;
– four steering streams – the manufacturing process steering stream, controlled output stream, timed activity stream, process dynamics change stream.

Each of the mentioned streams contains amounts of activities in time, adequate to its character. Types of activity within each of the streams determine the goal of the operator. The streams supplying the manufacturing process are represented by the operator vector – a vector comprised of the vector sum of all the input streams.

The activity of the operator of the manufacturing process results in a product, characterised by six vectors, representing features of the quality of bakery product, enumerated above.

Losses are represented by four vectors: ecological (agro-climatic conditions), human resource (raw material selection, process output), energy loss (no energy, power outages), and safety vector (health-related, machine failures).

In the presented concept of managing manufacturing quality in the baking industry, all relations are active. i.e. each has their tasks to perform.

Therefore, the description of the system needs to take into account momentary and unambiguous relation between the manufacturing process operator, product, and losses. A strict description of such a relations is immensely difficult. Some possibilities are provided by vectors, though.

For this reason, the further part contains ways of assigning the sets of vectors (stream $\vec{\phi}$, product $\vec{P}$, and losses $\vec{S}$) to the activity of the manufacturing system.

3. Defining the vectors of the manufacturing process

3.1. Introduction

All the vectors of the manufacturing process are set in rectangular grids, see Figures 3-5.

The *y* axes mark module values of the individual vectors of the system.

The values of vector modules and weights are of non-dimensional type.

The *x* axes contain weights, where the $\vec{e}_x$ unit versor is assigned, while the *y* axes are assigned with the $\vec{e}_y$ unit versor.

Therefore, each of the process vectors is a section on the *x*-*y* plane and is described as:

$$\vec{a} = a_x\vec{e_x} + a_y\vec{e_y} \tag{2}$$

The a_x values reflect the weights, while a_y mark numeric values of the modules of the state vectors. The a_x and a_y take values between zero and one.

$$a_x \in [0,1]\ ,\ a_y \in [0,1] \tag{3}$$

Each of the vectors of the manufacturing process reflects the modules and weights into a numerical set [0,1]. The method of showing individual parts of the system is described further.

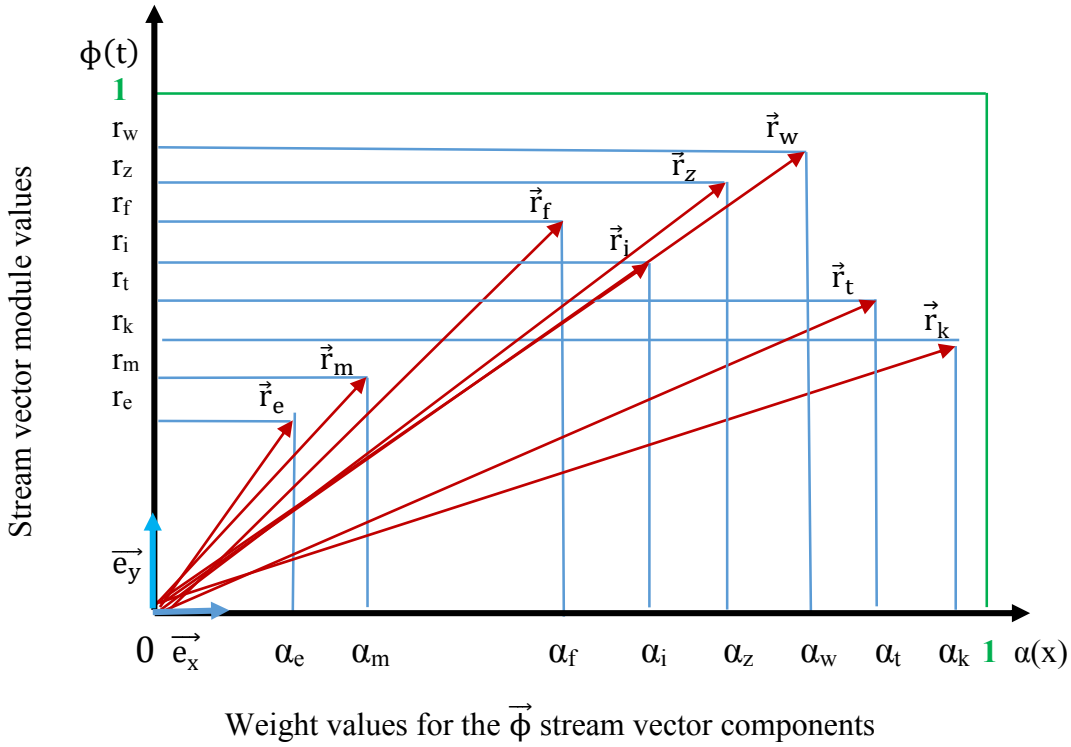


Figure 3. Components of the stream vector $\vec{\phi}$ in the grid of their values and weights. Source: own study.

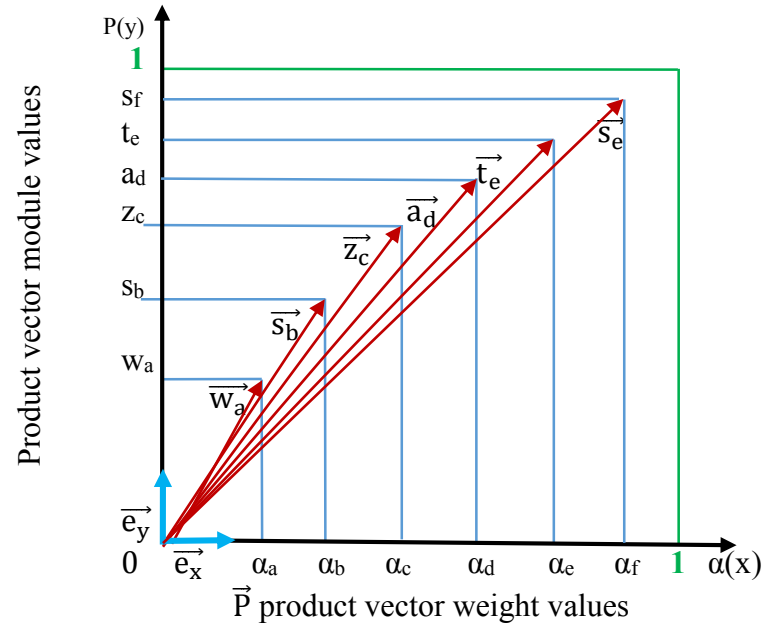


Figure 4. $\vec{P}$ product vector components in the grid of their modules and weights. Source: own study.

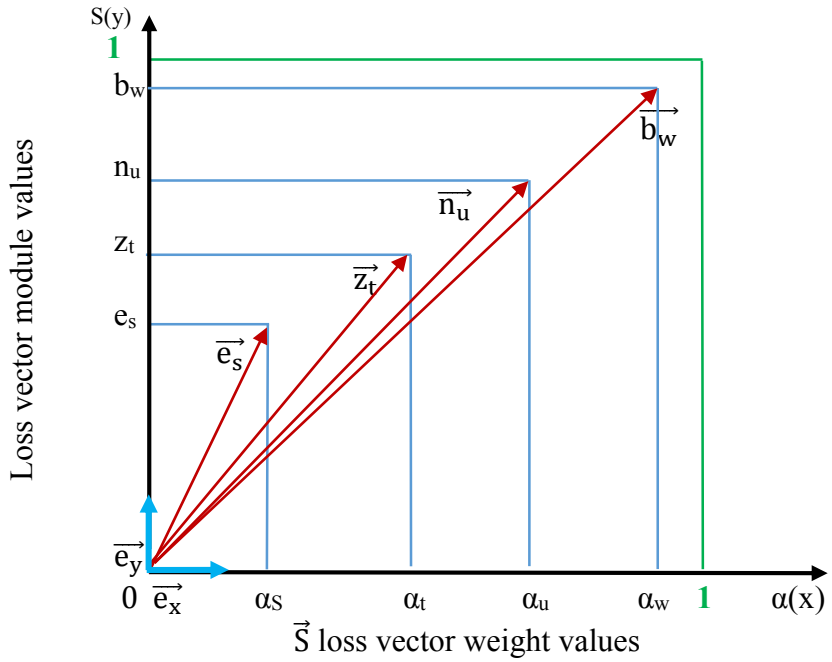


Figure 5. $\vec{S}$ loss vector components in the grid of their modules and weights. Source: own study.

The *x* axes of the grids marks the weights of the individual vectors. In each case, the sum of all vectors for a singular part of the manufacturing process equals 100 per cent

3.2. Stream vectors

As the fundamental functions describing controlled outlays of streams in time, let us introduce non-dimensional relations that take into account the ratios of the actually spent amounts of stream elements to the same values set by the concept of the product norm.

These will be non-dimensional values defining the activity of streams in time $t_0 \leq t < t_{fin}$. Their values are a_y in the formula (3). The representation is as follows:

1. Non-dimensional momentary output of the energy stream

$$r_e(t) = \frac{\int_{t_0}^{t} \phi_{E_a}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{E_a}^{n}(t)\cdot dt} \tag{4}$$

2. Non-dimensional momentary output of the material stream

$$r_m(t) = \frac{\int_{t_0}^{t} \phi_{M_b}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{M_b}^{n}(t)\cdot dt} \tag{5}$$

3. Non-dimensional momentary output of the financial stream

$$r_f(t) = \frac{\int_{t_0}^{t} \phi_{F_c}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{F_c}^{n}(t)\cdot dt} \tag{6}$$

4. Non-dimensional momentary output of the ordered information stream

$$r_i(t) = \frac{\int_{t_0}^{t} \phi_{I_d}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{I_d}^{n}(t)\cdot dt} \tag{7}$$

5. Non-dimensional momentary output of the manufacturing process management stream

$$r_z(t) = \frac{\int_{t_0}^{t} \phi_{Z_e}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{Z_e}^{n}(t)\cdot dt} \tag{8}$$

6. Non-dimensional momentary output of the controlled process output stream

$$r_w(t) = \frac{\int_{t_0}^{t} \phi_{W_f}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{W_f}^{n}(t)\cdot dt} \tag{9}$$

7. Non-dimensional momentary output of the timed activity stream

$$r_t(t) = \frac{\int_{t_0}^{t} \phi_{T_g}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{T_g}^{n}(t)\cdot dt} \tag{10}$$

8. Non-dimensional momentary output of the correction stream

$$r_k(t) = \frac{\int_{t_0}^{t} \phi_{K_h}^{rz}(t)\cdot dt}{\int_{t_0}^{t} \phi_{K_h}^{n}(t)\cdot dt} \tag{11}$$

The defined non-dimensional momentary stream outlays in time can be defined empirically in the course of the manufacturing process.

After the formulas (2), (4)-(11) have been accounted for, we receive the following formulas for the components of the stream vector:

$$\overrightarrow{r_e}(t) = \alpha_e \vec{e}_x + r_e(t)\overrightarrow{e_y} \quad (12)$$

$$\overrightarrow{r_m}(t) = \alpha_m \vec{e}_x + r_m(t)\overrightarrow{e_y} \quad (13)$$

$$\overrightarrow{r_f}(t) = \alpha_f \vec{e}_x + r_f(t)\overrightarrow{e_y} \quad (14)$$

$$\overrightarrow{r_l}(t) = \alpha_i \vec{e}_x + r_i(t)\overrightarrow{e_y} \quad (15)$$

$$\overrightarrow{r_z}(t) = \alpha_z \vec{e}_x + r_z(t)\overrightarrow{e_y} \quad (16)$$

$$\overrightarrow{r_w}(t) = \alpha_w \vec{e}_x + r_w(t)\overrightarrow{e_y} \quad (17)$$

$$\overrightarrow{r_t}(t) = \alpha_t \vec{e}_x + r_t(t)\overrightarrow{e_y} \quad (18)$$

$$\overrightarrow{r_k}(t) = \alpha_k \vec{e}_x + r_k(t)\overrightarrow{e_y} \quad (19)$$

The components are shown in Figure 6.3.

The resultant stream of the vector $\vec{\phi}$ is a vector sum of its components and is represented as:

$$\vec{\phi}(t) = \overrightarrow{r_e}(t) + \overrightarrow{r_m}(t) + \overrightarrow{r_f}(t) + \overrightarrow{r_i}(t) + \overrightarrow{r_z}(t) + \overrightarrow{r_w}(t) + \overrightarrow{r_t}(t) + \overrightarrow{r_k}(t) =$$
$$\vec{e}_x [\alpha_e + \alpha_m + \alpha_f + \alpha_l + \alpha_z + \alpha_w + \alpha_t + \alpha_k] +$$
$$\vec{e}_y [\overrightarrow{r_e}(t) + \overrightarrow{r_m}(t) + \overrightarrow{r_f}(t) + \overrightarrow{r_i}(t) + \overrightarrow{r_z}(t) + \overrightarrow{r_w}(t) + \overrightarrow{r_t}(t) + \overrightarrow{r_k}(t)]$$

3.3. Product vectors

The product may be represented by six vectors. They are as follows:

1. Nutritional value vector, $\overrightarrow{w_a}$

$$\overrightarrow{w_a} = \alpha_a \vec{e}_x + w_a \overrightarrow{e_y} \quad (20)$$

2. Taste vector, $\vec{s}_b$

$$\overrightarrow{s_b} = \alpha_b \vec{e}_x + s_b \overrightarrow{e_y} \quad (21)$$

3. Healthiness vector, $\vec{z}_c$

$$\overrightarrow{z_c} = \alpha_c \vec{e}_x + z_c \overrightarrow{e_y} \quad (22)$$

4. Atttractiveness vector, $\vec{a}_d$

$$\overrightarrow{a_d} = \alpha_d \vec{e}_x + a_d \overrightarrow{e_y} \quad (23)$$

5. Durability vector, $\vec{t}_e$

$$\overrightarrow{t_e} = \alpha_e \vec{e}_x + t_e \overrightarrow{e_y} \quad (24)$$

6. Freshness vector, $\vec{s}_f$

$$\overrightarrow{s_f} = \alpha_f \vec{e}_x + s_f \overrightarrow{e_y} \quad (25)$$

The values α_a, α_b, α_c,α_d, α_e, α_f, are weights, while w_a, s_b, z_c, a_d, t_e, s_f are empirically defined through procedure designated specifically for the product.

3.4. Loss vectors

Losses within the system are described by the sum of the following four component vectors:

1. Ecological vector

$$\overrightarrow{e_s} = \alpha_s \vec{e}_x + e_s \overrightarrow{e_y} \tag{26}$$

2. Resource vector

$$\overrightarrow{z_t} = \alpha_t \vec{e}_x + z_t \overrightarrow{e_y} \tag{27}$$

3. Energy loss vector

$$\overrightarrow{n_u} = \alpha_u \vec{e}_x + n_u \overrightarrow{e_y} \tag{28}$$

4. Safety vector

$$\overrightarrow{b_w} = \alpha_w \vec{e}_x + b_w \overrightarrow{e_y} \tag{29}$$

The values $\alpha_s, \alpha_t, \alpha_u, \alpha_w$ are the weighs of the vectors. The values e_s, z_t, n_u, b_w are defined empirically according to the procedures designated specifically for the researched manufacturing process.

The resultant $\vec{s}$ loss vector is the sum of the abovementioned vectors:

$$\vec{s} = \overrightarrow{e_s} + \overrightarrow{z_t} + \overrightarrow{n_u} + \overrightarrow{b_w} \tag{30}$$

The value of the module of the vector $\vec{s}$ takes values of [0,1]. The components of the vector $\vec{s}$ are shown in Figure 5.

4. Vector constitutive relations of the manufacturing process

A complex metrisable assessment of a manufacturing process ought to take into account the relation between the distribution of the input streams, product quality, and measurable effects of losses.

The set of three vectors, $\vec{\phi}, \vec{P}, \vec{S}$, representing the state of the process, allows to formulate a constitutive equation of the manufacturing process.

There are a few possible associations between the three abovementioned vectors. However, we shall present those which lead to better understanding of the phenomena and optimisation towards product attractiveness, energy consumption, and cost efficiency.

The relations between the vectors $\vec{\phi}, \vec{P}, \vec{S}$ may be functions or vectors, the result of whose calculations are of scalar or vector nature.

Among the vector ones, we may enumerate the vector product $(\vec{\phi} \times \vec{P}) * (\vec{S})$. The formula is as follows:

$$\vec{V}= (\vec{\phi} \text{ x } \vec{P}) * (\vec{S}) = \begin{vmatrix} \vec{e}_x & \vec{e}_y & \vec{e}_z \\ P_x & P_y & P_z \\ S_x & S_y & S_z \end{vmatrix} * \sqrt{s_x^2 + s_y^2} \quad (31)$$

Vector representations of the manufacturing process may also be achieved by the sum of vectors $\vec{\phi}$, $\vec{P}$, $\vec{S}$ and their double vector product.

The formula is as follows:

$$\vec{\Sigma} = \vec{\phi} + \vec{P} + \vec{S} \quad (32)$$

$$\vec{D} = (\vec{\phi} \text{ x } \vec{P}) \text{ x } \vec{S} \quad (33)$$

Modules of the vectors $\vec{\Sigma}$ and $\vec{D}$ may be scalar functions of the manufacturing process.

5. Conclusion

The placement of the issues of quality is of strict importance to the combination of all the elements of a manufacturing process. This section presents a concept of quality process management in baking industry in vector representation. Quality, in the understanding proposed by systems engineering, will denote collective general characteristics of the manufacturing process expressing the degree to which requirements related to the subject process are met.

The author introduced an innovative metrisable method of describing a manufacturing process. Vector representations of a manufacturing system were presented, ones that are based on systems engineering models. Also, the article presents constitutive relations – three vectors that combine the quality effects, as a vector of the features of the product, loss vector, and input stream vector.

The idea of vector structure of a manufacturing process allows to formulate quantitative relations between the activity of input streams, elements of product quality, and measurable effects of losses. The structure was basis for the formulation of the concept of the process of managing product quality in the baking industry in a vector representation.

According to the presented concept of managing quality in baking industry, the manufacturing process is a purposeful activity of an operator on streams, expressing an ordered set of relations between their elements, leading to the emergence of a product and inevitable losses.

The manufacturing operator space is supplied by eight streams, i.e.:

a) three material resource streams: energy, material element, and finances;
b) one information stream – the ordered information stream;
c) four steering streams – the manufacturing process steering stream, controlled output stream, timed activity stream, process dynamics change stream.

Each of the mentioned streams contains amounts of activities in time, adequate to its character. Types of activity within each of the streams determine the goal of the operator. The streams supplying the manufacturing process are represented by the operator vector – a vector comprised of the vector sum of all the input streams.

The activity of the operator of the manufacturing process results in a product, characterised by six vectors, representing features of the quality of bakery product, enumerated above.

Losses are represented by four vectors: ecological (agro-climatic conditions), human resource (raw material selection, process output), energy loss (no energy, power outages), and safety vector (health-related, machine failures).

In the presented concept of managing manufacturing quality in the baking industry, all relations are active. i.e. each has their tasks to perform.

Therefore, the description of the system needs to take into account momentary and unambiguous relation between the manufacturing process operator, product, and losses. A strict description of such a relations is immensely difficult, and impossible to measure in some instances. Some possibilities are provided by vectors and scalars, though. The article presents practical methods for assigning vector values to the said processes.

The application of systems engineering allows for a measurable answer to the fundamental questions of the goal of the manufacturing process, its efficiency in the context of combining all the elements, including product quality, as well as other improving activities.

At the same time mathematical models of systems engineering allow to construct multi-criterion indicators and their application to optimize the subsequent organisational, technological, and other steps.

The new idea for a metrisable vector structure of a manufacturing process has been designed with the baking industry in mind, but the whole system's construction makes it applicable to analyse other processes, in e.g. information production, didactics, strategy, etc., as it imposes no limitations on the character of the process, which may also be of immaterial production character.

References

1. Balon, U., Dziadkowiec, J.M., Sikora, T. (2016). *Cechy jakości żywności a decyzje zakupowe polskich konsumentów soków owocowych*. Kraków: Uniwersytet Ekonomiczny.
2. Drozd, R. (2020). *Model funkcjonalny wpływu czynników na jakość produktu w branży piekarniczej*. Warsaw: Aparatura Badawcza i Dydaktyczna ABID3/2020.
3. Drozd, R., Piwnik, J. (2019). *Koncepcja niezawodności strumieniowo-systemowej na przykładzie branży piekarniczej*. Warsaw: Aparatura Badawcza i Dydaktyczna ABID3/2019.
4. Drozd, R., Piwnik, J. (2019). *Modele matematyczne jakości procesów na przykładzie branży piekarniczej*. Warsaw: Aparatura Badawcza i Dydaktyczna ABID4/2019.
5. Dwiliński, L. (2020). *Zarządzanie jakością i niezawodnością wyrobów*. Warsaw: Oficyna Wydawnicza Politechniki Warszawskiej.
6. Gambuś, H., Litwinek, D. (2011). *Pieczywo – dlaczego warto jeść i jakie wybierać*. Kraków: Uniwersytet Rolniczy.
7. Gawęcki, J., Baryłko-Pikielna, N. (2007). *Zmysły a jakość żywności i żywienia*. Poznan: Wydawnictwo Akademii Rolniczej.
8. Gawęcki, J., Jędryka, T. (2001). *Analiza sensoryczna. Wybrane metody i przykłady zastosowań*. Poznan: Wydawnictwo Akademii Ekonomiznej.
9. Gomółka, Z. (1999). *Elementy ogólne teorii systemów*. Szczecin: Uniwersytet Szczeciński.
10. Kijowski, J. (2004). Integracja systemów zarządzania jakością i bezpieczeństwem zdrowotnym żywności w normach międzynarodowych. In: D. Witrowa-Rajchert, D. Nowak (eds.), *Metody zapewnienia jakości i bezpieczeństwa w przetwórstwie żywności*. Warsaw: SGGW.
11. Lisiecka, K. (2001). Systemy zarządzania jakością i kryteria pomiaru ich efektywności. *Problemy Jakości, Nr 9*.
12. Luhmann, N. (2012). *Introduction to systems theory*. Berlin: Polity Press.
13. Madej-Lachowska, M., Szwedziak, K., Polańczyk, E., Piechaczek, N. (2015). Ocena jakości wybranych produktów żywnościowych za pomocą metod wizyjnych. *Postępy Techniki Przetwórstwa Spożywczego, Nr 1*.
14. Powierża, L. (1997). *Elementy inżynierii systemów*. Warsaw: Oficyna Wydawnicza Politechniki Warszawskiej.
15. Sadowska, H. (2000). *System HACCP to bezpieczeństwo żywności. Zdrowa Żywność Zdrowy Styl Życia.*
16. Sienkiewicz, P. (1997). *Teoria efektywności systemów*. Warsaw: Ossolineum.
17. Sienkiewicz, P. (1998). *Teoria systemów*. Warsaw: Ossolineum.
18. Skolik, A. (2011). *Smak w analizie sensorycznej*. Poznan: WUE.

19. Taniewski, M., Malinowska, E. (2009). *Smak w sztuce gastronomii*. Gdansk: Wydawnictwo Wyższej Szkoły Turystyki i Hotelarstwa.
20. Wiśniewska, M., Malinowska, E. (2011). *Zarządzanie jakością żywności*. *Systemy, koncepcje, instrumenty*. Warsaw: Wydawnictwo Difin.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

FACTORS AFFECTING THE QUALITY OF RESEARCH PROCESSES

Henryk DŹWIGOŁ

Silesian University of Technology, Gliwice (Poland); London Academy of Science and Business, London (United Kingdom); Sumy State University, Sumy (Ukraine); henryk.dzwigol@poczta.fm, ORCID: 0000-0002-2005-0078

Purpose: The aim of the article was to determine main factors that would influence the quality of a research process, as an element that supplements currently used methodology-related approaches.
Design/methodology/approach: Following the fulfilment of the objective, the research was carried out with the help of a questionnaire addressed to the theoreticians of management sciences (401 representatives) being a target group. Moreover, in order to measure the factors determining the quality in management sciences, eight factors determining the quality of the research process were identified on the basis of the conducted factor analysis, which were subsequently described.
Findings: On the basis of the factor analysis, eight factors determining the quality of the research process were identified, i.e.:

- Practical application and purposefulness.
- Influence of diverse research problems on the process.
- Influence of a researcher on the research process.
- Unique character of a scientific discipline.
- Importance of observations.
- Completeness of the process.
- Process assistance type.
- Need for triangulation and universalism.

Research limitations/implications: The conclusions of the analysis concerning the methodology of conducting the research process indicate a lack of empirical approach to the problem of the quality of the research process, where as a result of the transformations taking place over the years in the methods of management, it is difficult to choose one single method allowing to conduct a full and thorough diagnosis of the problem already at the stage of defining the research problem. Therefore, the research undertaken in the article aims to identify factors influencing the quality of the research process as an element complementary to the existing methodological approaches.
Practical implications: The management methodology is constantly being extended with new methods characterized by different cognitive and practical efficiency. The constant growth of diagnostic instruments is primarily conditioned by changes in the environment, and is also related to the need to use increasingly sophisticated and effective tools.
Social implications: The conclusions of the analysis concerning the methodology of conducting the research process are reflections on the transformations that have taken place over the years in the management methods, that allow exploring the state of the organization.

Originality/value: Depending on the subject matter the researcher has undertaken in his or her scientific work, some of these factors do not necessarily have to be reflected and diminish its importance in science and practice. These factors are determinants that allow assessing the quality of the conducted research process. The notion of the quality of the research process in management sciences is understood as the possibility of verifying the degree of realization and coherence of the goals of the work with the research problem and conclusions described in it.

Keywords: Research process quality, research methodology, research methods and techniques.

1. Introduction

Dynamic changes in the organization's environment force companies to integrate, develop and reconfigure their internal and external competencies in order to respond to a rapidly changing environment (Teece et al., 1997). These capabilities are particularly important where innovation is equated with creative destruction of existing competencies. Examples of dynamic capabilities offered within the branch-related literature include responding to market needs, rapid and flexible product innovation, technological capabilities and R&D intensity (Karna et al., 2016). However, the current theoretical framework focusses only on what companies are doing and not why they are doing it (O'Leary and Hunt, 2016; Petrova, 2018).

A rapid introduction of new, recommended management-related concepts and methods, as well as their fast rejection resulted in negative organisational changes (Coghlan and Shani, 2016; Harrington, 2016). It would be difficult to identify the reasons why the applied methods were ineffective. Was the failure triggered by an inadequate method used for a management process or by its unskilful implementation (Dźwigoł, 2018).

It needs to be stated that, in spite of critical views, both management sciences and their methods and methodology result in the improved effectiveness and competitiveness of companies. However, it needs to be mentioned that management methods are not and cannot be of universal character. The methods must be changed as the times goes by, as the company changes over the years (Punch, 2016; Quian, 2018).

In modern management science, research and analyses focus mainly on the quality of the research process. The latter influences the accuracy and quality of decisions taken. The difference between the modern and traditional approach is significant. In the traditional approach to the management (in particular with reference to research processes) the main stress is put on finding answers to the following questions:

- Which elements – of an organisation, process, etc. are not working properly?
- Which elements should be regarded as inappropriate?
- What are the reasons for that?

The traditional approach does not always allow achieving satisfactory results; what is more, it does not always result in improving the existing situation. Within the scope of the contemporary approach, various types of principles, procedures or tools are elaborated. They allow, contrary to the traditional approach, enhancing the knowledge of the existing problem situation (Ares and Varela, 2018; Dźwigoł et al., 2020a, 2020b; Dementyev and Kwilinski, 2020; Dźwigoł and Dźwigoł-Barosz, 2020; Kharazishvili et al., 2020; Kwilinski et al., 2020; Boiko et al., 2019; Chygryn et al., 2020; Czyżewski et al., 2019; Cyfert et al., 2020; Czakon et al., 2020; Dalevska et al., 2019; Dyduch, 2019a, 2019b; Gorynia, 2019; Gorynia et al., 2019; Klimas et al., 2020; Kwilinski 2017, 2018a, 2018b, 2018c, 2019; Kwilinski et al., 2019a, 2019b, 2019c; Lakhno et al., 2018; Miskiewicz, 2018, 2019, 2020; Miśkiewicz and Wolniak, 2020; Pająk et al., 2016, 2017; Saługa et al., 2020; Savchenko et al., 2019; Tkachenko et al., 2019a, 2019b, 2019c, 2019d; Trąpczyński et al., 2019; Yakubovskiy et al., 2017; Zastempowski, 2020). To this end, one may adopt the following perspective – the Positive Organizational Scholarship (SOP). Upon its implementation, one needs to pose a basic question, i.e.: Why are some employees so ineffective? Then, the following questions are asked:

- Why is it so?
- What are the reasons for such a phenomenon?

As a result of the applied SOP perspective, one will find an answer to the following question – what needs to be done to achieve the desired state, i.e. what needs to be done to be good at something and how to achieve perfection.

In the literature on management sciences, the necessity to apply numerous self-verifying and self-correcting methods has been highlighted many a time (Denzin, 1970; Harrington, 2016). Furthermore, there occurred a phenomenon of methodological pluralism. It has advocated that in order to solve a research problem, one should be ready to apply research methods derived from various disciplines and theoretical approaches. It means that 'the multitude of ways in which the world is perceived shall be combined with multitude and diversity of ways, methods, evaluation techniques, and attempts to transform the world.' However, it very often causes anarchism and methodological eclecticism. With reference to the foregoing, in order to achieve reliable research results, it is necessary to analyse in details a research problem, and consequently select such research methods that would facilitate the avoidance of the above-mentioned phenomena.

Conclusions derived from an ongoing analysis of national and foreign literature dealing with methodology of conducting a research process (Boland et al., 2017) show a deficit in empiric approaches to the quality of research processes, where, as a result of transformations over several years in management methods, it is difficult, as early as at the stage of defining a research problem, to select just one method that would allow diagnosing a problem fully and comprehensively. That is why the research, as determined in the article, is aimed at selecting factors that would influence the quality of the research process, as an element supporting the ongoing methodology-related approaches.

2. Research method

Conclusions derived from an ongoing analysis of literature dealing with the methodology of conducting a research process showed a deficit in empiric approaches to the quality of research processes. Thus, the research problem is formulated as follows: What factors determine the quality of the research process in management sciences? In view of the above, the following main objective has been undertaken in the paper: to identify the factors influencing the quality of the research process as a complementary element of the existing methodological approaches.

As a result of the set goal, the research was carried out using an anonymous questionnaire. The research study was carried out from October 2016 to April 2018.

The structure of the questionnaire in the research part involved both open, rank questions, and questions based on the 5-point Likert scale. Within the scope of the latter, the respondents were obliged to classify a particular answer as strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), strongly disagree (1), with reference to each of proposed assumptions (Dźwigoł, 2018).

The research covered theoreticians of management sciences, being a target group. The group consisted of:

- 272 foreign universities having faculties and/or units dealing with management sciences,
- 21,024 foreign academic staff connected to the management sciences,
- 93 national universities having faculties and/or units dealing with management sciences,
- 2,307 national academic staff connected with the management sciences,
- 52 foreign companies,
- 183 national companies.

The size of a research sample, necessary to determine a representative character of the research, was determined on the basis of the following assumptions:

- the p fraction ratio was set to 50%,
- the amount of an error related to the fraction ratio was set to 5%,
- statistical significance $\alpha = 0.05$.

On the basis of the above-mentioned assumptions, the requested sample size formula will be simplified, and look as follows (Kukuła, 2007):

$$n_p = \frac{u_\alpha^2 * p(1-p)}{b_p^2} = \frac{u_\alpha^2}{4b_p^2} = \frac{1.96^2}{4 * 0.05^2} = 384.16$$

where:

n_p – requested sample size,

u_α – the amount of cumulative normal distribution derived from statistical tables,

p – fraction ratio,

b – the size of the fraction ratio error.

As a result of the research effort, 401 representatives of management science theorists were surveyed, thus the condition determining the representative character of the research sample was met.

In the surveyed group of scientists, Polish universities amounted to 32%, whereas foreign universities accounted for 33%. As to the remaining part of the research group (35%), no academic unit was indicated. The most common areas of sciences in which the researchers were involved where, among others: strategic management, company management, knowledge and innovation management, as well as methodics of the research on organisations.

In order to assess factors that determine the quality of research processes in management sciences, one applied a commonly used method of principal component analysis (PCA), also known as factor analysis (Trajer, Paszek, Iwan, 2012). The main aim of conducting the factor analysis was to identify all factors being directly correlated to a given set of variables, while maintaining, at the same time, the greatest amount of information contained in initial variables, which was then followed by their reduction.

A statistical analysis of results was conducted by means of a statistical programme named Statistica 13 (statsoft.pl). The software in question has been in widespread use for the analysis of statistical data (Malska, 2017; Fojud et al., 2017).

3. Research results

The analysis of research results included their preparation using descriptive statistics tools. It should be emphasized that the obtained results are preliminary in nature and are the basis for further in-depth research, which is the subject of other studies.

In compliance with method-related assumptions, referring to the fulfilment of basic requirements for carrying out the factor analysis, one should take the following steps, destined to prove that the method in question was correctly selected:

- Verification of a number of variables against a number of respondents taking part in the study,
- The Bartlett test (of sphericity),
- The KMO and MSA measures.

In the beginning, the condition referring to the number of observations and variables was studied. In the case in question, 33 variables and 401 surveyed respondents were analysed, which means that the condition was met.

For the purpose of performing the Bartlett test, the following zero hypothesis (H_0) and alternative hypothesis (H_1) were applied):

H_0 – the matrix containing variable correlations is a unit matrix.

H_1 – the matrix containing variable correlations is not a unit matrix.

Table 1.
The Bartlett test (of sphericity) results are relevant when $p < 0.05$). The author's own study

Empirical Chi^2	Levels of freedom	p-value	Theoretical Chi^2
4830.79	528	< 0.001	582.56

Since the empirical chi^2 exceeds the theoretical chi^2, the zero hypothesis is rejected in favour of the alternative hypothesis. It therefore transpires that variables can be subject to the factor analysis. The KMO Measure (Kaiser-Meyer-Olkin Measure of Sampling Adequacy), in the covered study, amounts to 0.835. Analysing the results obtained, the MSA (Measure of Sampling Adequacy) was additionally checked. After the analysis, it can be concluded that each of the questions meets the MSA measurement threshold mentioned above.

Table 2.
Results of the MSA analysis. The author's own study

Question	Variable number	MSA reference
Is the *Management science* discipline destined to support practical aspects of the economic life?	P1	0.850
Should a researcher provide models of effective organisation- and management-related solutions?	P2	0.805
Should a researcher provide methods to implement models of effective solutions?	P3	0.818
Is it necessary that the research studies, carried out within the scope of the *Management science* discipline, be practically and theoretically set?	P4	0.869
Is the instability of statements the main drawback connected with the *Management science*?	P5	0.852
Does the research cover, in most cases, those variables which depend on various conditions: operating conditions, weather and environmental conditions, legal or social conditions, etc?	P6	0.883
Does the complexity of research objects (e.g. companies) have a negative impact on the credibility of research findings?	P7	0.846
Does the application of qualitative factors, difficult to measure, affect the quality of a research process?	P8	0.817
Are the advocated and applied methods assessed differently by management theorists and practitioners?	P9	0.790

Cont. table 2.

Are there any problems in terms of verifiability of findings of research studies, carried out in the *Management science* discipline?	P10	0.786
Should the co-operation between science and business practice be of strategic character in the process of managing a modern company?	P11	0.873
In the *Management sciences*, does the time between posing a problem, analysing and finding a solution to the problem, and implementing the said solution have a negative impact on the effectiveness of the solution?	P12	0.909
Is there universalism of elaborated concepts, solutions to problems in the *Management sciences*?	P13	0.794
Is the methodological triangulation a prerequisite in research processes?	P14	0.802
Should qualitative methods in research processes be completed with case studies?	P15	0.865
Is it necessary, in order to make the research reliable, to verify the elaborated methods, procedures and models in practice?	P16	0.860
Can pilot studies affect the direction of a research process?	P17	0.875
Is it necessary to create a model, procedure, tool or approach for the sake of a research process?	P18	0.885
Is it possible for a researcher to match chosen methods to the character of the research study in question?	P19	0.701
Does a researcher have an impact on combining qualitative and quantitative methods in a research process?	P20	0.720
Do pilot studies affect the course of a research process?	P21	0.862
Does the elaboration of models, procedures, tools or approaches in the research process guarantee the credibility of results?	P22	0.884
Is it necessary to elaborate assumptions in order to create research methodics?	P23	0.884
Do the recommendation for management science and practice, elaborated on the basis of research results, improve the quality of science and practice?	P24	0.845
Does the elaborated model, procedure, tool or approach to the methods selected for a research process considerably affect the quality and application of research results?	P25	0.823
Is it necessary, upon determining the research problem, to analyse selected qualitative and quantitative methods, in order to make a preliminary selection?	P26	0.840
Are pilot studies an integral component of each research process?	P27	0.801
Is the verification of elaborated methods, models or procedures a prerequisite to combine management science and practice?	P28	0.856
Does the methodological triangulation support research processes?	P29	0.843
Does a case study allow to perform an in-depth analysis of a research process?	P30	0.813
Should the expert group assessment be regarded as a basic method of evaluating trends of the carried-out research?	P31	0.849
Is it important to carry out observations of research studies in natural conditions, in which a researcher co-operates with researched subjects?	P32	0.794
What is the importance of observation-interventions conducted with the scope of managerial activity in the researched subjects, whereas a researcher can directly influence the decisions taken?	P33	0.766

In this particular case, the research process is the central variable. On the basis of the presented results, 8 factors have been identified that meet the mentioned Kaiser criterion and it was concluded that this number is sufficient to illustrate the problem.

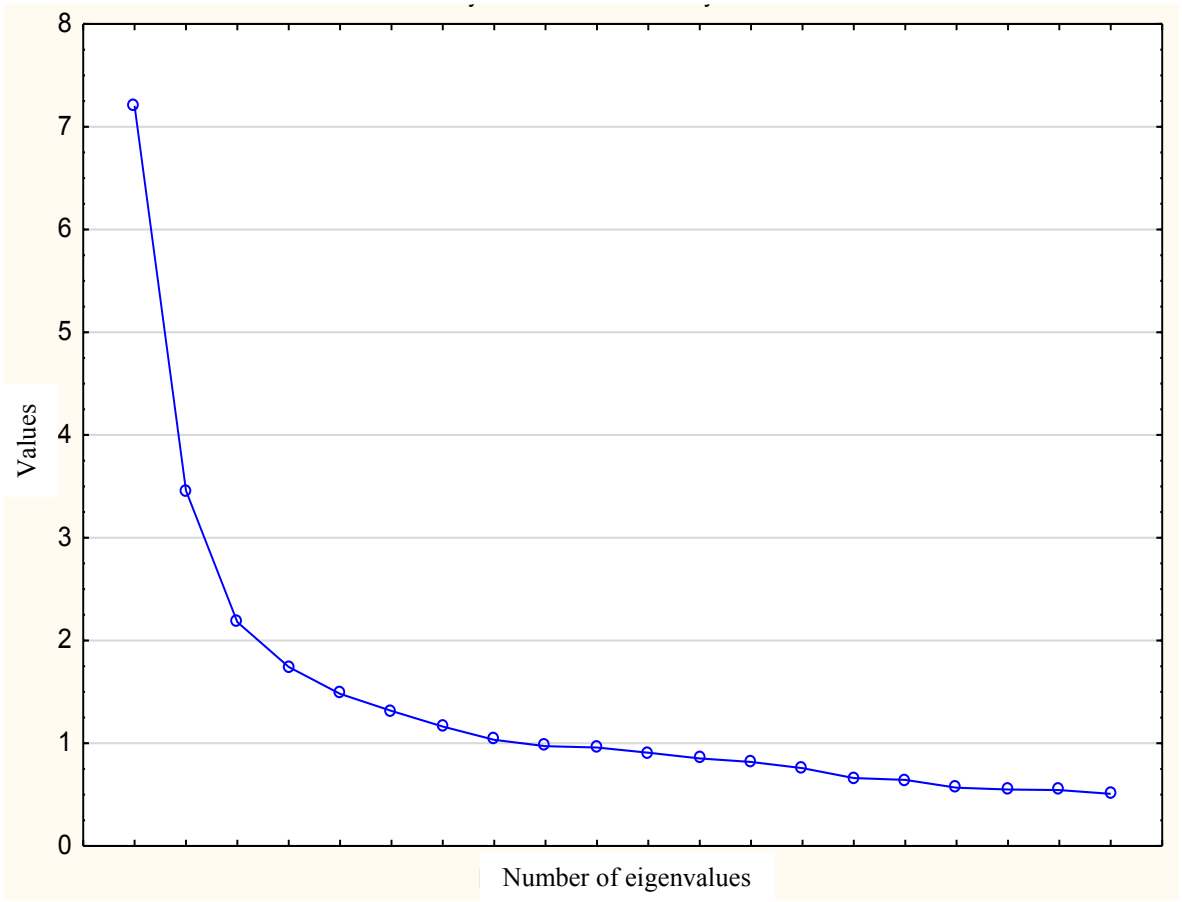


Figure 1. The Scree Chart for variables under research. The author's own study.

In the analysed case, the factor rotation was performed with the use of the EQUAMAX method which allows distributing, in a uniform way, a variance between factors. The method also reduces the number of factors required for the sake of explaining variances. The threshold loading was set to 0.5. In the case in question, by means of 8 defined factors, one is able to explain 59.32% of the research process.

1. Application and purposefulness in practice (P1-P4) – the factor understood as an opportunity to fulfil a scientific target, i.e. opportunity to implement the research process in question into the operation of companies and real economic life.
2. Impact of diversity of problems onto the process (P5-P8; P11; P30) – the factor understood as an answer to the question how the selected research problem will determine further research actions?
3. Influence of a researcher (P19-P21) – the factor that associates with the scope of free decisions taken by the researcher while dealing with a problem.
4. Unique character of a scientific discipline (P9-P10) – the factor shows differences in how practitioners and theoreticians evaluate the selected methods, which makes it difficult to assess, in an objective way, the verifiability of the conducted research studies.

5. Importance of observations (P32-P33) – the factor shows the impact of two types of observation. The first type of observation deals with the opportunity to co-operate with other entities, the second types involves, the so-called observation followed by a possible intervention.
6. Completeness of the process (P24-P26) – the factor is understood as an opportunity to divide the research process into stages that form a complementary whole, i.e.: combining qualitative and quantitative methods, elaborating a unique tool, model, approach to the way a method or procedure is selected, indicating recommendations as to scientific and practical aspects.
7. A type of a supported process (P15; P17; P21) – the factor is understood as an impact on the course and management of the research process by means of pilot studies and case studies.
8. The need for triangulation and universalism of the conducted research (P13; P14) – the factor shows, to a certain extent, a forced requirement for the management sciences to develop. However, a failure in meeting the requirements does not necessarily mean a failure in finding an original solution to the research problem.

4. Summary and research conclusions

The aim of the article was to determine factors that would influence the quality of a research process, as an element that supplements currently used methodology-related approaches. As a result of research efforts, including conducted empirical studies, the main aim hereof and detailed aims were achieved. Upon the achievement of the aims and finding answers to research question, one was able to positively verify the adopted hypothesis.

Findings derived from the analysis of foreign and national literature on the methodology of conducting a research process include thoughts on transformations occurring over the years. The transformations covered the management methods which allowed analysing conditions of organisations. The management methodology is constantly expanding by new methods, the latter being of diverse cognitive and practical effectiveness. A constant growth of diagnostic instruments has been dependent, mainly, on changes occurring in the environment; moreover, it is connected to the need to make use of more sophisticated and effective tools.

On the basis of the factor analysis, eight factors were identified. The factors, determining the quality of research processes, are as follows:

1. Practical application and purposefulness.
2. Influence of diverse research problems on the process.
3. Influence of a researcher on the research process.
4. Unique character of a scientific discipline.

5. Importance of observations.
6. Completeness of the process.
7. Process assistance type.
8. Need for triangulation and universalism.

It needs to be borne in mind that, depending on a subject covered in doctoral or post-doctoral theses, some of the above-mentioned factors do not necessarily have to be reflected in science or practice, nor should their importance be ignored. The above-mentioned factors allow evaluating the quality of the research process in question. The notion of the quality of the research process in management sciences should be understood as an opportunity to verify a level of execution and coherence of aims of theses with research problems and conclusions contained therein.

References

1. Ares, G. and Varela, P. (Eds.) (2018). *Methods in Consumer Research, Volume 2: Alternative Approaches and Special Applications*. Duxford: Woodhead Publishing, Elsevier.
2. Boiko, V., Kwilinski, A., Misiuk, M., & Boiko, L. (2019). Competitive Advantages of Wholesale Markets of Agricultural Products as a Type of Entrepreneurial Activity: The Experience of Ukraine and Poland. *Economic Annals – XXI, 175(1-2),* 68-72. https://doi.org/10.21003/ea.V175-12.
3. Boland, A., Cherry, G. and Dickson, R. (Eds.) (2017). *Doing a Systematic Review: A Student's Guide*. London: Sage.
4. Chygryn, O., Bilan, Y., & Kwilinski, A. (2020). Stakeholders of Green Competitiveness: Innovative Approaches for Creating Communicative System. *Marketing and Management of Innovations, 3,* 356-368. https://doi.org/10.21272/mmi.2020.3-26.
5. Coghlan, D. and Shani, A.B. (Eds.) (2016). *Action Research in Business and Management (Fundamentals of Applied Research)*. London: Sage.
6. Cyfert, S., Glabiszewski, W., Krzakiewicz, K., & Zastempowski, M. (2020). The Importance of Dynamic Capabilities in the Processes of Alignment of Chemical Industry Enterprises to Changes in the Environment. *Przemysł Chemiczny, 99(6),* 2020, 953-956.
7. Czakon, W., Kawa, A., Scott, S. (2020). Network Orientation of Logistics Service Providers: The Construct, Dimensionality and Measurement Scale. *International Journal of Logistics Research and Applications, 23(5),* 474-492. https://doi.org/10.1080/13675567.2019.1705260.

8. Czyżewski, B., Matuszczak, A., & Miskiewicz, R. (2019). Public Goods Versus the Farm Price-Cost Squeeze: Shaping the Sustainability of the EU's Common Agricultural Policy. *Technological and Economic Development of Economy, 25(1),* 82-102. https://doi.org/10.3846/tede.2019.7449
9. Dalevska, N., Khobta, V., Kwilinski, A., & Kravchenko, S. (2019). A Model for Estimating Social and Economic Indicators of Sustainable Development*, Entrepreneurship and Sustainability Issues, 6(4),* 1839-1860. https://doi.org/10.9770/jesi.2019.6.4(21)
10. Dementyev, V.V., & Kwilinski, A. (2020). Institutional Component of Production Costs. *Journal of Institutional Studies, 12(1),* 100-116. https://doi.org/10.17835/2076-6297.2020.12.1.100-116.
11. Denzin, N. (1970). *The Research Act: Theorethical Introduction to Sociological Methods*. Chicago: Aldine.
12. Dyduch, W. (2019). Entrepreneurial Strategy Stimulating Value Creation: Conceptual Findings and Some Empirical Tests. *Entrepreneurial Business and Economics Review, 7(3),* 65-82. https://doi.org/10.15678/EBER.2019.070304.
13. Dyduch, W. (2019). Organizational Design Supporting Innovativeness. *Przegląd Organizacji, 6,* 16-23. https://doi.org/10.33141/po.2019.06.02.
14. Dźwigoł, H. (2018). *Modern Research Processes in Management Sciences. Methodological and Methodical Conditions, in Polish* [*Współczesne procesy badawcze w naukach o zarządzaniu. Uwarunkowania metodyczne i metodologiczne]*. Warszawa: PWN.
15. Dźwigoł, H. (2019a). Research Methods and Techniques in New Management Trends: Research Results. *Virtual Economics, 2(1),* 31-48. https://doi.org/10.34021/ve.2019.02.01(2).
16. Dźwigoł, H. (2019b). The Concept of the System Approach of the Enterprise Restructuring Process. *Virtual Economics, 2(4),* 46-70. https://doi.org/10.34021/ve.2019.02.04(3).
17. Dźwigoł, H. (2020a). Innovation in Marketing Research: Quantitative and Qualitative Analysis. *Marketing and Management of Innovations, 1*, 128-135. http://doi.org/10.21272/mmi.2020.1-10.
18. Dźwigoł, H. (2020b). Methodological and Empirical Platform of Triangulation in Strategic Management. *Academy of Strategic Management Journal,* 19(4), 1-8.
19. Dźwigoł, H. (2020c). Interim Management as a New Approach to the Company Management. *Review of Business and Economics Studies, 8(1),* 20-26. https://doi.org/10.26794/2308-944X-2020-8-1-20-26.
20. Dźwigoł, H., & Dźwigoł-Barosz, M. (2018). Scientific Research Methodology in Management Science. *Financial and Credit Activity: Problems of Theory and Practice, 2(25),* 424-437. https://doi.org/10.18371/fcaptp.v2i25.136508.
21. Dźwigoł, H., & Dźwigoł-Barosz, M. (2020). Sustainable Development of the Company on the Basis of Expert Assessment of the Investment Strategy. *Academy of Strategic Management Journal, 19(5),* 1-6.

22. Dźwigoł, H., & Wolniak, R. (2018). Controlling in the management process of a chemical industry production company [Controlling w procesie zarządzania chemicznym przedsiębiorstwem produkcyjnym]. *Przemysł Chemiczny, 7,* 114933. https://doi.org/10.15199/62.2018.7.15.
23. Dźwigoł, H., Dźwigoł-Barosz, M., & Kwilinski, A. (2020b). Formation of Global Competitive Enterprise Environment Based on Industry 4.0 Concept. *International Journal of Entrepreneurship, 24(1),* 1-8.
24. Dźzwigoł, H., Dźwigoł-Barosz, M., Miskiewicz, R., & Kwilinski, A. (2020a). Manager Competency Assessment Model in the Conditions of Industry 4.0. *Entrepreneurship and Sustainability Issues, 7(4),* 2630-2644. https://doi.org/10.9770/jesi.2020.7.4(5).
25. Dźwigoł, H., Dźwigoł-Barosz, M., Zhyvko, Z., Miśkiewicz, R., & Pushak H. (2019a). Evaluation of the Energy Security as a Component of National Security of the Country. *Journal of Security and Sustainability Issues, 8(3),* 307-317. https://doi.org/10.9770/jssi.2019.8.3(2).
26. Dźwigoł, H., Shcherbak, S., Semikina, M., Vinichenko, O., & Vasiuta, V. (2019b). Formation of Strategic Change Management System at an Enterprise. *Academy of Strategic Management Journal, 18*(SI1), 1-10.
27. Fojud, A., Boniecki, P., Zaborowicz, M., Lisak, D., Ślósarz, P., Stanisz, M., Strzeliński, P. and Konieczny, A. (2017). Project of a computer system supporting extraction of the characteristics of pork half-carcases. *Journal of Research and Application in Agricultural Engineering, 62(3),* 87-92.
28. Gerring, J. (2017). *Case Study Research: Principles and Practices (Strategies for Social Inquiry)*. New York: Cambridge University Press.
29. Gorynia, M. (2019). Competition and Globalisation in Economic Sciences. Selected Aspects. *Economics and Business Review, 5(3),* 118-133. https://doi.org/10.18559/ebr.2019.3.7.
30. Gorynia, M., Trąpczyński, P., & Bytniewski, S. (2019). The Concepts of Strategy and Business Models in Firm Internationalization Research: Towards a Research Agenda. *International Entrepreneurship Review, 5(2),* 7-21. https://doi.org/10.15678/ier.2019.0502.01.
31. Harrington, H.J. and Voehl, F. (Eds.) 2016. *The Innovation Tools Handbook, Volume 1: Organizational and Operational Tools, Methods, and Techniques that Every Innovator Must Know*. USA, Boca Raton, FL: CRC Press.
32. Karna, A., Richter, A., and Riesenkampff, E. (2016). Revisiting the role of the environment in the capabilities-financial performance relationship: a meta-analysis, *Strategic Management Journal, 37,* 1154-1173.
33. Kharazishvili, Y., Kwilinski, A., Grishnova, O., Dzwigol, H. (2020). Social Safety of Society for Developing Countries to Meet Sustainable Development Standards: Indicators,

Level, Strategic Benchmarks (with Calculations Based on the Case Study of Ukraine). *Sustainability, 12(21),* 8953. https://doi.org/10.3390/su12218953.

34. Klimas, P., Czakon, W., Kraus, S., Kailer, N., & Maalaoui, A. (2020). Entrepreneurial Failure: A Synthesis and Conceptual Framework of its Effects. *European Management Review.* https://doi.org/10.1111/emre.12426.
35. Kwilinski, A. (2017). Development of Industrial Enterprise in the Conditions of Formation of Information Economics. *Thai Science Review, Autumn 2017*, 85-90.
36. Kwilinski, A. (2018a). Trends of Development of the Information Economy of Ukraine in the Context of Ensuring the Communicative Component of Industrial Enterprises. *Economics and Management, 1(77),* 64-70.
37. Kwilinski, A. (2018b). Mechanism of Formation of Industrial Enterprise Development Strategy in the Information Economy. *Virtual Economics, 1(1),* 7-25. https://doi.org/10.34021/ve.2018.01.01(1)
38. Kwilinski, A. (2018c). Mechanism of Modernization of Industrial Sphere of Industrial Enterprise in Accordance with Requirements of the Information Economy. *Marketing and Management of Innovations*, *4*, 116-128. http://doi.org/10.21272/mmi.2018.4-11.
39. Kwilinski, A. (2019). Implementation of Blockchain Technology in Accounting Sphere. *Academy of Accounting and Financial Studies Journal, 23(SI2),* 1-6.
40. Kwilinski, A., Dalevska, N., Kravchenko, S., Hroznyi, I., & Kovalenko, I. (2019a). Formation of the Entrepreneurship Model of E-Business in the Context of the Introduction of Information and Communication Technologies. *Journal of Entrepreneurship Education, 22(SI1),* 1-7.
41. Kwilinski, A., Dzwigol, H., & Dementyev, V. (2020e). Model of Entrepreneurship Financial Activity of the Transnational Company Based on Intellectual Technology. *International Journal of Entrepreneurship, 24(1),* 1-8.
42. Kwilinski, A., Ruzhytskyi, I., Patlachuk, V., Patlachuk, O., & Kaminska, B. (2019b). Environmental Taxes as a Condition of Business Responsibility in the Conditions of Sustainable Development. *Journal of Legal, Ethical and Regulatory Issues, 22(SI2),* 1-6.
43. Kwilinski, A., Volynets, R., Berdnik, I., Holovko, M., & Berzin, P. (2019c). E-Commerce: Concept and Legal Regulation in Modern Economic Conditions. *Journal of Legal, Ethical and Regulatory Issues, 22(SI2),* 1-6.
44. Kwilinski, A., Vyshnevskyi, O., & Dźwigoł H. (2019d). Digitalization of the EU Economies and People at Risk of Poverty or Social Exclusion. *Journal of Risk and Financial Management, 13(7),* 142. https://doi.org/10.3390/jrfm13070142.
45. Lakhno, V., Malyukov, V., Bochulia, T., Hipters, Z., Kwilinski, A., & Tomashevska, O. (2018). Model of Managing of the Procedure of Mutual Financial Investing in Information Technologies and Smart City Systems. *International Journal of Civil Engineering and Technology, 9(8),* 1802-1812.

46. Miśkiewicz, R, Wolniak, R. (2020). Practical Application of the Industry 4.0 Concept in a Steel Company. *Sustainability, 12(14),* 5776. https://doi.org/10.3390/su12145776.
47. Miskiewicz, R. (2018). The Importance of Knowledge Transfer on the Energy Market. *Polityka Energetyczna, 21(2),* 49-62. http://dx.doi.org/10.24425%2F122774.
48. Miskiewicz, R. (2019). Challenges Facing Management Practice in the Light of Industry 4.0: The Example of Poland. *Virtual Economics, 2(2),* 37-47. https://doi.org/10.34021/ve.2019.02.02(2).
49. Miskiewicz, R. (2020). Internet of Things in Marketing: Bibliometric Analysis. *Marketing and Management of Innovations, 3,* 371-381. http://doi.org/10.21272/mmi.2020.3-27.
50. Mooi, E., Sarstedt, M. and Mooi-Reci, I. (2018). *Market research. The process, data, and methods using stata*. Singapore: Springer Nature.
51. O'Leary, Z. and Hunt, J.S. (2016). *Workplace Research: Conducting small-scale research in organizations*. London: Sage.
52. Pająk, K., Kamińska, B., & Kvilinskyi, O. (2016). Modern Trends of Financial Sector Development under the Virtual Regionalization Conditions. *Financial and Credit Activity: Problems of Theory and Practice, 2(21),* 204-217. https://doi.org/10.18371/fcaptp.v2i21.91052.
53. Pająk, K., Kvilinskyi, O., Fasiecka, O., & Miskiewicz, R. (2017). Energy security in regional policy in Wielkopolska region of Poland. *Economics and Environment, 2(61),* 122-138.
54. Petrova, V.M. (Eds.) (2018). *Advances in Engineering Research*. New York: Nova Science Pub Inc.
55. Punch, K.F. (2016). *Developing Effective Research Proposals*. London: Sage.
56. Quian, D. (2018). *Adaptive Control: Methods, Applications and Research*. New York: Nova Science Publishers, Inc.
57. Saługa, P.W., Szczepańska-Woszczyna, K., Miśkiewicz, R., & Chłąd, M. (2020). Cost of Equity of Coal-Fired Power Generation Projects in Poland: Its Importance for the Management of Decision-Making Process. *Energies, 13(18),* 4833, https://doi.org/10.3390/en13184833.
58. Savchenko, T., Basiurkina, N., Rodina, O., & Kwilinski, A. (2019). Improvement of the Assessment Methods of Product Competitiveness of the Specialized Poultry Enterprises. *Management Theory and Studies for Rural Business and Infrastructure Development, 41(1),* 43-61, https://doi.org/10.15544/mts.2019.05.
59. Sloan, L. and Quan-Haase, A. (Eds.) (2017). *The SAGE Handbook of Social Media Research Methods*. London: Sage.
60. Teece, D.J., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18(7),* 509-533.
61. Tkachenko, V., Kwilinski, A., Kaminska, B., Tkachenko, I., & Puzyrova, P. (2019d). Development and Effectiveness of Financial Potential Management of Enterprises in

Modern Conditions. *Financial and Credit Activity: Problems of Theory and Practice, 3(30),* 85-94. https://doi.org/10.18371/fcaptp.v3i30.179513.

62. Tkachenko, V., Kwilinski, A., Klymchuk, M., & Tkachenko, I. (2019b). The Economic-Mathematical Development of Buildings Construction Model Optimization on the Basis of Digital Economy. *Management Systems in Production Engineering, 27(2),* 119-123. http://doi.org/10.1515/mspe-2019-0020.
63. Tkachenko, V., Kwilinski, A., Korystin, O., Svyrydiuk, N., & Tkachenko I. (2019a). Assessment of Information Technologies Influence on Financial Security of Economy. *Journal of Security and Sustainability, 8(3),* 375-385. http://doi.org/10.9770/jssi.2019.8.3(7).
64. Tkachenko, V., Kwilinski, A., Tkachenko, I., & Puzyrova, P. (2019c). Theoretical and Methodical Approaches to the Definition of Marketing Risks Management Concept at Industrial Enterprises. *Marketing and Management of Innovations,* 2, 228-238. http://doi.org/10.21272/mmi.2019.2-20.
65. Trajer, J., Paszek, A. and Iwan, S. (2012). *Zarządzanie wiedzą*. Warszawa: PWE.
66. Trąpczyński, P., Gorynia, M., Nowak, J., Wolniak, R. (2019). EU Countries from Central and Eastern Europe, and the Investment Development Path Model: A New Assessment. *Argumenta Oeconomica, 2(43),* 385-406. https://doi.org/10.15611/aoe.2019.2.16.
67. Yakubovskiy, M., Liashenko, V., Kamińska, B., & Kvilinskyi, O. (2017). Economy Modernization of Industrial Regions (Based on the Example of Ukraine). In P. Głowski, & O. Kvilinskyi (Eds.), *Economic Transformation in Ukraine: Comparative Analysis And European Experience* (pp. 12-29). Warsaw: Consilium Sp. z o.o.
68. Zastempowski, M., Glabiszewski, W., Krukowski, K., Cyfert, S. (2020). Technological Innovation Capabilities of Small and Medium-Sized Enterprises. *European Research Studies, 23(3),* 460-474.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

RESEARCH METHODS AND TECHNIQUES IN MANAGEMENT PRACTICE IN THE ERA OF INDUSTRY 4.0

Henryk DŹWIGOŁ

Silesian University of Technology, Gliwice, Poland; London Academy of Science and Business, London, United Kingdom; Sumy State University, Sumy, Ukraine; henryk.dzwigol@poczta.fm, ORCID: 0000-0002-2005-0078

Purpose: The aim of the article was to indicate research methods and techniques used in management practice while taking into account the assumptions of Industry 4.0.
Design/methodology/approach: In order to identify research methods and techniques, the author of the article made use of a survey questionnaire addressed to practitioners who were his target group: 52 foreign companies, 183 domestic companies. As a result of the research effort undertaken, the answers of 118 representatives of management science practitioners were analysed.
Findings: The conclusions of the research indicated that the most important methods, according to management practitioners, were: observation, interview and documentation analysis. However, the most frequently used research techniques in practice include: analysis of business opinions, a probation period at the workplace, situation-related interview, knowledge test in a specific field, task-related behaviour samples, task skills test and analysis of informal client opinions.
Research limitations/implications: At the stage of defining a research problem, it is now difficult to choose a single method that provides a complete and thorough diagnosis of the problem. It is, therefore, necessary to use a variety of research methods which provide a comprehensive response to the research problem posed.
Practical implications: Optimization of strategic decision-making processes will depend on the situation the company is in. In a crisis situation, the most important thing is to make quick decisions triggering actions that would improve the company's competitive edge. That requires undertaking actions 'in parallel', i.e. not only reacting to the problems resulting from the current situation but also solving the issues related to the future, e.g. Industry 4.0, which is considerably difficult.
Social implications: When analysing the obtained results, management practitioners stress that it is necessary to develop a model, procedure, tool, approach to the research process. Moreover, respondents also believe that the developed model, procedure, tool or approach in the selection of methods to the research process significantly affects the quality and practical use of research results.
Originality/value: The analysis of the results clearly indicates the use of research techniques that are close to the task processes of companies and verify the competence of employees. Conclusions resulting from the analysis of national and foreign literature on research process methodology indicate the need to address the problem of using diversified research methods providing a comprehensive response to the problem posed in the context of Industry 4.0.

Keywords: Methods, research techniques, research process, Industry 4.0.

1. Introduction

The methodology of strategic management determines all the principles of its implementation, i.e. logic, language, methods and techniques, instruments. The methodology, in its sense, serves as an intermediary between an object and a subject of strategic management, it constitutes a kind of global tool through which the object of strategic management is influenced by the subject of strategic management (Ansoff et al., 2018). The strategic management system means a coherent set of elements of strategic management, structured on the basis of a strategic attitude and circumstances, capable of performing the functions of strategic planning, organising, motivating, controlling and other management-related processes (Coleman, and Casselman, 2016). Strategic company management is a dynamic and deliberately targeted process of performing the necessary functions allowing culturally conditioned coordination and synchronization of human work and economical use of economic resources, by shaping their potential, allowing both to take advantage of the opportunities and mitigate the threats occurring or likely to occur in the company's environment (Banker et al., 2018). Contemporary organisations have been struggling with problems resulting directly from changes in their environment. Continuous development and environmental conditions prompt companies to seek new trends and management methods. Taking that into account, research methods and techniques in management sciences are aimed at finding out about rules and principles that govern organisations, and at changing the said organisations for better (Quinlan et al., 2019).

A method can be defined as a conscious and resolute way in which a researcher acts or behaves in order to achieve a defined goal (Dźwigoł, 2019a). A technique, on the other hand, can be defined as an instrument, tool used to solve appearing problems (Dzwigoł, 2019a; 2019b; 2020a; 2020b; 2020c; Dzwigoł, & Wolniak, 2018; Dzwigoł, & Dzwigoł-Barosz, 2018). However, from the practical point of view, it is not easy to distinguish between a method and a technique. Regardless of a researcher’s decision about applying a research method or a research technique, the researcher is always obliged to implement a determined research process (Bryman, 2006; Vaivio et al., 2010). The research process consists of numerous elements; the said elements should be meticulously planned on the basis of continuous choices. The said choices are to be made in consideration of reliability and credibility of research findings (Cooke, 2003).

When analysing the literature on phenomena and problems of interest to the researcher and their subsequent solutions, the researcher must also be subject to the principle of intersubjective verifiability. According to this principle, the results of someone else's research should be verified and checked (Grudzewski, and Hejduk, 2007). Research methodology and selected research methods and techniques within its framework should support the process of management in practice, including for example Industry 4.0 or the crisis.

One cannot discuss the assumptions of Industry 4.0 in isolation from the current crisis situation.

It should be stated that in spite of some criticism, management science and its methods lead to increased efficiency and competitiveness of enterprises. It is worth noting, however, that management methods are not and cannot be universal. These methods must change over time, just as the company does with the time.

Most disciplines of science have separate, relevant and diverse cognitive methods to solve or diagnose a research problem, whereas the management methodology is neither permanent nor universal. Management uses methods specific to other sciences, including psychology, social sciences, statistics, econometrics or economics. Management methodology is a set of reflections on the transformations taking place over the years in management methods, which allows exploring the state in which a company is in. It is constantly being enhanced with new methods characterized by different cognitive and practical efficiency. Continuous development of diagnostic instruments is primarily determined by the changes taking place in the environment.

The literature on management sciences has often stressed the need to use, at the same time, numerous different methods of exploring and developing organisations (Labarca, 2017; Patton, 2002). The literature has also pointed out that there is a need for simultaneous use of many mutually verifying and correcting methods (Koźmiński, 2011). Therefore, the aim of the article is to indicate research methods and techniques used in management practice in the era of Industry 4.0.

2. Industry 4.0 in a changing economic environment

Industry 4.0 – The Fourth Industrial Revolution – a generic concept relating to the concept of 'industrial revolution' in connection with the modern mutual use of automation, data processing and exchange, and manufacturing techniques. By definition, it is an aggregate term for the techniques and principles of value chain organisation that jointly use or apply cyber-physical systems, the internet of things and cloud computing – 2011 Germany (Lee, 2013).

It has been assumed that in the area of Industry 4.0, the company's production system shall consist of an information system and numerically controlled machines that will operate in an autonomous manner and display elements of artificial intelligence (Wittbrodt, Łapuńka). Due to the specific character of production systems in different industries, the term Industry 4.0 cannot, in principle, be generalised. (Kagermann, Wahlster, Helbig, 2013; Lasi, Fettke, Kemper, Feld, Hoffmann, 2014; Schmidt, Härting, Reichstein, Neumaier, Jozinovi, 2015).

Consequently, Industry 4.0 should be considered on a case-by-case basis, according to the needs of the company in question. The implementation of this idea should make it possible to develop intelligent production systems which, in addition to the aforementioned autonomy, will have the properties of self-configuration, self-control or self-repair. Industry 4.0 is currently one of the most frequently discussed topics among practitioners and researchers, making it a priority for many research centres and companies. The concept of Industry 4.0 covers areas which include numerous technologies and related paradigms. The main elements that are closely related to the idea of Industry 4.0 include: industrial internet of things, cloud-based production, intelligent factories, cyber-physical systems or social product development (Hermann, Pentek, Otto, 2015; Dzwigoł, & Dzwigoł-Barosz, 2020; Dzwigoł et al., 2019a; 2019b; 2019c; 2020a; 2020b; Kwilinski, 2017; 2018a; 2018b; 2018c; 2019; Kwilinski et al., 2019a; 2019b; 2019c; 2019d; 2020; Lakhno et al., 2018; Miśkiewicz, 2018; 2019; 2020; Miśkiewicz, & Wolniak, 2020; Tkachenko et al., 2019a; 2019b; Yakubovskiy et al., 2017).

The development of theoretical-methodological aspects of strategic change management in an enterprise under the conditions of 'Industry 4.0' must take into account the current new social, economic and business-related reality. One should try to answer the following question: **Are we able to develop a research methodology and select research methods and techniques to support management in conditions of crisis and Industry 4.0?**

One question that needs to be answered is: what approach, methods and techniques of research should be used in the process of strategic management under conditions of, perhaps, the greatest economic crisis in history and, in addition, to take into account the assumptions of Industry 4.0?

Taking into account the above considerations, an attempt should be made to develop a new strategic management concept, i.e. assumptions for a new concept of strategic management in conditions of crisis and industry 4.0.

It seems necessary to adopt certain assumptions in the process of developing a new concept of strategic management in the context of Industry 4.0.:

- developing new methods of management in crisis conditions,
- developing a new research methodology to support management in practice,
- changes to the process of creating sustainable development assumptions,
- making use of time management in economic processes,
- making use, within the scope of strategic communication, of the following features: communication, automation, robotisation and computerisation as basic factors within the development process,
- searching common areas between natural and artificial intelligence,
- the inclusion of artificial intelligence in strategic change management in the enterprise and economy,
- changes to the process of knowledge management,
- enhancing social participation in the management processes.

In order to optimise the process of making strategic decisions, a modern manager must consider a number of factors taking into account the current situation in which these decisions are made, i.e. the crisis and Industry 4.0. The essence is to select appropriate methods and techniques to support the decision-making process. It is important that these tools and methods are proven in practice, as experimenting in an ever-changing environment may be dangerous from the point of view of the effectiveness of the designed strategy.

3. Research methods

The conclusions of the analysis of national and foreign literature on research methods and techniques in management sciences indicate the need to diagnose the use of methods and techniques in economic practice. Therefore, the research problem is formulated as follows: Which of the research procedures, methods and techniques are used in management practice?

In view of the above, the article raised the following research questions:

1. Which research procedures are used in management practice?
2. Which research methods are used in management practice?
3. Which research techniques are employed in management practice?
4. Is verification of the developed methods, models or procedures a prerequisite for combining learning and management practice?
5. Is it necessary to develop a model, procedure, tool or approach to the research process itself (e.g. procedures supporting the selection of appropriate techniques/methods for a given issue)?

In order to obtain answers to the research questions submitted, the research was conducted by means of an anonymous questionnaire distributed in a paper form sent by traditional mail and by electronic mail to e-mail addresses derived from an e-mail database gathered earlier. The research was conducted in the period from October 2016 to April 2018.

The questionnaire consisted of four parts. The first part included general questions about conducting research and using available methods and techniques in practice (6 questions), the second one was devoted to the importance of using methods and techniques in the research process in the management and quality sciences (2 questions), the third one consisted of questions about improving the level of conducted research processes (4 questions), while the fourth one included demographics (5 questions). The questionnaire consisted mostly of closed questions (8 questions), single or multiple choice, but also open questions (5 questions). They were arranged in the form of a matrix based on the five-point Likert scale (4 questions) (Dźwigoł, 2018).

Quantitative research (questionnaire) was addressed to management science practitioners, being the target group and covering: 52 foreign companies, 183 domestic companies. As a result of the research effort, 196 representatives of management science practitioners were examined. After initial verification, 118 correctly filled-in questionnaires were admitted for further research analysis.

4. Research results

4.1. Which research procedures are used in management practice?

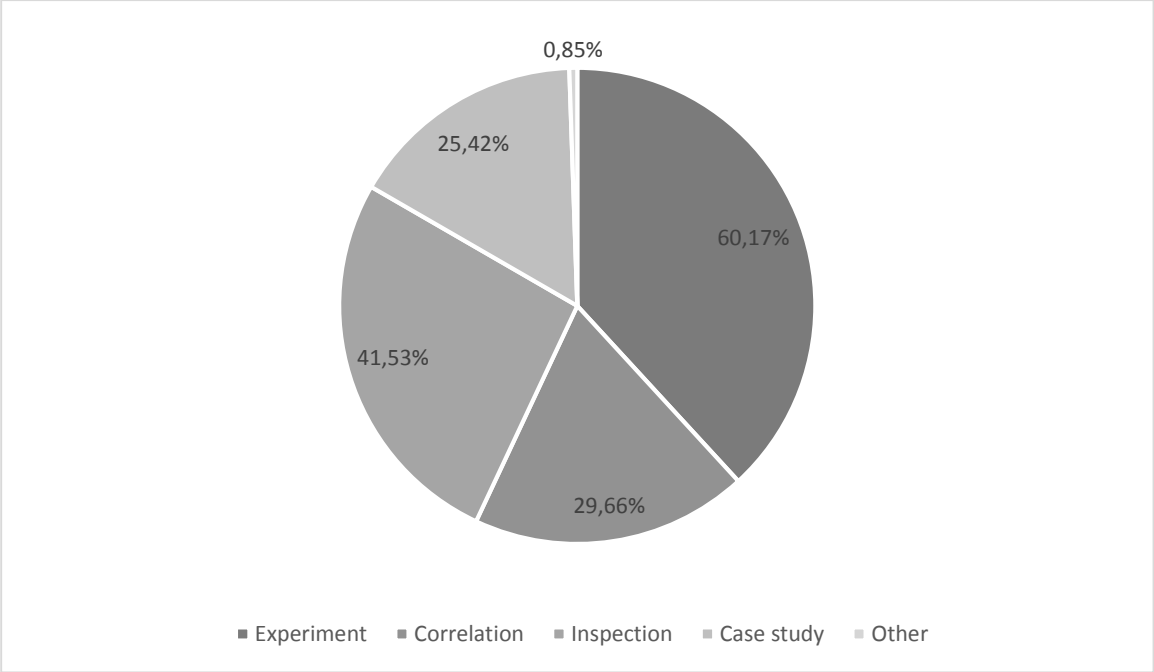


Figure 1. Research procedures employed in management practice. The author's own research.

By analysing the results obtained, it can be unequivocally stated that all the research procedures mentioned are used in economic practice. The above thesis can also be confirmed in the subject-related literature, where it is often indicated that in order to fully and thoroughly diagnose a research problem, it is necessary to apply diversified research methods providing a comprehensive response to the problem. Due to the specific nature of management, it is necessary to use a wide range of tools to identify both universal and specific elements of a given process or area.

Moreover, the introduction of innovative technical solutions in the managed infrastructure requires obtaining optimal knowledge before taking actions, the latter resulting in investment expenditure on a wider scale.

4.2. Which research methods are used in management practice?

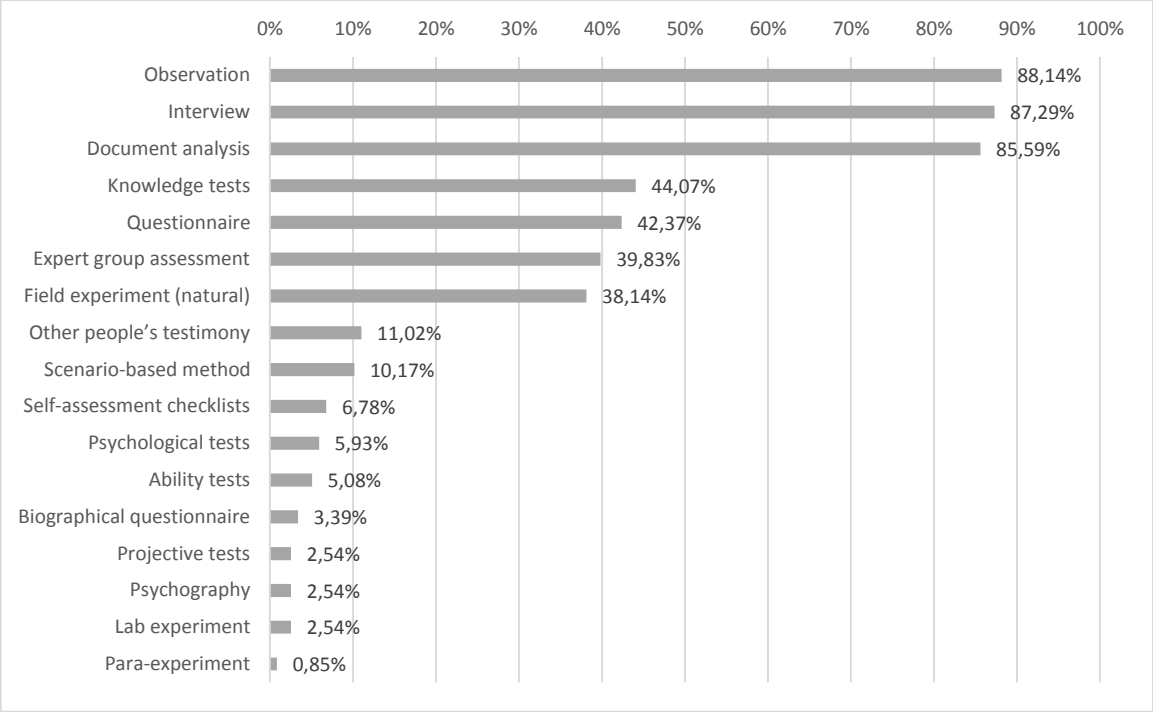


Figure 2. Research methods used in management practice. The author's own research.

When analysing the results obtained, it can be clearly stated that the most frequently used research methods in economic practice are: observation, interview and documentation analysis. Management practitioners indicate that the popularity of these methods is associated with the simplicity of their use. Moreover, the most frequently used methods also include: knowledge test, survey, expert group assessment or field experiment. It should also be emphasized that in the surveyed companies not one, but several research methods are applied. Only such a wide range of research tools and methods makes it possible to match them appropriately to the issues, and find an effective solution.

4.3. Which research techniques are employed in management practice?

The most frequently used research techniques in practice include: analysis of business opinions, probation period at the workplace, situation-related interview, knowledge test in a specific field, task behaviour samples, task skills test and analysis of informal client opinions. The analysis of the results clearly indicates the use of research techniques that are close to the task processes of companies and that verify employees' competencies. Moreover, selected techniques etc. have been, from the practical point of view, empirically verified many a time. The obtained measurement results reflected the actual shape of the examined processes and, what is most important, allowed developing correct conclusions, whereas the latter repeatedly contributed to the optimisation of decision-making processes and business results within the scope of the conducted activity.

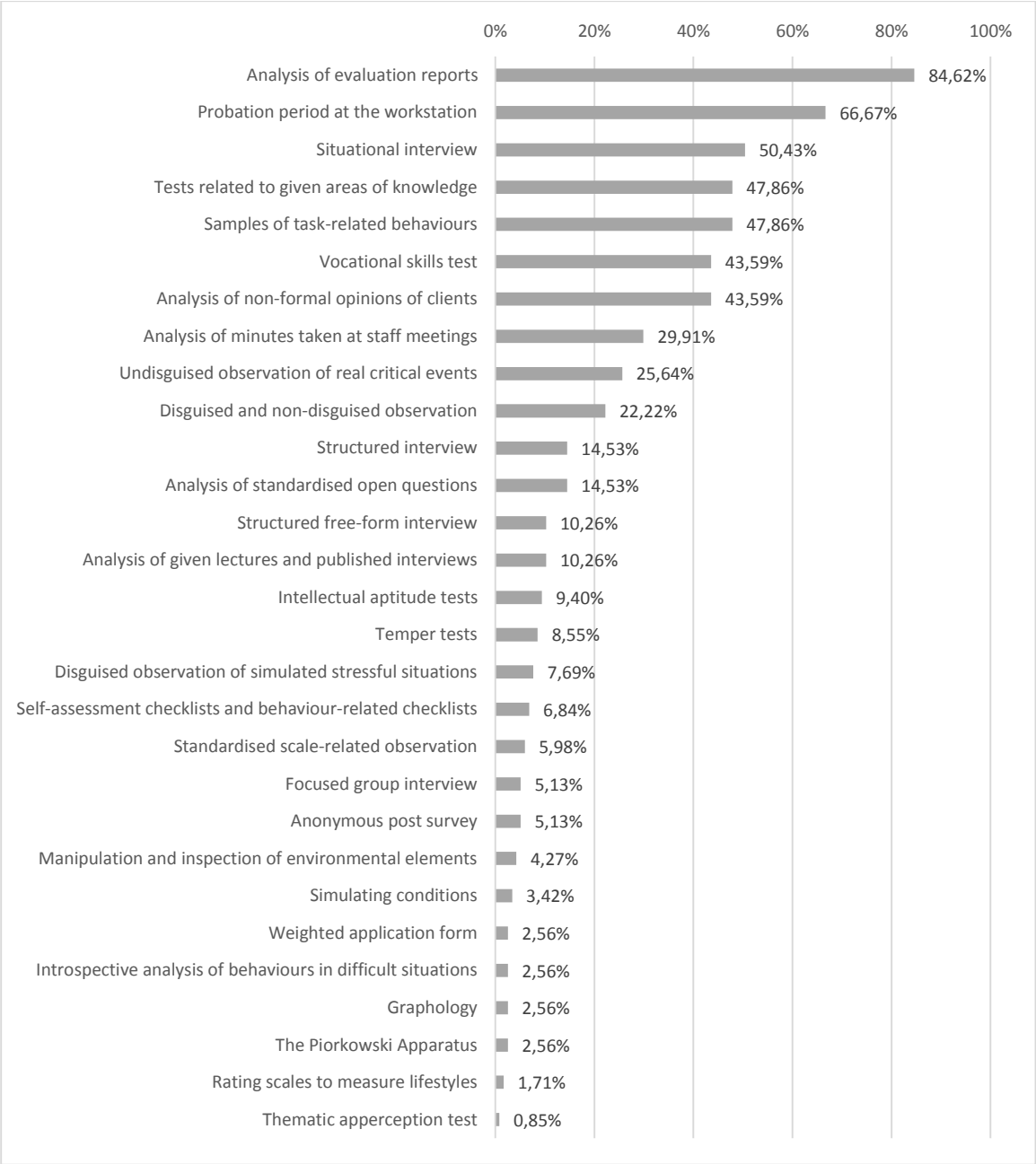


Figure 3. Research techniques used in management practice. The author's own research.

4.4. Is verification of the developed methods, models or procedures a prerequisite for combining learning and management practice?

By analysing the results obtained, it can be unequivocally stated that verification of the developed methods, models or procedures is a necessary prerequisite for combining science and management practice (Dźwigoł et al. 2019). The above thesis can also be confirmed in the subject-related literature, where it is often indicated that in order to fully and thoroughly diagnose a research problem, it is necessary to use diversified research methods providing a comprehensive response to the problem. What's more, the development of heterogeneous cognitive, modelling or organisational management methods implies the need to adopt an open

approach allowing and requiring the combination of multiple approaches and methods, where the verification of both the developed methods, procedures or models in practice is indicated in order to make the research reliable as necessary, and to analyse the selection of chosen methods in terms of the nature of the research before undertaking research work (Thomas 2017; O'Leary 2017).

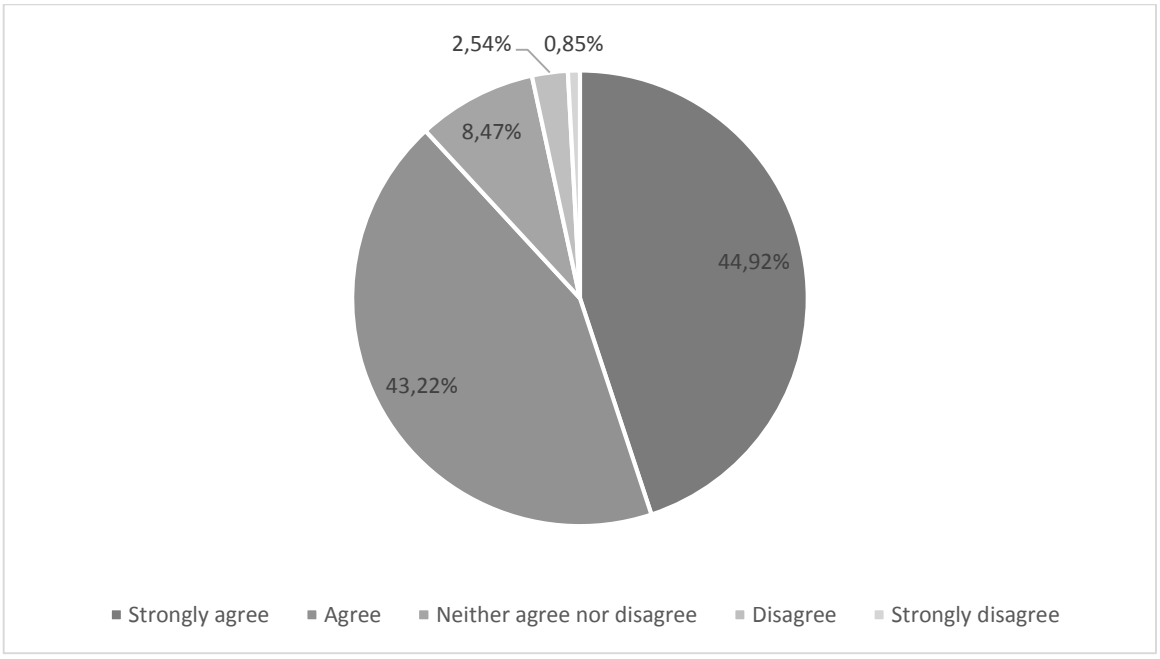


Figure 4. Verification of the developed methods, models or procedures as a prerequisite for combining practical and scientific aspects of management. The author's own research.

4.5. Is it necessary to develop a model, procedure, tool or approach to the research process itself?

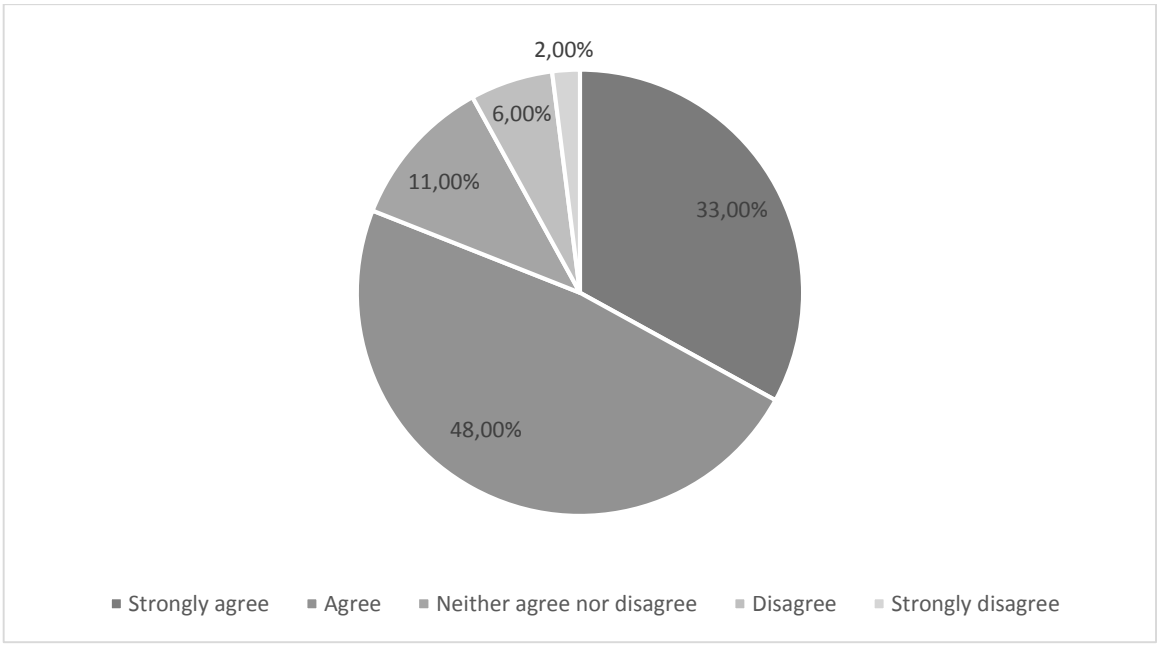


Figure 5. Is it necessary to develop a model, procedure, tool or approach to the research process itself. The author's own research.

When analysing the obtained results, management practitioners stress that it is necessary to develop a model, procedure, tool, approach to the research process. Moreover, respondents also believe that the developed model, procedure, tool or approach as to the selection of methods to the research process significantly affects the quality and practical use of research results.

5. Summary and research findings

The aim of the article was to indicate research methods and techniques used in management practice, taking into account the assumptions of Industry 4.0. Industry 4.0 is not an abstract concept, but real technologies and implementations. Conclusions from the research and literature analysis revealed that the most important methods according to management practitioners are: observation, interview and documentation analysis. In addition, the generally common methods used also include:

- knowledge test,
- survey,
- expert group assessment,
- field experiment.

These are methods to be used in management science. They have also been identified as those that should be used in the research process; however, one should bear in mind that they do not exhaust all the methods that can possibly be used in this area.

Furthermore, it should be pointed out that among the methods that are used in the management sciences, it is possible to identify both methods specific to management only and others, derived from workshops of other sciences. The borrowed methods refer primarily to learning about the organisation and management, while the management's own methods focus on shaping the organisation and management system.

However, the most common techniques used in management practice include:

- analysis of evaluation reports,
- probation period at the workplace,
- situation-related interview,
- test of knowledge in a specific field,
- samples of task-based behaviour,
- task skills test,
- analysis of clients' non-formal opinions.

The analysis of the results clearly indicates the use of research techniques that are close to the task processes of companies and that verify employees' competencies.

The results obtained confirm extensive literature research on research methodology, where it is noted that the use of many different methods in the research process allows for a comprehensive approach to the research problem and provides a more complete picture.

Conclusions from the analysis of national and foreign literature on research process methodology indicate the need to address the problem of using diversified research methods providing a comprehensive response to the problem.

At the point of defining a research problem, it is currently difficult to select a single method that will provide a complete and thorough diagnosis of the problem. It is therefore necessary to use various research methods which provide a comprehensive response to the posed research problem. Moreover, 89% of the surveyed management practitioners believe that there is a need for a developed model, procedure, tool or approach supporting the appropriate selection of methods for the research process.

Optimization of strategic decision-making processes will depend on the situation the company is in. In a crisis situation the most important thing is to make quick decisions triggering actions that would improve the company's competitive edge. That requires undertaking actions 'in parallel', i.e. not only reacting to the problems resulting from the current situation, but also solving the issues related to the future, e.g. Industry 4.0, which is considerably difficult. One should hope that the new research methodology and selected research methods and techniques will be able to support this difficult process.

References

1. Almalki, S. (2016). Integrating Quantitative and Qualitative Data in Mixed Methods Research—Challenges and Benefits. *Journal of Education and Learning, 5(3),* doi:10.5539/jel.v5n3p288.
2. Ansoff, H.I., Kipley, D., Lewis, A.O., Helm-Stevens, R., & Ansoff, R. (2018). *Implanting Strategic Management.* Springer.
3. Banker, R.D., Byzalov, D., Fang, S., & Liang, Y. (2018). Cost management research. *Journal of Management Accounting Research, 30(3),* 187-209.
4. Bryman, A. (2006) Integrating quantitative and qualitative research: How is it done? *Qualitative Research, 6(1),* 3-37, https://doi.org/10.1177/1468794106058877.
5. Coleman, L., & Casselman, R.M. (2016). Optimizing Decisions Using Knowledge Risk Strategy. *Journal of Knowledge Management.*
6. Cooke, R.B. (2003). *Probabilistic risk analysis: foundations and methods*. Rep. Cambridge University Press (CUP).
7. Dźwigoł, H. (2018). *Współczesne procesy badawcze w naukach o zarządzaniu. Uwarunkowania metodyczne i metodologiczne*. Warszawa: PWN.

8. Dzwigoł, H. (2019a). The Concept of the System Approach of the Enterprise Restructuring Process. *Virtual Economics, 2(4),* 46-70. https://doi.org/10.34021/ve.2019.02.04(3)
9. Dzwigoł, H. (2019b). Research Methods and Techniques in New Management Trends: Research Results. *Virtual Economics, 2(1),* 31-48. https://doi.org/10.34021/ve.2019.02.01(2)
10. Dzwigoł, H. (2020a). Innovation in Marketing Research: Quantitative and Qualitative Analysis. *Marketing and Management of Innovations, 1,* 128-135. http://doi.org/10.21272/mmi.2020.1-10.
11. Dzwigoł, H. (2020b). Methodological and Empirical Platform of Triangulation in Strategic Management. *Academy of Strategic Management Journal, 19(4),* 1-8.
12. Dźwigoł, H. (2020c). Interim Management as a New Approach to the Company Management. *Review of Business and Economics Studies, 8(1),* 20-26. https://doi.org/10.26794/2308-944X-2020-8-1-20-26.
13. Dzwigoł, H., & Dźwigoł-Barosz, M. (2018). Scientific Research Methodology in Management Sciences. *Financial and Credit Activity: Problems of Theory and Practice, 2(25),* 424-437. https://doi.org/10.18371/fcaptp.v2i25.136508.
14. Dzwigoł, H., & Dzwigol-Barosz, M. (2020). Sustainable Development of the Company on the Basis of Expert Assessment of the Investment Strategy. *Academy of Strategic Management Journal, 19(5),* 1-7.
15. Dzwigoł, H., & Wolniak, R. (2018). Controlling w procesie zarządzania chemicznym przedsiębiorstwem produkcyjnym [Controlling in the management process of a chemical industry production company]. *Przemysl Chemiczny, 97(7),* 1114-1116. https://doi.org/10.15199/62.2018.7.15.
16. Dzwigoł, H., Aleinikova, O., Umanska, Y., Shmygol, N., & Pushak, Y. (2019b). An Entrepreneurship Model for Assessing the Investment Attractiveness of Regions. *Journal of Entrepreneurship Education, 22(1S),* 1-7.
17. Dzwigoł, H., Dźwigoł–Barosz, M., & Kwilinski, A. (2020a). Formation of Global Competitive Enterprise Environment Based on Industry 4.0 Concept. *International Journal of Entrepreneurship, 24(1),* 1-5.
18. Dzwigoł, H., Dzwigol-Barosz, M., Miskiewicz, R., & Kwilinski, A. (2020b). Manager Competency Assessment Model in the Conditions of Industry 4.0. *Entrepreneurship and Sustainability Issues*, *7(4),* 2630-2644. https://doi.org/10.9770/jesi.2020.7.4(5).
19. Dzwigoł, H., Dzwigoł-Barosz, M., Zhyvko, Z., Miskiewicz, R., & Pushak, H. (2019c). Evaluation of the Energy Security as a Component of National Security of the Country. *Journal of Security and Sustainability Issues, 8(3),* 307-317. http://doi.org/10.9770/jssi.2019.8.3(2).
20. Dzwigoł, H., Shcherbak, S., Semikina, M., Vinichenko, O., & Vasiuta, V. (2019a). Formation of Strategic Change Management System at an Enterprise. *Academy of Strategic Management Journal, 18(SI1),* 1-8.

21. Ferran-Ferrer, N., Guallar, J., Abadal E. and Server, A. (2017). Research methods and techniques in Spanish library and information science journals (2012-2014). *Information Research, 22(1)*.
22. Grudzewski, M.W., and Hejduk, I. (2007). Współczesne kierunki rozwoju nauk o zarządzaniu. In: W.M. Grudzewski (Ed.), *Rozwój funkcjonowanie przedsiębiorstw w warunkach globalnej gospodarki światowej*. Katowice: Wyższa Szkoła Zarządzania Marketingowego i Języków Obcych.
23. Hair, J.F., Page, M., and Brunsveld, N. (2019). *Essentials of Business Research Methods. 4th Edition.* New York: Routledge, https://doi.org/10.4324/9780429203374
24. Hermann, M., Pentek, T., Otto, B. (2015). Design Principles for Industrie 4.0 Scenarios: A Literature Review. *Technische Universität Dortmund, No. 01*.
25. Kagermann, H., Wahlster, W., Helbig, J. (2013). *Recommendations for implementing the strategic initiative Industrie 4.0: Final report of the Industrie 4.0 Working Group*.
26. Koźmiński, K.A. (2011). *Reaktywacja*. Warszawa: Poltext.
27. Kwilinski, A. (2017). Development of Industrial Enterprise in the Conditions of Formation of Information Economics. *Thai Science Review, Autumn,* 85-90.
28. Kwilinski, A. (2018a). Trends of Development of the Information Economy of Ukraine in the Context of Ensuring the Communicative Component of Industrial Enterprises. *Economics and Management, 1(77),* 64-70.
29. Kwilinski, A. (2018b). Mechanism of Formation of Industrial Enterprise Development Strategy in the Information Economy. *Virtual Economics, 1(1),* 7-25. https://doi.org/ 10.34021/ve.2018.01.01(1).
30. Kwilinski, A., Dalevska, N., Kravchenko, S., Hroznyi, I., Kovalenko, I. (2019c). Formation of the Entrepreneurship Model of E-Business in the Context of the Introduction of Information and Communication Technologies. *Journal of Entrepreneurship Education, 22(SI1),* 1528-2651-22-S1-337: 1-7.
31. Kwilinski, A., Dzwigol, H., & Dementyev, V. (2019f). Transnational Corporations as Entities of International Entrepreneurship. *International Journal of Entrepreneurship, 23(SI4),* 1-6.
32. Kwilinski, A., Ruzhytskyi, I., Patlachuk, V., Patlachuk, O., & Kaminska, B. (2019d). Environmental Taxes as a Condition of Business Responsibility in the Conditions of Sustainable Development. *Journal of Legal, Ethical and Regulatory Issues, 22(SI2),* 1544-0044-22-SI-2-354: 1-6.
33. Kwilinski, A., Volynets, R., Berdnik, I., Holovko, M., & Berzin, P. (2019e). E-Commerce: Concept and Legal Regulation in Modern Economic Conditions. *Journal of Legal, Ethical and Regulatory Issues, 22(SI2),* 1544-0044-22-SI-2-357: 1-6.
34. Kwilinski, A., Vyshnevskyi, O., & Dzwigol, H. (2020a). Digitalization of the EU Economies and People at Risk of Poverty or Social Exclusion. *Journal of Risk and Financial Management, 13(7),* 142. https://doi.org/10.3390/jrfm13070142.

35. Labarca, C. (2017). *Qualitative Research for beginners*. Venezuela: Maracaibo.
36. Lakhno, V., Malyukov, V., Bochulia, T., Hipters, Z., Kwilinski, A., & Tomashevska, O. (2018). Model of Managing of the Procedure of Mutual Financial Investing in Information Technologies and Smart City Systems. *International Journal of Civil Engineering and Technology, 9(8),* 1802-1812.
37. Lasi, H., Fettke, P., Kemper, H., Feld, T., Hoffmann, M. (2014). Industry 4.0. *Business & Information Systems Engineering, 6,* 239-242.
38. Lee, J. (2013). Industry 4.0 in Big Data Environment. *German Harting Magazine*, 8-10.
39. Miśkiewicz, R., & Wolniak, R. (2020). Practical Application of the Industry 4.0 Concept in a Steel Company. *Sustainability*, *12(14),* 5776. https://doi.org/10.3390/su12145776.
40. Miskiewicz, R. (2018). The Importance of Knowledge Transfer on the Energy Market. *Polityka Energetyczna, 21(2),* 49-62. http://dx.doi.org/10.24425%2F122774.
41. Miskiewicz, R. (2019). Challenges Facing Management Practice in the Light of Industry 4.0: The Example of Poland. *Virtual Economics, 2(2),* 37-47. https://doi.org/10.34021/ve.2019.02.02(2).
42. Miskiewicz, R. (2020). Internet of Things in Marketing: Bibliometric Analysis. *Marketing and Management of Innovations, 3*, 371-381. http://doi.org/10.21272/mmi.2020.3-27.
43. O'Leary, Z. (2017). *The Essential Guide to Doing Your Research Project*. London: Sage.
44. Patton, M.Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks: Sage Publications.
45. Quinlan, Ch., Babin, B., Carr, J., and Griffin, M. (2019). *Business Research Methods*. South Western Cengage.
46. Schmidt, R., Möhring, M., Härting, R. C., Reichstein, C., Neumaier, P., Jozinovi, P. (2015). Industry 4.0 – Potentials for Creating Smart Products: Empirical Research Results. In: W. Abramowicz (Ed.), *Business Information Systems* (pp. 16-27). Springer International Publishing.
47. Thomas, G. (2017). *How to Do Your Research Project: A Guide for Students*. London: Sage.
48. Tkachenko, V., Kwilinski, A., Klymchuk, M., & Tkachenko, I. (2019b). The Economic-Mathematical Development of Buildings Construction Model Optimization on the Basis of Digital Economy. *Management Systems in Production Engineering*, *27(2),* 119-123. http://doi.org/10.1515/mspe-2019-0020.
49. Tkachenko, V., Kwilinski, A., Korystin, O., Svyrydiuk, N., & Tkachenko, I. (2019a). Assessment of Information Technologies Influence on Financial Security of Economy. *Journal of Security and Sustainability, 8(3),* 375-385. http://doi.org/10.9770/jssi.2019.8.3(7).
50. Tonidandel, S., King, E.B., and Cortina, J. (2016). Big Data Methods: Leveraging Modern Data Analytic Techniques to Build Organizational Science. *Organizational Research Methods, 21(3),* 525-547, DOI: 10.1177/1094428116677299.

51. Vaivio, J., & Sirén, A. (2010). Insights into method triangulation and "paradigms" in interpretive management accounting research. *Management Accounting Research, 21(2),* 130-141, https://doi.org/10.1016/j.mar.2010.03.001.
52. Wittbrodt, P., Łapuńka, I. (2017). Opole: Instytut Innowacyjności Procesów i Produktów, Politechnika Opolska.
53. Yakubovskiy, M., Liashenko, V., Kamińska, B., & Kvilinskyi, O. (2017). Economy Modernization of Industrial Regions (Based on the Example of Ukraine). In: P. Głowski, O. Kvilinskyi (Eds.), *Economic Transformation in Ukraine: Comparative Analysis And European Experience* (pp. 12-29). Warsaw: Consilium Sp. z o.o.
54. Kwilinski, A. (2018c). Mechanism of Modernization of Industrial Sphere of Industrial Enterprise in Accordance with Requirements of the Information Economy. *Marketing and Management of Innovations, 4,* 116-128. http://doi.org/10.21272/mmi.2018.4-11.
55. Kwilinski, A. (2019). Implementation of Blockchain Technology in Accounting Sphere. *Academy of Accounting and Financial Studies Journal, 23(SI2),* 1-6.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

ECONOMIC ACTIVITY IN THE FIELD OF HUNTING

Dorota FRAŃCZAK[1*], Ewelina LECH[2], Radosław FRAŃCZAK[3]

[1] Wyższa Szkoła Prawa i Administracji, Rzeszowska Szkoła Wyższa, Rzeszów; dorota.franczak@wspia.eu, ORCID: 0000-0001-5238-012X
[2] ewelina-171988@o2.pl, ORCID: 0000-0002-2970-2482
[3] radofranczak@gmail.com, ORCID: 0000-0002-2667-0585
* Correspondence author

Purpose: Economic activity in the field of hunting consists in the provision of tourist services involving hunting and in the activities in the field of trade in live animals, as well as carcasses and parts thereof. It should be noted that the protection of natural resources, including wild animal species, is one of the most important obligations of the state. The aim of the article is to analyse the legal regulations in force regarding the conditions for undertaking and conducting economic activity in the field of hunting.
Design/methodology/approach: Legal provisions, jurisprudence and literature were analysed in the study.
Findings: The article attempts to evaluate the applicable legal regulations and contains proposals for changes in legal provisions relating to the performance of economic activities in the field of hunting. Particular attention was paid to the importance of the adequate manner of controlling entrepreneurs regarding the provision of tourist services involving hunting and economic activity in the field of trade in live game, game carcasses and their parts.
Originality/value: The article indicates the issues related to conducting economic activities in the field of hunting. Attention should be paid to the fact that, so far, legal issues related to this type of economic activity have been marginally present in the literature.

Keywords: economic activity involving hunting, hunting law, commercial hunting, Business Entities Act.

Category of the paper: General review.

1. Introduction

Hunting has always been a form of human influence exerted on nature. While, centuries ago, its goal was to obtain food or clothing, today it is becoming an instrument for maintaining natural balance (Szpetkowski, 2011, p. 6).

The definition of hunting first appeared in Polish legislation in 1952, with the advent of the new socio-economic system. On October 29, 1952, the Decree of the President of the Republic of Poland on hunting law was published, approved by the Council of State (Daniłowicz, 2020). In the light of the decree, hunting consisted in planned game management in accordance with the requirements of the national economy and nature protection. However, the very game management was carried out based on an approved breeding plan and comprised game breeding and protection, hunting and the introduction of the hunted game onto the market. Moreover, game management was conducted by the State (Journal of Laws 1952, No. 44, item 300). Although there was a place for hunting in the new system, it was understood in a way very different from the traditional one. It has become an element of the national economy. Following the political transformation of 1989, the concept of hunting being a part of the national economy ceased to correspond to reality. However, the legislator maintained the definition of hunting, introducing significant modifications to it.

Contemporary hunting is not only an art rich in history and tradition. It is also one of the elements of nature conservation, as it was pointed out in the Act of October 13, 1995, Hunting Law. Pursuant to the Act, as an element of environmental protection, hunting consists in the protection of wild game and the management of game resources in accordance with the principles of ecology and rational agriculture, forestry and fishing (Journal of Laws 2020, item 67). Its aim is to protect, preserve the diversity and manage the populations of game animals, as well as to protect and shape the natural environment in order to improve the living conditions of the game. Furthermore, hunting consists in obtaining the best possible health condition of individuals and the appropriate size of populations of individual game species, maintaining the balance of the natural environment, combined with cultivating tradition and promoting hunting ethics and culture (Nüβlein, 2010). It is worth noting that, in the Act, broadly understood protection comes ahead of breeding or obtaining game. This order is not accidental, because it defines the hierarchy of priorities (Gwiazdowicz, 2012): the goals of nature protection and shaping the natural environment are put to the fore, followed by individual goals of hunters achieved without disturbing the natural balance. Finally, the Act identifies hunting as an element of culture (Radecki, 2014). It should be noted that the recreational function was only mentioned as the last of the four points defining the goals of hunting (Daniłowicz, 2020).

It is worth noting that the term "hunting" appears in the hunting dictionary to denote all matters related to game management, weapons, game shooting, hunting cynology and falconry, hunting law, hunting ethics, as well as hunting history, tradition and culture with the hunting jargon, literature, periodicals, art, music, applied arts and the rich organisational life, etc. (Jóźwiak, and Biały, 1994).

2. Conducting business in the scope of hunting

The provisions of Chapter 4 of the Hunting Law Act concerning economic activity in the field of hunting have changed repeatedly. Originally, the chapter was entitled "Concessions". This was related to the Act effective then, of December 23, 1988, On Economic Activity, which licensed any business activity in the scope of hunting. The nature of this activity was based on the fact that its performance required the fulfilment of specific conditions defined by the legal provisions (Szydło, 2005). Then, the Act of November 19, 1999, Law of Business Activity came into force. It changed the name of Chapter 4 of the Hunting Law Act to "Permits". The reason for this change was the transition, in terms of economic activity in hunting, from the licensing mechanism to the permit mechanism (Radecki, 2014). At this point, it should be noted that the following types of activities were covered by the, initially, licensing and then the permit mechanism:

1. trade in live animals,
2. trade in carcasses of game,
3. sale of tourist services.

The situation changed again after the Act of July 2, 2004, came into force – the provisions introducing the Act on the Freedom of Economic Activity. The provision of tourist services was considered a regulated activity then, while the other two types of activity were exempted from regulation and no longer required a licence or permit.

A further significant amendment to the Hunting Law Act was made by the Act of March 25, 2011, on Reduction of Administrative Barriers for Citizens and Entrepreneurs. Economic activity consisting in the provision of hunting tourist services on the territory of the Republic of Poland and hunting abroad ceased to be an activity regulated within the meaning of the Act on Freedom of Economic Activity and no longer requires an entry in the hunting register. This activity is still an economic activity, however, it is no longer an activity regulated in the form of a license, permit or an entry in the register of regulated activity (Radecki, and Danecka, 2019).

Currently, the basic act regarding the performance of economic activity is the Act of March 6, 2018, the Law of Entrepreneurs. This act defines economic activity as organised gainful activity pursued in one's own name and on a continuous basis (i.e. Journal of Laws 2019, item 1292).

Organising a business consists in creating appropriate conditions for pursuing the activity, its preparation and establishment. Economic activity is understood as a gainful activity if there is an intention to earn income, while the actual obtaining income is not necessary. The continuity of the activity indicates repeatability, which does not exclude the possibility of taking breaks in its conduct. The intention to repeatedly perform certain activities is essential here, thus incidental or one-off activities have been eliminated from the definition of economic

activity. On the other hand, the performance of economic activity on one's own behalf is distinguished by the fact that it has a direct impact on the entrepreneur who benefits from its performance and it is the entrepreneur who bears the risk associated with the activity conducted (Lewandowski, 2019, pp. 99-100).

Moreover, it is worth pointing out that the case law of the Supreme Court distinguishes several specific characteristics of economic activity:

- professional character, i.e. a character which is permanent, not amateur or occasional,
- compliance with the principles of profitability and gain,
- repeatability of activities (e.g. seriality of production, typicality of transactions, constant cooperation, etc.),
- participation in business transactions (III CZP 40/91).

Economic activity in the field of hunting involves provision of tourist services including hunting and trade in live game, game carcasses and their parts.

An entrepreneur who undertakes and performs economic activity consisting in the provision of tourist services, including hunting carried out both on the territory of the Republic of Poland and abroad, is obliged to meet the conditions specified in the Hunting Law Act, such as:

1) establishment of mandatory security for settling any third party claims for non-performance or improper performance of obligations on the part of the entrepreneur,
2) passing an examination on the knowledge of the rules of hunting and principles of nature protection or employing a person who meets this requirement,
3) submitting to the competent marshal of the voivodeship, before the expiry of the previous contract or release of funds blocked in a bank account, the original documents confirming the conclusion of the next contract or making another block of funds referred to in art. 18 sec. 3 of the Hunting Law.

Securing claims is an institution derived from Civil Law. By introducing it, the legislator strove to facilitate the situation of the aggrieved party, because the enforcement of civil liability by civil proceedings might turn out to be quite complicated (Radecki, 2015).

Establishing a security consists in concluding a civil liability insurance contract for damage caused in connection with the performance of business activity or in concluding a bank or insurance guarantee contract, or in blocking funds in a bank account, for the benefit of the competent voivodeship self-government, in the amount of 4% of the annual income from the business activity conducted by the entrepreneur, obtained in the financial year preceding the year of concluding the contract, but not less than the PLN equivalent of EUR 20,000, calculated according to the average exchange rate of foreign currencies announced by the National Bank of Poland on the last day of the month preceding the month in which the funds were blocked. The detailed scope of the compulsory insurance, the date when the insurance obligation arises and the minimum guarantee amount are determined by the regulation of the minister responsible for financial institutions, in consultation with the minister in charge of the environment, having consulted the Polish Insurance Association.

The condition of possessing knowledge of the principles of hunting and nature protection has been regulated by the legislator in the form of an alternative: either the entrepreneur has knowledge of these principles or shall employ a person who knows them. The principles of hunting are set out in the Hunting Law and secondary legislation. On the other hand, the principles of nature protection are contained in the Nature Conservation Act and in the regulations issued on its basis.

The examination on the knowledge of hunting and the principles of nature protection is carried out by an examination committee appointed by the minister in charge of the environment. It covers the knowledge of the provisions on nature protection, weapons and ammunition, as well as hunting law (i.e. Journal of Laws 2020, item 67). The examination consists of two parts: a written test and an oral section. The written part consists in selecting one from among several suggested answers to each of the questions contained in the test. Having obtained not less than 60% of correct answers, the candidate is admitted to the oral part consisting in answering four questions asked by the examination committee. Moreover, the members of the examination committee may also ask supplementary questions.

A positive grade in the oral part of the examination results in the examination being considered passed, and a relevant certificate is issued then. It is worth adding that in the event of an equal number of votes, the casting vote belongs to the chairman of the examination committee (Radecki, and Danecka, 2019), which consists of six members:

a) representative of the Minister of the Environment – as the chairman,
b) representative of the Polish Hunting Association,
c) representative of Państwowe Gospodarstwo Leśne Lasy Państwowe (State Forest Enterprise),
d) expert in the field of environmental protection,
e) expert in the field of hunting economy,
f) expert in the field of possession and use of hunting firearms – repressentative of the Commander in Chief of the Police (Journal of Laws 2005, No. 27, item 230).

Particular attention should be paid to the fact that the performance of economic activity consisting in the provision of tourist services involving hunting is conditioned on clean criminal record of the entrepreneur and the persons managing the entrepreneur's activities, as far as intentional crimes specified in art. 52 and art. 53 of the Hunting Law are concerned. Such crimes include collecting, possessing, manufacturing, storing or marketing tools and devices intended for poaching, hunting in the presence of or with the participation of a child under 18, deliberate obstructing or preventing the performance of hunting, hunting during the closed season or hunting without authorisation. Moreover, the entrepreneur or the person managing the entrepreneur's activity must not have been punished for economic and trade related offences.

Economic activity in the scope of hunting, like any other economic activity, is subject to control. Pursuant to Art. 22b of the Hunting Law Act in conjunction with Art. 47 section 1 of the Entrepreneurs Act, the control authority plans and carries out an inspection at the entrepreneur's premises, having analysed the probability of violating the law as part of the business activity conducted. This analysis includes the identification of areas where the risk of non-compliance is the greatest. However, the very method of carrying out the analysis is determined by the control authority or the superior authority. It is worth pointing out here that Art. 47 section 1 of the Entrepreneurs' Law Act does not apply when the inspection body has a reasonable suspicion of:

a) threat to life and health,
b) crime of offence having been committed,
c) tax crime or offence having been committed,
d) other breach of a legal prohibition or failure to comply with a legal obligation

– as a result of the pursuit of business activity subject to control.

If non-compliance with the conditions required for running a business consisting in the provision of tourist services involving hunting is determined, the entrepreneur may be punished with an administrative sanction in the form of a ban on performing such an activity. At this point, the legislator provided for a two-stage procedure. First, the voivodeship marshal issues written to the entrepreneur to remedy the infringements within the prescribed period. However, this summons does not take the form of an administrative decision or decision. Only if the entrepreneur fails to remove the infringements within the prescribed period, the voivodeship marshal issues an administrative decision prohibiting the economic activity for a period of 3 years. The decision mentioned above may be appealed against by the entrepreneur to the Local Self-Government Appeals Court and then a complaint may be lodged with the administrative court.

The Hunting Law Act also specifies the obligations of an entrepreneur who trades in live game, game carcasses and their parts. An entrepreneur carrying out economic activity in this area is obliged to keep a purchase register at each venison buying station and to ensure the examination of game and meat in accordance with the provisions on fighting infectious animal diseases, examination of slaughter animals and meat, and the Veterinary Inspection. These obligations do not apply to sales made by lessees and managers of game shooting districts on the territory of the Republic of Poland. Details specifying what the records should contain are established in the regulation of the Minister of the Environment of February 7, 2005, on the records of purchase of live game, game carcasses and their parts (Journal of Laws 2005, No. 27, item 231). It should be noted that, owing to this regulation, it is possible to control the amount of game and its health condition, which is of great importance for determining the annual as well as long-term hunting plans (Pązik and Słomski, 2015).

It deserves attention that there is no legal definition of a venison buying station. It is assumed in the literature that this is a place where shot game animals are kept under hygienic conditions before being transported to the processing plant. The entrepreneur running the venison buying station is obliged to mark the carcasses of: elk, deer, fallow deer, mouflon, roe deer and wild boar immediately after the obtained game is delivered to the buying station (i.e. Journal of Laws 2020, item 67). If an authorisation or a certificate of origin of the game is not presented together with the carcass, the person running the venison buying station shall refuse to accept the game carcass. Furthermore, it is a duty of the person running such a station to issue a document confirming the acceptance of the carcass at the venison buying station to the deliverer, which is a pre-numbered form (Journal of Laws 2005, No. 61, item 548). The task of the entrepreneur is also required to collect such a number of carcasses as is appropriate for their economic transport to the processing plant and to ensure hygienic and refrigerated conditions for keeping the carcasses of game animals (Ziembińska, and Krasnowska, 2007, p. 22).

3. Conclusion

Contemporary hunting penetrates into more and more areas of today's reality. In terms of nature, it is an instrument for maintaining a disturbed balance between individual species of fauna and flora, while in the economic field it is a scope creating a powerful market. The protection of natural resources, including wild animal species, is one of the most important obligations of the state. In accordance with the Constitution, public authorities pursue a policy ensuring ecological safety for the present and future generations. Moreover, public authorities support the actions of citizens aimed at protecting and improving the condition of the environment. It should be emphasized that the values and norms regulating human attitude towards the natural world are extremely important and valuable.

Bearing in mind the common good of nature protection, it is worth considering whether business activity in the field of hunting consisting in the provision of tourist services involving hunting, should not be a regulated activity, subject to entry in an appropriate register. First of all, it should be remembered that hunting and the accompanying use of firearms, must not pose a threat to the safety of citizens.

With regard to entrepreneurs conducting economic activity in the field of trade in live animals and trade in game carcasses and their parts, appropriate control carried out by a competent public administration body is particularly important. The control body should examine carefully whether an entrepreneur provides appropriate examination of game and meat in accordance with the provisions on combating infectious animal diseases, examination of slaughter animals and meat, and the Veterinary Inspection. Moreover, during the control

proceedings, particular attention should be paid to the correctness of purchase records kept by entrepreneurs, in order to eliminate illegal trade in game and meat. It is extremely important for the entrepreneur to ensure proper storage conditions for raw material and to ensure appropriate quality of the products obtained. It is also important to require and enforce knowledge of the principles governing handling of slaughtered game on the part of hunters, because, to a large extent, it is their knowledge and skills which determine the quality of raw material supplied for processing.

References

1. Daniłowicz, W. (2020). *Prawo łowieckie.* Warszawa: Wolters Kluwer.
2. Dekret z dnia 29 października 1952 r. o prawie łowieckim, Dz.U. 1952, nr 44, poz. 300 (1952).
3. Gwiazdowicz, D. (2012). Łowiectwo a ochrona przyrody. In: D. Gwiazdowicz (Ed.), *Problemy współczesnego łowiectwa w Polsce* (p. 94). Poznań: Oficyna Wydawnicza G&P.
4. Jóźwiak, Z., and Biały, K. (1994). *Słownik podstawowych terminów łowieckich i ekologicznych.* Warszawa: Wydawnictwo Łowiec Polski.
5. Lewandowski, P. (2019). O definicji przedsiębiorcy i działalności gospodarczej po wejściu w życie ustawy – Prawo przedsiębiorców. *Palestra, 1-2*, pp. 99-100.
6. Nüßlein, F. (2010). *Łowiectwo.* Łódź: Galaktyka.
7. Pązik, A., and Słomski, M. (2015). *Prawo łowieckie. Komentarz.* Warszawa: Lex a Wolters Kluwer business.
8. Radecki, W. (2014). *Prawo łowieckie. Komentarz.* Warszawa: Difin.
9. Radecki, W., and Danecka, D. (2019). *Prawo łowieckie. Komentarz.* Warszawa: Difin.
10. Rozporządzenie Ministra Środowiska z dnia 7 lutego 2005 r. w sprawie egzaminu ze znajomości wykonywania polowania oraz zasad ochrony przyrody, Dz.U. 2005, nr 27, poz. 230 (2005).
11. Rozporządzenie Ministra Środowiska z dnia 7 lutego 2005 r. w sprawie ewidencji skupu zwierzyny żywej, tusz zwierzyny i ich części, Dz.U. 2005, nr 27, poz. 231 (2005).
12. Rozporządzenie Ministra Środowiska z dnia 23 marca 2005 r. w sprawie szczegółowych warunków wykonywania polowania i znakowania tusz, Dz.U. 2005, nr 61, poz. 548 (2005).
13. Szpetkowski, K. (2011). Historia łowiectwa w Polsce. *Łowiec Polski*, *t. I*, p. 6.
14. Szydło, M. (2005). *Swoboda działalności gospodarczej*. Warszawa: C.H. Beck.
15. Uchwała składu 7 sędziów Sądu Najwyższego z dnia 18 czerwca 1991 r., III CZP 40/91 (1991).
16. Ustawa z dnia 13 października 1995 r. – Prawo łowieckie, t.j. Dz.U. 2020, poz. 67 (2020).

17. Ustawa z dnia 6 marca 2018 r. – Prawo przedsiębiorców, Dz.U. 2019, poz. 1292 (2019).
18. Ziembińska, A., and Krasnowska, G. (2007). Zapewnienie bezpieczeństwa zdrowotnego w obrocie tuszami zwierząt łownych. *Żywność. Nauka. Technologia. Jakość, 1(50),* p. 22.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SHAPING RELATIONSHIPS WITH BUSINESS PARTNERS IN THE OPINION OF ENTERPRISE EMPLOYEES

Marzena GÓRALCZYK

University of Zielona Góra, Faculty of Economics and Management; m.goralczyk@wez.uz.zgora.pl,
ORCID: 0000-0003-2048-5386

Purpose: The aim of the study is to answer the questions: how the employees of enterprises evaluate the care for building proper relationships with suppliers, recipients, customers and other entities, the enterprise/organization cooperates with, what activities support building good relationships.
Design/methodology/approach: Empirical research conducted among respondents from enterprises and organizations in the Lubuskie voivodship. The background was to show the essence and models of relationship marketing.
Findings: Employees of enterprises show a high sense of the importance of their actions for shaping relationships with business partners. This is based on: communication, building a good image, meeting the needs and expectations of external entities and joint activities for the local community**.**
Research limitations/implications: Future research may include a detailed characterization of the relationships between business entities representing various sectors of the economy.
Practical implications: The surveyed enterprises should shape the internal communication processes of the management staff with employees to build relationships with the environment, improve the external information systems of their partners. Managing the social potential in an enterprise should focus on motivating employees to take actions for shaping relationships with business partners, etc. Moving to a higher level of intra-organizational perception may affect the awareness of the role of the company/organization's employees and their verifying power of activities for the environment.
Social implications: The research results should show employees that their attitudes and openness to social needs can affect solving local problems and building the company's image.
Originality/value: Indicating the perception of the importance of employees in shaping relationships with the environment and evaluation of company's activities in this regard.

Keywords: relationship marketing, enterprise, environment, employees.

Paper category: research paper.

1. Introduction

Relationship marketing is a response to the growing demand for improving the competitiveness of companies on the market. Enterprises interact constantly with their business partners. Both suppliers, recipients are important as well as other business entities with whom enterprises cooperate, as well as customers purchasing products offered on the market or various types of services. It is worth learning the opinions of enterprise employees on the conditions that shape these relationships. This can be a valuable source of information about how the company perceives its position, how to strengthen it in the study of relationships with the environment. Thanks to this approach, the company realizing its development vision will achieve measurable benefits.

The purpose of the study is to answer the following questions: how company employees assess care for building proper relationships with suppliers, recipients, customers and other entities with which the company/organization cooperates, what activities contribute to building good relationships. The article presents various approaches and models of relationship marketing. The development of the concept for relationship marketing was described with reference to particular representatives.

The study was prepared based on the results of empirical research conducted in the period from June to October 2016 on a group of 300 respondents working in various enterprises and organizations in the Lubuskie voivodship.

2. Relationship marketing – the essence, models, importance in practice

There are many references to the concept of relationship marketing in the literature of the subject.

As early as 1966, L. Adler observed that relationships between independent enterprises are "symbiotic" and include both the resources at their disposal and cooperation programs aimed at increasing the market potential of each business partner. The spectrum of using various solutions in the field of symbiotic marketing relationships is to become an antidote to market volatility, meet the needs of customers, contribute to overcoming resource scarcity, be "a weapon in the fight against competition", including an international dimension (Varadarajan, and Rajaratnam, 1986).

Relationship marketing has emerged from two trends of marketing orientation, i.e. industrial and service orientation. Industrial orientation is related to the views and theories of such trends as (Kowalska-Musiał, 2007):

1. American School Harvard Business School (represented by Th. Levitt, B.B. Jackson),
2. The International Marketing and Purchasing (MP) Group (represented by H. Hakansson, I.J. Snehota, N. Cambell, D. Ford, B. Axellon, G. Easton, M.T. Cunnigham, P. Turnbull),
3. Ango-Australian School of Affiliate Marketing (represented by A. Payne, D. Ballantyne, M. Christopher),
4. Centre for Relationship Marketing (represented by J.N. Sheet, A. Parvatiyar).

Service orientation is represented by two trends (Kowalska-Musiał, 2007):

1. Nordic School of Service Marketing (representatives: Ch. Grönroos, E. Gummesson, K. Strandvik, V. Liljander, J.R. Lehtinen),
2. Texas University (representatives: L.L. Berry, T.W. Thompson).

The term relationship marketing was first developed by L. Berry (1983), it concerned a new area in the field of service marketing. According to L. Berry, "Relationship marketing means creating, maintaining and enriching customer relationships. Acquiring a new customer is only the first step in the marketing process" (Otto, 2001, p. 46).

L.L. Berry (1995) characterizes three levels of relationship marketing:

1. The first is focused on ensuring customer loyalty.
2. The second relies heavily on social bonds.
3. The third covers the area of structural solutions of problems important for the client, which is part of the design of activities in the service provision system. By offering customers value-added benefits, the foundation is created to maintain and improve relationships. This happens when the solutions used are not easily copied by other market participants.

Moreover, L.L. Berry (1995) indicates that it is important to provide two-way communication channels at the enterprise – customer level and vice versa customer – enterprise. By providing services, an enterprise can increase market share by: attracting new customers, making more transactions with existing customers, and reducing customer losses. The perspective of looking at relationships applies not only to customers, but also to employees and partners of strategic alliances. By implementing practical solutions in the field of relationship marketing, the company focuses on profitable relationships. Trust is the central element that builds relationships.

A representative of the Nordic School of Marketing of Services, Ch. Grönroos, gives the following definition: "Relationship marketing is shaping, maintaining and enriching relationships with customers and other partners in such a way that the goals of both parties are achieved through mutual exchange and fulfilment of promises made". The role of bonds and mutual achievement of goals are important (Otto, 2001, after Grönroos, 1990, p. 138).

Another representative of this trend, E. Gummesson, also made a significant contribution to the development of relationship marketing. In his approach, he extracts 30 various relationships that can be observed in the sphere of business and in its environment. Relationship

marketing is perceived by him as a variety of relationships, networks and interactions that affect the functioning of many business entities. He emphasizes that the process of interaction between suppliers, customers, competitors and other entities contributes to the co-creation of value by interested parties. He indicates that the responsibility for cooperation rests with all parties – participants of the relationship, showing activity not only in the short term but also in the long term. His concept has an operational character and is based on practical aspects of relationships. Thanks to grouping them into market and non-market relationships, it is possible to see the multifaceted concept that describes the closer and further conditions of business in a network of multiple connections. Activities undertaken in the area of relationship marketing are part of marketing management, aspects specific to service marketing or the approach visible in industrial marketing can be found in them. Not without significance are issues covering the sphere of quality management (Gummesson, 1997).

The six market model is the best known concept of relationship marketing. It presents considerations for six related broadened areas of enterprise marketing activities. Relationships with many parties are shown – organizations or enterprises and other entities that can potentially contribute, directly or indirectly, to the market efficiency of the enterprise. Six market domains were identified in the model, with centrally located "internal markets". Moreover, it has the following markets (Payne et al., 1999):

- customers,
- suppliers,
- potential employees of the enterprise,
- influential institutions,
- mediators (distributors).

The configuration presented in the model emphasizes the role of internal marketing as an integrator and facilitator, supporting the management of relationships with other entities in other "markets". When modifying the model, its creators adopt an approach that assumes the central location of customer markets. Relationship marketing activities directed at clients are necessary, but they are an insufficient area of impact on the environment. The organization must also identify other relevant market domains in which to distinguish subdomains that need to be grouped. It is necessary to develop appropriate marketing strategies for them. Relationship marketing meets constant changes in the business environment. There are close links and complementary mechanisms of interaction between new organizational structures and relationship marketing. It can be understood as "a market-driven, customer-oriented, overall management concept, partly based on a return to the roots of marketing and the original marketing concept" (Payne et al., 1999, p. 28). It is important to provide the customer with the best value offer possible. The goal of relationship marketing is to create value for the client, care for his/her satisfaction and loyalty, which helps to improve profitability in the long run. In addition, it is worth emphasizing that this approach is based on creating a win –

win relationship, providing benefits to interested parties, this is particularly evident in the supply chain (Payne et al., 1999).

Close cooperation with long-term suppliers meets the requirements posed by the need for continuous improvement of competitiveness. Intermediaries as well as existing clients have a significant impact on the profitability and turnover of the company. Improving relationships with mediators and special marketing programs supported by specific financial resources should bring the expected results. The potential employees of the company are also important, the acquisition of which requires the development of effective and attractive offers. Activities undertaken in these markets require the use of public relationships' techniques or sponsorship. The specificity of influential institutions is strictly dependent on the industry, sector and business profile of the company. Internal markets are employees in a particular enterprise whose needs and expectations should be taken into account and constantly met (Payne et al., 1999).

K. Fonfara states that "The concept of relationship marketing puts emphasis on the management process, i.e. creating, developing and maintaining relationships of the company with other entities. It exposes the direct, interactive, two-sided and multilateral nature of contacts between the seller and the buyer and other entities in the process of creating and supplying products and services. In addition, it emphasizes the lasting nature of the links between exchange partners. Creating and maintaining these relationships requires time, effort and money" (Fonfara, 2004, p. 61).

According to another definition of I.H. Gordon, "Relationship marketing is a continuous process of seeking and creating new value with an individual client and sharing benefits within a partnership, covering the entire period of the client's purchasing activity" (Gordon. 2001, p. 35). He emphasizes that cooperation between suppliers and a selected group of customers is permanent.

An efficient organization of the 21st century should look in the future and learn from experiences not only their own but also other participants in the environment. When creating relationships with external partners, it is crucial to keep in mind the needs of the client, which is not only an external client but also an internal one – an employee of the company. This requires commitment especially from managers so as to form a new kind of relationship between participants of the organization and the environment (Mazurkiewicz, 2010).

Building long-term relationships with customers contributes to strengthening their loyalty, and as a consequence stabilizes the conditions of functioning and the level of goodwill. Moreover, customers are involved in the process of identifying, creating and delivering value, providing the company with access to information about their preferences, problems and experiences. An important role in these activities is played by the company's personnel who can effectively listen and identify the needs of customers. They do not feel the need to constantly compare the supplier's offer with other competitive offers (Dobiegała-Korona, 2008).

The implementation of corporate social responsibility (CRS) solutions in practice may contribute to the co-creation of value by the customer in terms of products and services offered on the market (Luu, 2019; Iglesias et al., 2020).

It is also advisable to note the research that provides deeper insight into the role different types of customer commitment play in relation to important relationship marketing outcomes. A comprehensive and integrated approach to understanding customer commitment supports establishing and maintaining co-creative and interactive customer-enterprise relationships. This affects the quality of the company's product or service offering and customer retention. Enterprises should find ways to support specific types of customer commitment in line with their strategic goal and seek customers as proactive collaborators (Braun, Hadwich, and Bruhn, 2017).

Because customers migrate through different relationship states over time, not all relationship marketing strategies are equally effective. In order to meet the needs of entrepreneurs, it is worth looking at the results of the research by J.Z. Zhang, G.F. Watson IV, R.W. Palmatier and P. Dant, who used the multidimensional Markov model to analyse a set of data on well-known companies. They identified different relationship states, customer migration between these relationship states, but also migration mechanisms. Knowledge of the most effective RM strategies in all migration paths is very valuable for companies. Managers in an enterprise can find guidance on how to allocate resources in an efficient and dynamic manner (Zhang et al., 2016).

Caring for customer satisfaction is a must for the company, otherwise dissatisfied customers go to the competition or change the brand. A company losing contact with a customer cannot remove any irregularities (Mazurek-Łopacińska, 2002). Y. Minta and Y. Traore (2018) presented in their publication a list of relationship marketing variables that affect customer loyalty based on literature research. They include such factors as, among others: trust, commitment, satisfaction, personalization, perceived quality, values, communication.

The conceptual model of customer loyalty research may cover the following areas of relationship quality, these are: trust, satisfaction, commitment. The following tactics in the field of relationship marketing are assigned to them: service quality, brand image, price perception and value offers (Eskandari et al., 2017). It is worth adding that customer loyalty is influenced not only by their level of satisfaction with the service or product offered by a particular company, but also by how they perceive the relationships that have developed as a result of long-term cooperation with a particular employee (Olszyńska, 2005).

Relationship marketing requires that shared value systems of partners should be compatible or at least close to each other, as this supports achieving common goals, as each entity identifies with them (Baruk, 2008). One should agree with the statement that: "In the process of partnership cooperation, over time, they form extensive social, economic and technical bonds. Partner relationships are therefore a complicated management, marketing, logistics, social and cultural problem" (Światowiec, 2006, p. 15).

It is worth asking the question here why is the interest in relationship marketing in all its forms growing? Ballantyne D., Christopherm M., Payne A. (2003) provide a reply. The first fundamental reason is the openness of the market and the dynamics of changes occurring in it as well as intra-organizational changes. Establishing greater openness with suppliers, key clients and other stakeholders restores the strategic stability of the company and also gives new opportunities for creating value. The second reason is better and faster exchange as well as data collection (unprecedented on such a scale) on customer behaviour. Furthermore, the increase in uncertainty on financial markets and the resulting risk of loss of value for shareholders (Ballantyne, Christopherm, Payne, 2003) was also important. "Increased uncertainty in the environment supports shaping relationships based on recurring transactions and relationships in which the dominant role is played by a partner ensuring easier access to rare resources. The uncertainty of the environment may also cause the development of a bilateral relationship in which the mutual dependence between the partners is evened out" (Żebrucki, 2012, p. 18).

Relationship marketing should be combined with other approaches. A good example of synthesis is the look of A. Payne and P. Frow (2013), who compare relationship marketing and customer relationship management (CRM). They indicate that a holistic approach to customer relationship management and other key stakeholders leads to an increase in shareholder value. The joint research areas they propose should be referred to the strategic management process. Relationship marketing and CRM is gaining importance in the practical sphere of enterprise functioning. The authors of the concept point to the important role currently observed on the market of activities in the field of building relationships using information technologies, including in particular social media and the possibilities offered by mobile devices and the so-called Internet 3.0 network.

Using the Institutional Role Model (IRM), C. Grabellus, L.L. Heinrich and W.H. Schulz (2019) presented a conceptual approach showing the basic framework for effective stakeholder cooperation in the B2B market. It is based on the use of the B2B retail platform taking into account various aspects of identifying the role perception by the partner in the area of interconnection with the support of the 360° assessment, which is based on self-assessment, partner assessment, and expert assessment. The cooperation of stakeholders using digital technologies enables the optimization of processes and gaining a competitive advantage. The cooperative B2B platform can be adapted to the changing environment of the enterprise and ensure ease of integration of new entities.

An important element of the new challenges facing relationship marketing is the multifaceted research combining achievements in the field of relationship marketing (RM), customer relationship management (CRM) in the form of many-to-many marketing – their extension and logic SD (service-dominant logic) and service science. In this way, the connection between the Business to Business (B2B), Business to Customer (B2C),

and the Consumer-Consumer (C2C) approach is established. Such approaches indicate the active role of clients in the network of mutual interactions (Polese, and Gummesson, 2009).

In order to meet the challenges of the revolution in technology, Internet-of-Things (IoT) is becoming a new area for entrepreneurs to develop to improve customer experience, and it may also contribute to greater effectiveness of relationship marketing strategies. Thanks to the connection and exchange of data via the Internet, information of a strategic nature is collected, and enterprises increase their effectiveness in responding to market changes. Benefits are achieved in terms of improved efficiency and business results. Moreover, enterprises remain competitive. It is also essential for creating new creative solutions for existing business models. An integrated, modern communication platform requires a high level of confidence in the use of data by economic operators. The impact of IoT on relationship marketing is based on the ability not only to create new solutions, but also to optimize communication with customers (Fang-Yi Lo, and Campos, 2018).

The online commerce market is a suitable environment for relationship marketing. Consumer satisfaction is related to the perception of quality which has four dimensions, i.e. the quality of information, services, products and deliveries. Satisfaction causes customer loyalty and turns into a long-term relationship (Radionova, and Praude, 2016).

Due to the specificity of relationship marketing, it is an important research area not only for the discipline of management and quality science, but also may be of interest to others, for example, sociological sciences and psychology. One such example is the transfer of the Convoy Model Theory to relationship marketing. This applies to referring to the advanced experience and expertise of the company's employees in order to shape a support group for clients according to their needs and expectations. It is possible to create a support network in the chain of business connections of enterprises. It is important to define the areas of responsibility of market participants and the durability of customer relationships (Saath et al. 2018). While analysing the issues related to supply chains, it is worth paying attention to aspects related to the behavioural sphere, relating to behaviour based on power between business partners, i.e. to the manifestations of behaviour proving domination, egalitarianism or submission. In the publication of I. Gölgecia, W.H. Murphyb, D.A. Johnston (2018), conceptualization and presentation of the behavioural characteristics of the partners were conducted. The possibilities of using the presented approach to better study the dynamics of force in relations were discussed.

Based on the theory of social exchange, an attempt was made to combine aspects of relationship marketing with this theory in order to explain long-term relationships between competing companies, which may include, for example, networks or strategic alliances. The proposed conceptual model shows the factors influencing the behaviour of enterprises involved in inter-organizational relations (Neumann, and Laimer, 2019). This may be a certain area of reference for examining the aspects of competitive advantage between these types of entities.

Another area where relationship marketing finds its practical reference is cooperation between importing and exporting companies. An important issue is the perception of the value of the relationship between partners. Business entities are relationship-oriented, in which sharing knowledge and experience, combining unique competences is visible. Moreover, the required complementary capabilities and the reference to the basic principles of flexibility, solidarity and reciprocity are essential. Creating higher value relationships support competition in the global market. Relations are built by, among others, exchange of knowledge about products and the market between international partners, they are influenced by the complex relationship between mental distance and the culture of sensitivity represented by partners (Skarmeas, Zeriti, and Baltas, 2016).

Relationship marketing finds its reference to research in the field of business leadership. The research was carried out on the factors most important for relationship marketing in the context of leadership creation, referring to various stages of business relationships, including the possibility of practical applications of the proposed solutions for managers of various levels in enterprises, which may support the business improvement strategy (Jraisat, 2017).

Some companies may consider implementing social media marketing, following the example of the well-known Maersk company, building communities among professionals, employees and current or potential customers, improving their image in the environment, e.g. by showing their social commitment (Zaif, and Cerchia, 2019). By implementing activities in the field of SMM (Social Media Marketing), business entities have a greater chance of acquiring new employees, receiving feedback not only from current but also former employees, it also gives an additional perspective for re-evaluating the HR policy. In addition to building relationships with customers, there is also a platform for improvements in personnel management.

Ch. Grönroos (2017) indicates that human resource management should be more oriented outside the organization and the need to focus employees on the customer in terms of company-customer relationships. Internal marketing should be focused on the client and broadly understood services. Without successful internal marketing, an organization will not develop a service culture. Active customer-oriented leadership, enhanced by internal marketing processes and service culture, should be considered a leading value and norm in the organization. Employees in the company are an important "link" between the organization and the customer.

3. Presentation of research results. Indications for enterprises

The study uses empirical research conducted on a group of 300 people employed in the Lubuskie voivodship. They constitute a fragment of research carried out in relation to broader, more complex issues in the field of enterprise management. The research was carried out with the help of a tool which is a questionnaire. The survey contained questions constituting the basis for presenting the characteristics of the studied population. The following elements of the respondents description were distinguished: gender, age, length of service in the enterprise/organization. The characteristics of the studied population are presented in Table 1. Moreover, the respondents answered the questions that constitute the basis for the presentation of basic data characterizing the enterprises/organizations, in which the respondents are employed. It is shown in Table 2.

Table 1.
Characteristics of the studied population

Specification		In percentage terms (in%)
Gender of respondents	women	56,7
	men	43,3
Age structure of respondents	Up to 20 years old	2,3
	From 21 to 30 years old	57,0
	From 31 to 40 years old	20,4
	From 41 to 50 years old	13,0
	From 51 to 60 years old	7,3
Work experience in an enterprise/organization	Shorter than 1 year	21,7
	From 1 to 5 years	44,0
	From 6 to 10 years	16,0
	From 11 to 15 years	6,3
	From 16 to 20 years	5,7
	More than 20 years	6,3

Source: own study based on conducted research.

Among the respondents there were 56,7% women and 43,3% men. The largest group (57,0% of respondents) were people aged 21 to 30 years. Then 20,4% were respondents who were in the age group of 31 to 40 years old, 13,0% of the respondents were people aged 41 to 50 years and 7,3% were employees aged 51 to 60 years. 2,3% of respondents are people up to 20 years old.

Taking into account work experience in the enterprise/organization, employees from 1 to 5 years dominated (44,0% of respondents), 21,7% of the surveyed population are employees with seniority up to 1 year, 16,0% are people working in a particular enterprise/organization from 6 to 10 years. Employees with experience from 11 to 15 years and over 20 years constituted a group of 6,3% of respondents. The least numerous group were people with a period of employment from 16 to 20 years. They constituted 5,7% of respondents.

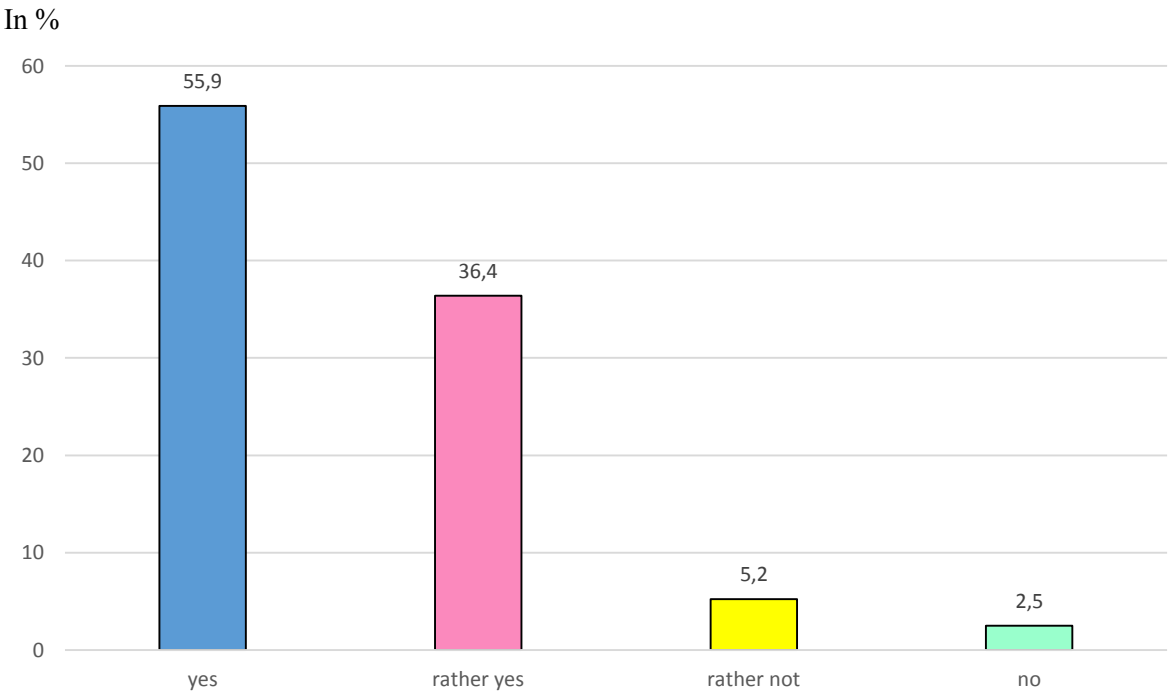
Table 2.
Characteristics of enterprises/organizations in which the surveyed respondents are employed

Specification		In percentage terms (in %)
Period of operation of the enterprise/organization on the market	Up to 5 years	14,3
	From 6 to 10 years	16,3
	From 11 to 15 years	17,0
	From 16 to 20 years	9,0
	More than 20 years	43,4
The geographical scope of the enterprise/organization	Local market	28,0
	Regional market	19,7
	Domestic market	36,7
	International market	42,7
Type of enterprise/organization's activity	production	33,0
	trade	24,6
	services	39,7
	other	11,7
Legal form	State enterprise	27,7
	Private enterprise	65,7
	Another form	6,6
Capital ownership	Polish capital	57,7
	Foreign capital	20,7
	Mixed capital with foreign advantage	17,0
	Mixed capital with Polish advantage	4,6
Size of enterprise/organization	Micro (less than 10 employees)	14,7
	Small (from 10 to 49 employees)	25,0
	Medium (from 50 to 249 employees)	27,7
	Large (more than 249 employees)	32,6

Source: own study based on conducted research.

The surveyed employees were employed in economic entities whose period of functioning on the market was varied. The most numerous group were those that existed for over 20 years. The least numerous group was entities with 16 to 20 years of experience. The geographical range was varied, some entities were active not only on one market. Most of the surveyed entities are private enterprises (65,7%). In terms of capital ownership, Polish capital dominated. Most people (32,6% of respondents) work in large entities.

The respondents commented on whether the management and other employees of the company/organization care about building proper relationships with suppliers. This is shown in Figure 1.

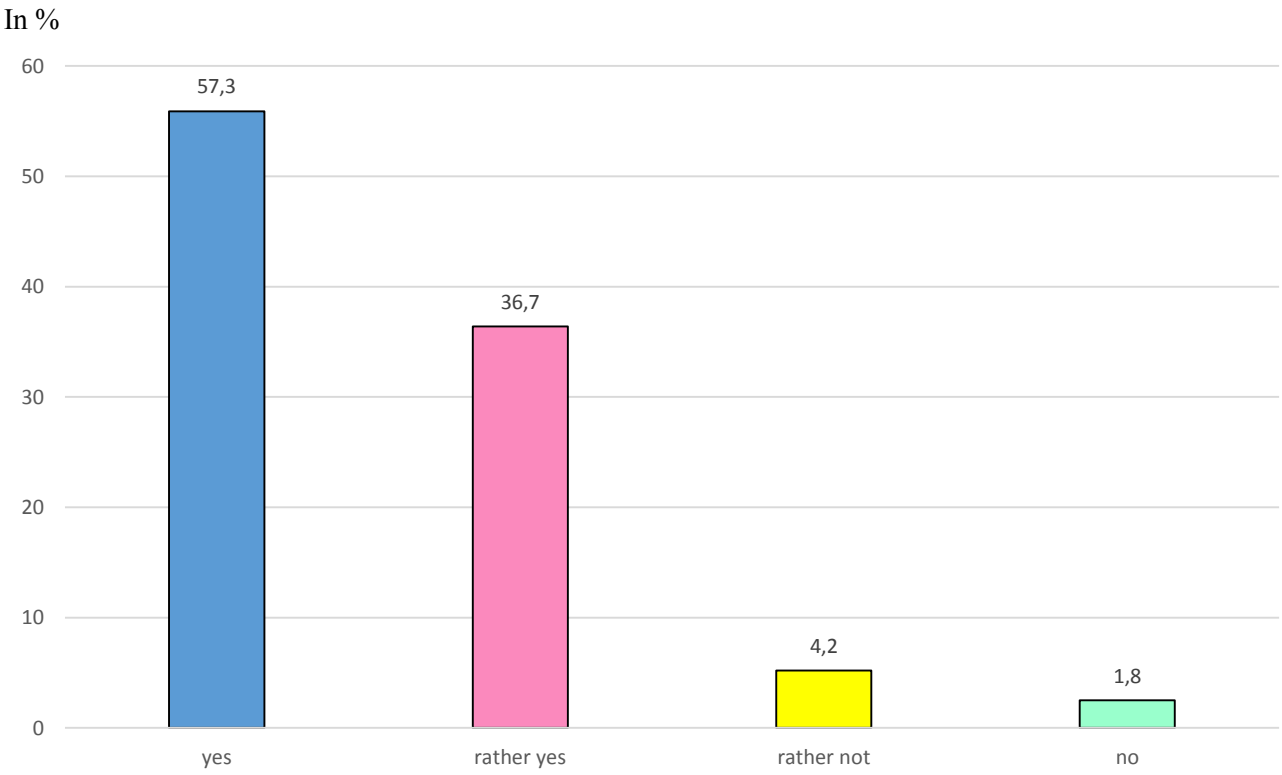


Note: 95,3% of respondents commented on building relationships with suppliers.

Figure 1. Respondents' opinion on care for the management and other employees of the enterprise/organization to develop appropriate relationships with suppliers. Source: own study based on conducted surveys.

Among the respondents who defined how they perceive the relationship between the management and other employees of the company/organization with suppliers, 55,9% believe that employees care about these relationships because they indicated yes. 36,4% of respondents in the particular group gave the answer rather yes, 5,2% rather not and 2,5% no. The data provided shows that the vast majority of respondents are of the opinion that measures are being taken that support shaping proper relationships with suppliers.

The respondents also specified whether the management and other employees of the company/organization care about building proper relationships with recipients. This is shown in Figure 2.

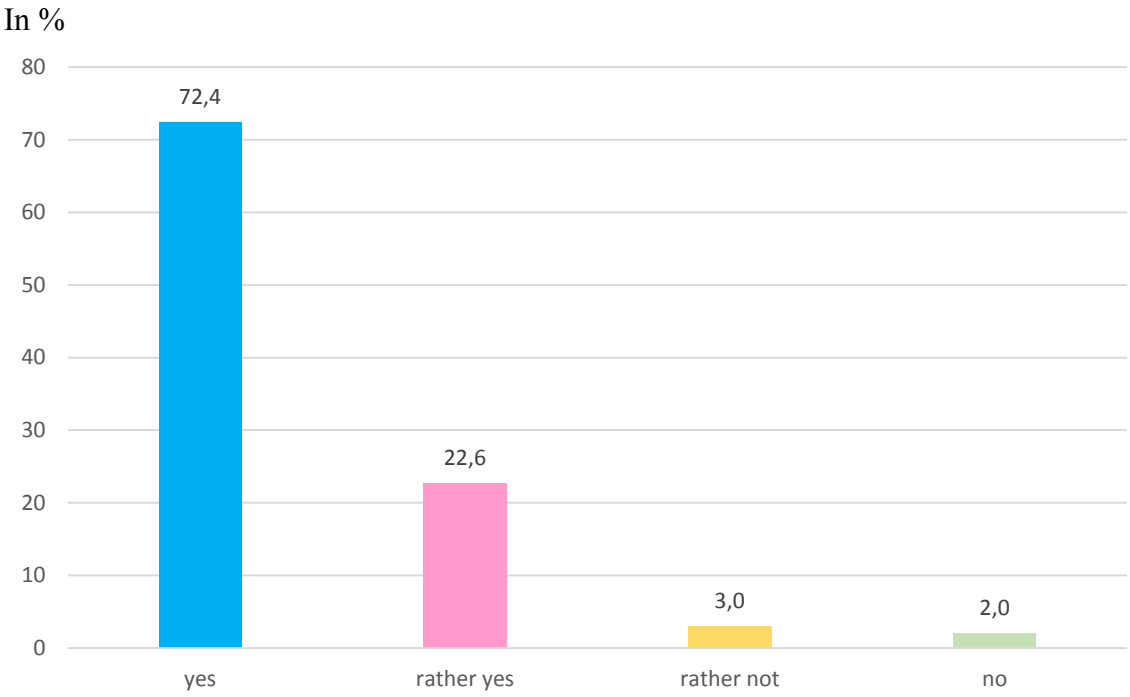


Note: 95,3% of respondents commented on building relationships with recipients.

Figure 2. Respondents' opinion on the care taken by the management staff and other employees of the enterprise/organization for appropriate relationships with recipients. Source: own study based on conducted surveys.

Among the respondents who defined how they perceive the relationship between the management and other employees of the company/organization with suppliers, 57,3% believe that employees care for these relationships because they indicated yes for the answer. 36,7% of respondents from the particular group gave the answer rather yes, 4,2% rather not and 1,8% no. The data provided shows that the vast majority of respondents are of the opinion that measures are being taken that support shaping proper relationships with suppliers.

The respondents commented on whether the management and other employees of the company/organization care about building proper relationships with clients. This is shown in Figure 3.

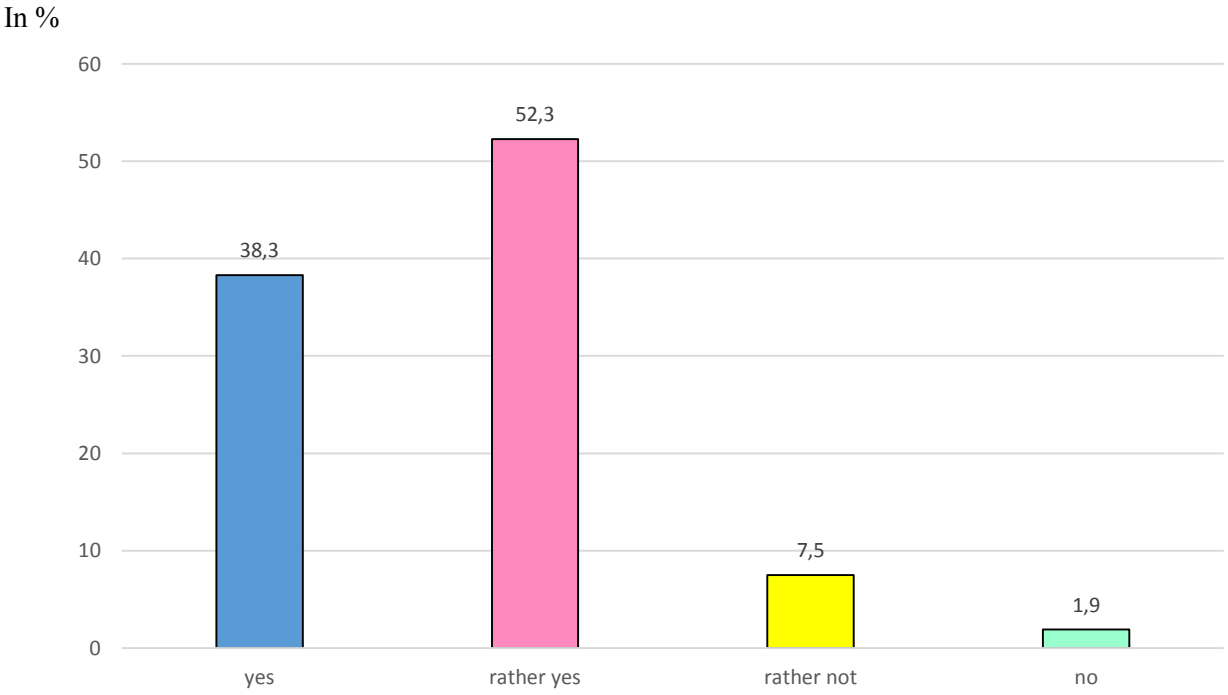


Note: 99,0% of respondents commented on building customer relationships.

Figure 3. Respondents' opinion on the care taken by the management staff and other employees of the enterprise/organization for appropriate customer relationships. Source: own study based on conducted surveys.

Among the respondents who defined how they perceive the relationship between the management and other employees of the enterprise/organization with clients, 72,4% believe that employees care about these relationships because they indicated yes. 22,6% of respondents from the particular group gave the answer rather yes, 3,0% rather no and 2,0 no. The vast majority of respondents are of the opinion that actions are taken to shape the right relationships with customers.

The respondents also specified whether the management and other employees of the enterprise/organization care about building proper relationships with other enterprises/ organizations/institutions with which the enterprise cooperates. This is shown in Figure 4.



Note: 88,6% of respondents commented on building relationships with these external stakeholders.

Figure 4. Respondents' opinion on the care taken by the management and other employees of the enterprise/organization for appropriate relationships with other enterprises/organizations/institutions with which the enterprise cooperates. Source: own study based on conducted surveys.

Among respondents who defined how they perceive the relationship between the management and other employees of the enterprise/organization with other enterprises/ organizations/institutions with which the particular entity cooperates 38,3% believe that employees care about these relationships because they indicated the answer yes. 52,3% of respondents from the particular group gave the answer rather yes, 7,5% rather not and 1,9% no.

The respondents commented on what type of actions taken by the employees of the enterprise/organization supports building proper relations with: suppliers, recipients, customers and other enterprises/organizations/institutions with which the enterprise cooperates. This is shown in Figure 5.

In %

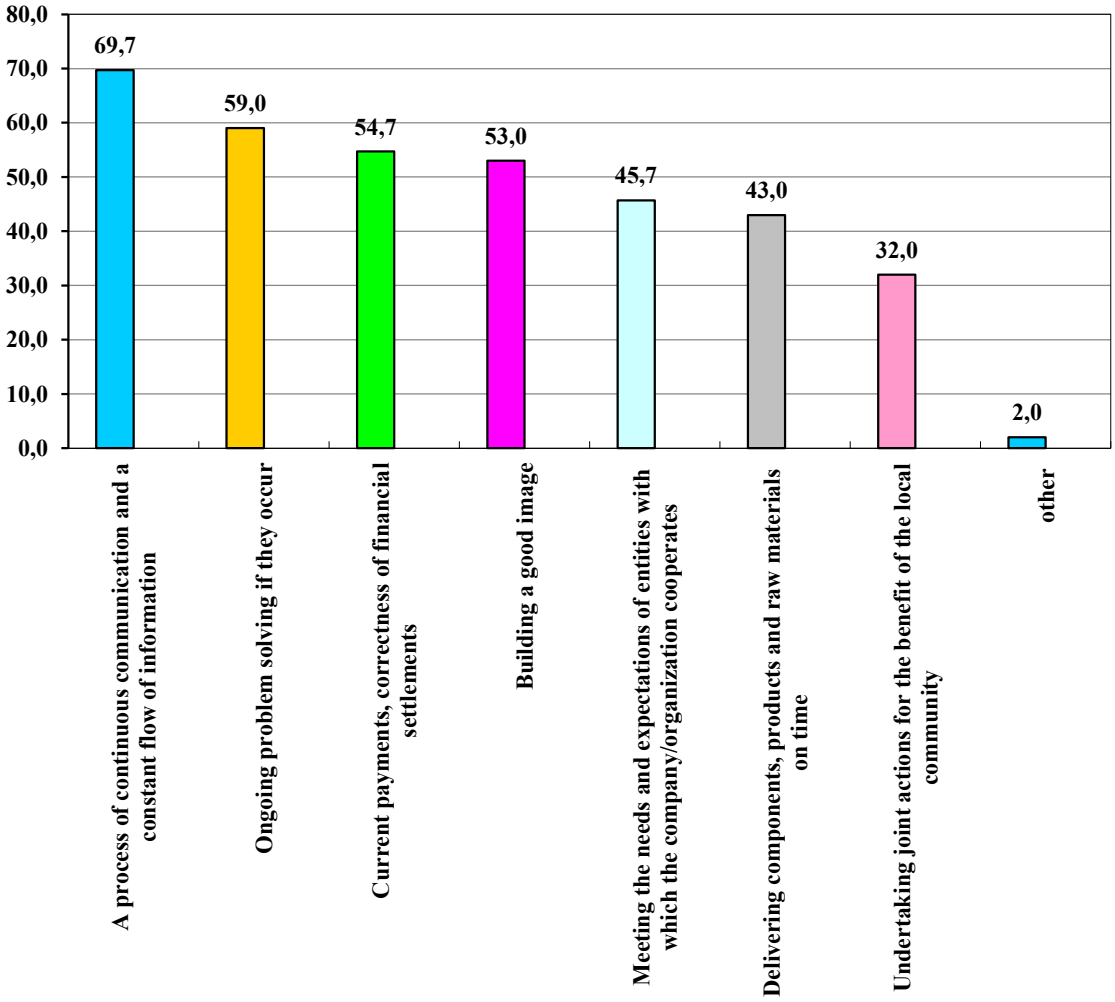


Figure 5. Actions taken by employees of the enterprise/organization to build proper relationships with: suppliers, recipients, customers and other enterprises/organizations/institutions with which the enterprise cooperates. Source: own study based on conducted surveys.

Based on the analysis of the conducted research, it can be concluded that the vast majority of respondents attach great importance to the process of communicating with business partners. Nearly 70,0% of respondents share this view. It is also closely related to the second factor, i.e. ongoing solving of emerging problems, which, as known, cannot take place without maintaining permanent "communication ties" with partners from the environment with which the particular entity cooperates. Financial issues connected with current payment regulation are also significant. The next two factors are related to each other, as building a good image requires, among others, meeting the needs and expectations of entities with which the company/organization cooperates. Further positions include: delivering sub-assemblies, products, raw materials on time (as indicated by 43,0% of respondents) and undertaking joint activities with local business partners (32,0% of respondents). 2% of respondents indicated other activities, including the impact of prices and charity activities.

Research shows that an important factor affecting building of good relationships with business partners is building a good image. As A.I. Baruk states, employees are a key carrier of the company's image. Therefore, shaping the right professional attitudes of employees characterizes entities operating in accordance with the principles of relationship marketing (p. 43).

Due to the fact that respondents first pointed to the factor related to communication, which was defined as "a process of continuous communication and constant flow of information", it is worth considering what supports such activities. W. Rydzak (2017) referring to the results of the European Communication Monitor (ECM) research "indicates that currently there is a perception of coexistence and complementarity of online and traditional channels. The challenge for companies in the next few years will be such a dialogue that, despite multi-channel communication and various environment groups, ensures consistency of messages addressed to stakeholders".

The fulfilment of the first postulate regarding the communication of business partners with each other is closely related to the implementation of the second important aspect of business implementation in this dimension, namely solving problems on a regular basis if they only appear. They may be of a different nature and result in irregularities on many levels of enterprise's operation. Sometimes the chain of interdependencies drives the "spiral" of subsequent gaps and deficiencies, resulting from the fact that the "weaker link", e.g. in the logistics chain, like the domino effect, escalates worrying problems. It is therefore necessary to constantly diagnose the situation and be proactive rather than conservative. Enterprises that want to ensure long-term relationships with other market players as well as with consumers should meet their needs and expectations. Implementing various CRM (*Consumer Relationship Management*) activities can be the answer. CRM solutions should be prepared and used in an enterprise to provide support for all phases of customer contact with the enterprise. Interactive (communication) CRM can be particularly important, which uses the latest Internet and telephone technology that ensures a smooth flow of information. The scope of its application most often includes the marketing, sales and service department in enterprises (Malanowska, and Koliński, 2011). Benefits that can be achieved thanks to the implementation of the CRM system are such as (Ławnicki, 2005):

1. increasing customer loyalty by monitoring contacts on the enterprise – customer line,
2. fast consumer information flow,
3. improvement of complaint procedures,
4. creating one, coherent database of potential and actual clients.

Inbound marketing – the concept of conducting business-market communication, which aims not only at building but also maintaining and strengthening long-term relationships on the level of customer and business interaction, goes against the challenges of the modern market. The solutions used in this area within marketing automation, SEO, integration of ERP and CRM systems allow building long-term, profitable relationships of the company on the market.

Thanks to this, it is possible to generate a wide spectrum of benefits for clients, the basis for the stability of relationships is being built (Witczak, 2014).

The ability to create customer satisfaction is associated with the use of customer service logistics. It is determined by factors such as time, reliability, communication and convenience (Ławnicki, 2005). Communication helps maintain close contact with customers but also monitors service reliability.

The efficient communication process of business partners operating in a complex network of relationships and entities that participate in the supply chain can promote the exchange of knowledge. However, it is important to remember that there may be various types of barriers. They should be accurately identified in the process of sharing knowledge at the level of various actors in the supply chain (Dohn, 2016). Co-creation of new knowledge with relevant stakeholders requires an efficient flow of information, its generation and continuous research to update it.

Conclusions

The paper shows how employees of enterprises ("internal customers") perceive building the right relationships with: suppliers, recipients, customers and other enterprises, organizations and institutions with which a particular entity cooperates. As a result of the conducted research, it was found that the discussed group of respondents perceived a high level of implementation of such activities. Employees show a high awareness of the impact of their actions on the relationship that a particular entity forms with the environment. It has been proven that the main factors favouring this include: the process of continuous communication and constant flow of information, ongoing problem solving, correct and timely implementation of financial settlements as well as building a good image. The following ones were considered a bit less important: providing components, products, raw materials on time, meeting the needs and expectations of entities with which the company cooperates or undertaking joint actions for the local community. Important indications in the field of practice include: continuous improvement of the process of communicating with the environment, also in the dimension of following innovations in the field of applying new, interactive technologies. It is also important to proactively react to signals coming from the environment, and to quickly solve emerging problems. Image building may be fostered by practices in the field of corporate social responsibility, e.g. implementing projects for the local community together with other market participants. It would be worthwhile to make efforts to generate "quick warning" diagnostic programs that would help business partners manage also in crisis conditions.

One should agree with the statement that: "Mutual, diverse relations perfectly fit into the partial paradigm of a modern enterprise – the paradigm of relational competence. Enterprises, by establishing relationships, strive to achieve goals that they cannot achieve individually" (Kwiecień, 2018, p. 19). Creating competitive advantage of enterprises can be rooted in shaping the right relationships with business partners and customers. The behaviour of employees of a particular business entity significantly affects its perception by the environment. It is because of their efficient functioning and perception of the need to build relationships with the business environment that the enterprise will be able to shape its competitive advantage and strengthen its market position. The image of the company is developed on many levels and without the full commitment of employees it cannot be consolidated in the opinion of the environment.

Enterprises will have to unify relationship marketing practices to focus on high-quality customer service, as this will affect the success and retention of the business entity. Recognition of relationship marketing as a "wave of the future" is becoming increasingly important (Rasul, 2018).

References

1. Ballantyne, D., Christopherm, M., and Payne A. (2003). Relationship marketing: looking back, looking forward, *Marketing Teory*, *Vol. 3(1),* pp. 159-166. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.821.7252&rep=rep1&type=pdf, 15.09.2019.
2. Baruk, A.I. (2008). *Postmodernistyczne koncepcje marketingowe a marketing klasyczny*. Toruń: Wydawnictwo „Dom Organizatora".
3. Berry, L.L. (1995). Relationship Marketing of Services — Growing Interest, Emerging Perspectives. *Journal of the Academy of Marketing Science*, *Vol. 23, Iss. 4,* pp. 236-245. Retrieved from https://link.springer.com/content/pdf/10.1177/009207039502300402.pdf, 15.09.2019.
4. Braun, C., Hadwich, K., and Bruhn M. (2017). How do different types of customer engagement affect important relationship marketing outcomes? An empirical analysis, *Journal Of Customer Behaviour*, *Vol. 16, No. 2,* pp. 111-144. Retrieved from http://dx.doi.org/10.1362/147539217X14909732699525, 07.06.2020.
5. Dobiegała-Korona, B. (2008). Zarządzanie wartościami dla klienta (wybrane aspekty). In: W.M. Grudzewski, and J.K. Hejduk (Eds.), W poszukiwaniu nowych paradygmatów zarządzania (pp. 29-51). Warszawa: Szkoła Główna Handlowa – Oficyna Wydawnicza.
6. Dohn, K. (2016). Identyfikacja zakłóceń w procesie dzielenia się wiedzą na różnych poziomach łańcucha dostaw. *Zeszyty Naukowe Politechniki Śląskiej, Seria: Organizacja*

i Zarządzanie, z. 89, Retrieved from https://www.infona.pl/resource/bwmeta1.element.baztech,ZNOiZ_89_2016_Dohn.pdf, 18.09.2019.

7. Eskandari, H., Aali, S., and Heris, A.B. (2017). The Impact of Relationship Marketing Tactics and Dimensions of the Relationship Quality on Customer Loyalty. *Management and Business Research Quarterly*, *no. (1)*, pp. 1-13, Retrieved from https://www.researchgate.net/publication/325090048_The_Impact_of_Relationship_Marketing_Tactics_and_Dimensions_of_the_Relationship_Quality_on_Customer_Loyalty, 29.07.2020.
8. Fang-Yi, Lo, and Campos, N. (2018). Blending Internet-of-Things (IoT) solutions into relationship marketing strategies. *Technological Forecasting & Social Change, 137*. pp. 10-18. Retrieved from https://doi.org/10.1016/j.techfore.2018.09.029, 21.07.2020.
9. Fonfara, K. (2004). *Marketing partnerski na rynku przedsiębiorstw*. Warszawa: PWE.
10. Gölgecia, I., Murphyb, W. H., and Johnston, D. A. (2018). Power-based behaviors in supply chains and their effects on relational satisfaction: A fresh perspective and directions for research. *European Management Journal, 36*, pp. 278-287, Retrieved from http://dx.doi.org/10.1016/j.emj.2017.03.011, 15.07.2020.
11. Gordon, I.H. (2001). *Relacje z klientem. Marketing partnerski.* Warszawa: PWE.
12. Grabellus, C., Heinrich, L., and Schulz, W.H. (26.07.2020). *B2B supply chain processes lacking behind the B2C developments – a co-operative platform approach for jointly realizing competitive advantages,* https://www.researchgate.net/profile/Santi_Setyaningsih/publication/339401715_THE_EFFECT_OF_SUPPLY_CHAIN_COOPERATION_ON_THE_STRATEGY_OF_SMES_IN_HUNGARY/links/5e4fb82792851c7f7f49bff6/THE-EFFECT-OF-SUPPLY-CHAIN-COOPERATION-ON-THE-STRATEGY-OF-SMES-IN-HUNGARY.pdf#page=68, Session 1: General Issues in Supply Chain Management, Proceedings of the 24th International Symposium on Logistics (ISL2019) Supply Chain Networks vs Platforms: Innovations, Challenges and Opportunities, Würzburg, Germany, 14-17th July 2019.
13. Grönroos, Ch. (2017). Relationship marketing and service: An update. *Journal of Global Scholars Of Marketing Science*, *vol. 27, no. 3,* pp. 201-208, https://www.tandfonline.com/doi/pdf/10.1080/21639159.2017.1318666. https://doi.org/10.1080/21639159.2017.1318666, 21.07.2020.
14. Gummesson, E. (1997). Relationship marketing as a paradigm shift: some conclusions from the 30R approach. *Management Decision, 35/4,* pp. 267-272. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.39.5182&rep=rep1&type=pdf, 14.09.2019.
15. Gummesson, E. (2017). From relationship marketing to total relationship marketing and beyond. *Journal of Services Marketing, Vol. 31, No. 1,* pp. 16-19. Retrieved from https://doi.org/10.1108/JSM-11-2016-0398, 13.09.2019.

16. Gummesson, E., and Polese, F. (2009). B2B is Not an Island. *Journal of Business & Industrial Marketing*, *Vol. 24, No. 5/6*, pp. 337-350.
17. Iglesias, O., Markovic, S., Bagherzadeh, M., and Singh, J.J. (2020). Co-creation: A Key Link Between Corporate Social Responsibility, Customer Trust, and Customer Loyalty. *Journal of Business Ethics,* Vol. 163, pp. 151-166. Retrieved from https://doi.org/10.1007/s10551-018-4015-y, 15.07.2020.
18. Jraisat, L. (2017). Factors of Relationship Marketing In Creating Leadership. *Journal of Organisational Studies and Innovation, Vol. 4, no. 1, Spring,* pp. 1-13. Retrieved from http://www.mbacademy.org.uk/journals/2017-2018/vol-4/issue-1/Luai%20Jraisat.pdf, 07.06.2020.
19. Kowalska-Musiał, M. (2007). Morfologia relacji w ujęciu paradygmatu marketingu relacji. In: O. Witczak (Ed.), *Budowanie związków z klientami na rynku business to business*. Warszawa: CeDeWu Sp. z o.o.
20. Kwiecień, A. (2018). *Dynamiczne zarządzanie relacjami w kreacji sukcesu przedsiębiorstwa*. Katowice: Wydawnictwo Uniwersytetu Ekonomicznego.
21. Ławnicki, J.S. (2005). *Marketing sukcesu – partnering*. Warszawa: Difin.
22. Luu, T.T. (2019). CSR and Customer Value Co-creation Behavior: The Moderation Mechanisms of Servant Leadership and Relationship Marketing Orientation. *Journal of Business Ethics, Vol. 155*, pp. 379-398. Retrieved from https://link.springer.com/content/pdf/10.1007/s10551-017-3493-7.pdf, 07.06.2020.
23. Malanowska, I., and Koliński, A. (2011). Rola systemów informatycznych w procesie przepływu informacji w łańcuchu dostaw. In: C. Halesa, B. Mikuła (Eds.), *Społeczeństwo informacyjne. Gospodarka, technologie*. Kraków: Wydawnictwo Uniwersytetu Ekonomicznego.
24. Mazurek-Łopacińska, K. (2002). *Orientacja na klienta w przedsiębiorstwie*. Warszawa PWE.
25. Mazurkiewicz, A. (2010). *Kapitał ludzki w procesie kształtowania sprawności organizacji*. Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
26. Minta, Y., and Traore, Y. (2018). A review to understand relationship marketing and customer loyalty: effect factors. *International Journal of Current Research, Vol. 10, Iss. 08*, pp. 73106-73111, August, 2018. Retrieved from DOI: https://doi.org/10.24941/ijcr.32003.08.2018, 21.07.2020.
27. Neumann, J.L., and Laimer, C.G. (2019). Proposed Application of the Relationship Marketing in Interorganizational Relations. *Brazilian Journal of Marketing*, *19(1),* pp. 118-131. Retrieved from https://doi.org/10.5585/remark.v18i1.3925, 07.06.2020.
28. Olsztyńska, A. (2005). *Marketing wewnętrzny w przedsiębiorstwie. Koncepcje i narzędzia wspomagające integrację działań wewnętrznych organizacji*. Poznań: Wydawnictwo Akademii Ekonomicznej.
29. Otto, J. (2001). *Marketing relacji. Koncepcje i stosowanie.* Warszawa: C.H. Beck.

30. Payne, A., and Frow, P. (2013). *Strategic Customer Management, Integrating Relationship Marketing and CRM.* Cambridge: University Press.
31. Payne, A., Christopher, M., Clark, M., and Peck, H. (1999). *Relationship Marketing for competitive advantage. Winning and keeping Customers*. Oxford. Retrieved from https://books.mec.biz/tmp/books/25QB1U2ZZZEP74HQ86ZR.pdf, 18.09.2019.
32. Radionova, E., and Praude, V. (2016). The Opportunities of Relationship Marketing: Aspect of the Eu Digital. *European Integration Studies, No. 10*, pp. 126-134, Retrieved from https://www.exeley.com/exeley/journals/european_integration_studies/10/10/pdf/10.5755_j01.eis.0.10.14605.pdf, 07.06.2020.
33. Rasul, T. (2018). Relationship marketing's importance in modern corporate culture. *The Journal of Developing Areas*, *Vol. 52, No. 1*. Retrieved from https://search.proquest.com/docview/1960279252/fulltext/10F21FC4F0414435PQ/1?accountid=14686, 13.09.2020.
34. Rudawska, E. (2008). *Znaczenie relacji z klientem w procesie kształtowania wartości przedsiębiorstwa.* Szczecin: Wydawnictwo Naukowe Uniwersytetu Szczecińskiego.
35. Rydzak, W. (2017). European Communication Monitor – kierunek zmian komunikowania się firm z otoczeniem. *Zeszyty Naukowe Polskiego Towarzystwa Ekonomicznego w Zielonej Górze, No. 7.* Retrieved from http://ptezg.pl/Files/files/zn7/art20.pdf, 19.09.2019.
36. Saath, M., Schönitz, M.S., Siems, F.U., and Papen, M.Ch. (2018). Benefits of Convoy Model Theory for Explaining and Controlling Business-to-Customer Relationships. *Journal Of Relationship Marketing*, *Vol. 17, No. 4*, pp. 292-310. Retrieved from https://doi.org/10.1080/15332667.2018.1534061, 07.06.2020.
37. Skarmeas, D., Zeriti A., and Baltas, G. (2016). Relationship Value: Drivers and Outcomes in International Marketing Channels. *Journal of International Marketing, American Marketing Association, Vol. 24, No. 1*, pp. 22-40. Retrieved from https://www.academia.edu/17898280/Relationship_Value_Drivers_and_Outcomes_in_International_Marketing_Channels, 07.06.2020.
38. Światowiec (2006). *Więzi partnerskie na rynku przedsiębiorstw*. Warszawa: PWE.
39. Varadarajan, P.R., and Rajaratnam, D. (1986). Symbiotic Marketing Revisited. *Journal of Marketing, Vol. 50, No. 1*, pp. 7-17. Retrieved from https://www.jstor.org/stable/1251274, 14.09.2019.
40. Witczak, O. (2014). Inbound marketing a koncepcja marketingu relacji. *Studia Ekonomiczne*, *tom 182*, pp. 20-29. Retrieved from http://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.desklight-c988c6ff-aa85-4dc4-a175-7832ebbc86b8, 05.10.2019.
41. Zaif, A., and Cerchia, A.E. (2019). Integrating Online Marketing Strategies in B2B Companies. *"Ovidius" University Annals, Economic Sciences Series, Vol. XIX, Iss. 2*, pp. 614-620, http://stec.univ-ovidius.ro/html/anale/RO/wp-content/uploads/2020/02/Section%20IV/35.pdf, 07.06.2020.

42. Żebrucki, Z. (2012). *Badania form partnerstwa logistycznego między przedsiębiorstwami*. Gliwice: Wydawnictwo Politechniki Śląskiej.
43. Zhang, J.Z., Watson IV, G.F., Palmatier, R.W., and Dant, R.P. (2016). Dynamic Relationship Marketing. *Journal of Marketing, Vol. 80*, pp. 53-75. Retrieved from https://researchrepository.griffith.edu.au/bitstream/handle/10072/337606/ZhangPUB2495.pdf?sequence=1&isAllowed=y, 07.06.2020.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

APPLICATION OF THE SMED METHOD FOR IMPROVING THE CNC MACHINE WORKPLACE PRODUCTION PROCESS IN THE SCOPE OF "WAITING" MUDA

Katarzyna HYS[1]*, Antoni DOMAGAŁA[2]

[1] Politechnika Opolska, Wydział Inżynierii Produkcji i Logistyki, Opole; k.hys@po.opole.pl, ORCID: 0000-0003-0800-2804
[2] Akademia WSB, Dąbrowa Górnicza: domagala.antoni@gmail.com, ORCID: 0000-0002-2040-6222
* Correspondence author

Purpose: The purpose of this work is to analyze the actual changeover time of a given machine and apply the developed changes.
Design/methodology/approach: Properly designed and implemented, the SMED method allows you to limit the setup time for a given machine. Retrofitting in Lean optics is one of the activities that does not add value to the organization, because of its waiting time.
Findings: As a result of the changes implemented, it was possible to determine measurable effects for the company in the category of "waiting" in the Muda aspect.
Research limitations: The presented analysis has a spatially and temporally limited dimension, which could be the trigger for expanding the research in the future.
Originality/value: This article presents actions leading to the optimization of the Computerized Numerical Control (CNC) machine production process by using one of the Lean Management concepts – in this case, it is the Single Minute Exchange of Die (SMED) method.

Keywords: Lean Management, SMED method, SMED methodology, Muda "waiting".

Category of the paper: case study.

1. Introduction

Continuous and sustained improvement of production processes is based on the elimination of all kinds of waste and standardization of solutions introduced for these processes. One of the ways to achieve the correct organization of work, together with a high level of quality and the required safety standards while taking into account the necessary costs, can be implementing activities in accordance with the philosophy of Lean Management (Bhamu, & Sangwan, 2014).

The concept of lean management is based on eliminating waste (from Japanese – muda) (Nicholas, 2016; Hys, 2016; Camuffo, & Gerli, 2018). Muda refers to all activities carried out in the organization that do not add value to the product, but exist due to the structure of the production process. The concept of waste is complex. Its literal translation means not utilizing things (in part or in whole), inefficient management or unreasonable wastefulness. From the Lean Management concept point of view - it is used to define activities in the process for which the client does not want to pay. In literature on the subject, several types of waste are distinguished, which are grouped into the following categories (Prasetyawan et al., 2019; Meng, 2019):

- overproduction – that is, manufacturing of products despite the fact that they have not been ordered, the result of which is the increase of fixed production costs (e.g. energy consumption, human labor, storage costs),
- unnecessary stocks – both finished goods and inter-operational products, which increase the costs of transport and storage,
- unnecessary employee movement – activities that are carried out during the production process, but they do not directly constitute any value to the product (e.g. starting the machine, searching for a tool to fix),
- unnecessary transport – the absence of optimization in the area of communication and transport routes (e.g. missing or incorrect marking, incorrectly determined/calculated routes),
- faulty and quality defective products – which means creating new and repairing defective ones,
- unnecessary and excessive processing – implementing subprocesses unnecessary from a qualitative perspective in the production process,
- waiting – wait time generated by downtime in an improperly optimized production process.

In literature on the subject for such categories, the acronym TIMWOOD is used, which means respectively: *transportation, inventory, motion, waiting, overproduction, overprocessing, defects*.

The given group of activities generating mismanagement is a classic set. Nevertheless, in literature it is postulated to supplement this list with categories of so-called soft muda. These include lost employee creativity (the so-called untapped employee potential) and lost benefits resulting from the company's lost reputation in a given market (De Boeck et al., 2019; Bicheno, & Holweg, 2009).

2. SMED method and methodology

In the majority of enterprises, not only associated with industrial production but also other branches of industry, production processes are becoming increasingly more automated (Hys, 2014). The SMED (Single Minute Exchange of Die) method is a set of techniques and tools that make it possible to shorten the changeover times of machines and devices involved in a given production process (Basri et al., 2019). The creator of the SMED methodology is Shingeo Shingo, who initiated the concept of quick retooling in 1950 (Shingo, & Dillon, 1985). The purpose of SMED is to design the production process in such a way that the changeover of machines and devices is carried out using the least number of tools.

From the practical point of view, the idea of SMED consists in transferring as many operations as possible "outside" (i.e. carrying out changeover operations during machine operation) and simplifying and increasing the efficiency of the implementation of individual steps of retooling machines and equipment (Cakmakci, 2009; Da Silva, & Godinho, 2019). As the researchers note – in most of the cases studied, it is not technical factors that determine the duration of the changeover, but organizational factors (Sayem et al., 2014; Rosmaini, & Soberi, 2018; Godina et al., 2018).

The literature on the subject indicates four stages of organization of the machine retooling process. These include (Womack, & Jones, 2001; Moreira, & Campos, 2011; Bikram, & Dinesh, 2011):

- stage I – analysis of the current state of the given production cell,
- stage II – separation of internal and external retooling operations,
- stage III – transformation of internal processes into external processes,
- stage IV – improving all aspects of retooling.

STAGE 1 – Analysis of the changeovers process. At this stage, there are no physical improvements in the production process yet, and time is spent on in-depth analysis of the process. Here, particular attention is paid to the definition of individual steps in the process of retooling machines and devices and to the analysis of the required resources related to these shifts. The first stage consists of the following operational activities:

- Recording of all retooling operations (external and internal) with particular emphasis on the operator's movements, equipment used, workstation organization, transport routes, waiting for the next operation, etc.
- Analysis of retooling in a large team, which allows you to increase the perspective of analyses and a multifaceted look at the order and scope of activities carried out when retooling machines and devices.
- Preparation of documentation for analyses constituting a record of the current status of the changeover process.

As a result of such conclusions, an analysis of operator's motions is obtained in the form of a "Spaghetti diagram" and changeover progress report card.

STAGE 2 – External and internal changeover. This step in the SMED methodology is considered to be the most important, and its correct implementation allows for a decrease in changeover time [...]. The basic goal of this stage is a clear demarcation between internal and external retooling and elimination of all those activities that unnecessarily extend the retooling of machines and devices.

Among the techniques facilitating the implementation of this stage of SMED are the following:

1. Control cards that contain:
   - a list of employees trained and authorized to perform retooling of machinery and equipment,
   - a list of tools, instruments and changeover materials,
   - setting values on a machine that is being retooled or for a specific process,
   - a list of procedures and instructions to be used for the changeover.
2. Appropriate transport of parts and tools for changeovers (external operation).
3. Visual control techniques – using colors and labelling to mark machine equipment, appropriate arrangement and presentation of tools (e.g. in the form of shadow boards).

STAGE 3 – Transformation of changeovers. The primary purpose of this stage of the SMED method is to replace as many retooling operations as possible from internal to external. The introduction of the changeover transformation stage allows for a reduction in its duration, the tools and techniques used, which include:

- indirect clamping devices,
- standardization of functions – unification of assembly parameters in a machine or device, unification of tools and instrumentation,
- standardization of the changeover procedure itself through the precise changeover instructions, which contain photos or diagrams of the various stages of the changeover, set parameters, etc.

STAGE 4 – Improvements. The final stage of the SMED method is to take actions to reduce the duration of internal operations as much as possible. The potential of this stage is estimated at approx. 10% reduction in changeover time. The basic tools used in this step include:

- proper storage and management of tools and instruments,
- parallel operations,
- fixing grippers,
- elimination of regulations,
- mechanization.

The SMED methodology is a universal record of activities that can be directly related to research and analyses carried out in a given production environment.

3. Research methodology

The research presented in this article was carried out in a production company at an automatic CNC machine station equipped with a robotic pallet system. The study involved an employee implementing a retooling of a CNC machine in a robotized manufacturing cell, hereinafter referred to as a setting operator.

The research was carried out during the first half of 2019 at an industrial production plant in southern Poland. The purpose of this work is to analyze the actual changeover time of a given machine and to apply the developed changes to the investigated production line. The analysis was carried out using the SMED Method for one of the Muda categories, i.e. the waiting time for the changeover of a CNC machine tool on a given production line. The expectation was set that the time analysis in the field of CNC machine tool changeover will allow optimization of the changeover time for that machine.

Attempting to achieve the research objective, one of Muda's losses was analyzed, i.e. waiting for the machine changeover using the SMED methodology and method. Typical activities constituting a loss (i.e. waste) during the retooling of machinery and equipment in the production process in the area of "waiting" include, among others:

- searching for tools by the employee and their unnecessary transport,
- repairing tools,
- waiting for the supervisor's decision,
- waiting for logistics,
- sorting and searching for information for retooling machines and devices (instructions, parameters, etc.),
- pondering and repeatedly controlling implemented activities and steps taken.

For the purpose of this study, tests were carried out at the CNC machine workstation using the following stages according to the SMED methodology:

Stage 1 – workstation analysis and selection of the workstation.

Stage 2 – selection of the research method.

Stage 3 – analysis of the operator's work during the change of instrumentation at the selected workplace, in particular:

a) determining the initial state,
b) verification of the initial state,
c) a proposal of changes to improve the operator's actions during the change of tooling at the CNC machine workstation.

Stage 4 – implementing changes.

Stage 5 – controlling the effects of changes introduced in a given workplace.

Stage 6 – analysis and verification of changes made and effects obtained. Making a decision to introduce permanent changes to the technology in the field of retooling, rejecting these changes or their partial implementation.

4. Research results

Stage 1 – workstation analysis and selection of workstation.

Figure 1. Robotic pallet system (illustrative example), source Metal Team advertising materials.

The work of the employee making the changeover and setting up the production process at a CNC machine workstation was the subject of the research. Due to the protection of the data of the examined organization, in (Figure 1) in exchange for presenting the original photo of the workplace, a catalog visualization of a compact, robotic pallet system with five pallets, called "Rexio® Drawer" is used. During the changeover process to another manufactured product, the so-called "separators" dedicated to each of the manufactured elements are mandatorily exchanged. The grippers on the Kawasaki robot and pneumatic equipment installed directly on the CNC machine are also subject to replacement.

Stage 2 – selection of the research method.

The research method was chosen. It was decided to film the changeover process, and then conduct frame by frame analysis. All actions performed were grouped into:

- internal activities – those that can be done only when the machine is stopped,
- external activities – activities that can be performed even when the machine is running.

The next step was transforming as many of the internal operations as possible into external ones, as well as improving all aspects of retooling. The obtained results were to be described and presented in the form of graphs.

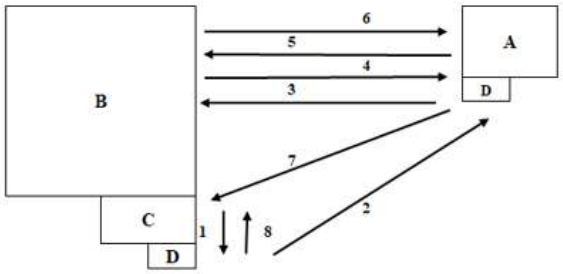
Stage 3 – operator's work analysis.

The set of all activities (the so-called initial state), along with the division into internal and external activities during the changeover, which the setting operator performs at the analyzed workplace, is presented in (Table 1).

Table 1.
Setting operator's actions performed during the changeover – initial state

Action No.	Activity Description	Type of activity internal/ external	Time [min.]
Production stop			
1	walking up to tool trolley	int.	1
2	taking the tool trolley	int.	1
3	moving on to the robotized manufacturing cell with the tool trolley	int.	3
4	unscrewing the separators from all drawers	int.	48
5	dismantling the grippers from the robot	int.	6
6	dismantling the tooling from the CNC machine	int.	7
7	moving on to the tool holding storage with separators, grippers and other instrumentation	int.	3
8	putting the separators, grippers and instrumentation on rack No. 1	int.	3
9	collecting separators, grippers and instrumentation from rack No. 2	int.	3
10	transition with collected separators, grippers and instrumentation to the robotized manufacturing cell	int.	3
11	screwing separators onto all drawers	int.	60
12	mounting grippers on the robot	int.	10
13	mounting the tooling on a CNC machine	int.	13
14	selecting the appropriate program on the HMI panel	int.	1
15	performing the entire cycle of exchanging pieces for 20% of the working capacity of the robot	int.	15
16	performing measurements of the first correct piece	int.	5
Resumption of production			
17	moving the tool trolley to its designated parking place	ext.	3
18	return to the workstation	ext.	1
		Total	186

Source: own study.



Route no.	Number of steps
1	2
2	14
3	11
4	11
5	11
6	11
7	14
8	2
Total	**76**

Legend:
A. Robotized manufacturing cell
B. Tool holding storage
C. Setting operator's workstation
D. Tool trolley

Figure 2. Workplace overview graph - initial state source own study.

Using the Spaghetti Chart diagram in (Figure 2), at a semi-automatic workstation, the initial state of the setting operator's movements during the changeover of the robotic pallet system was presented.

Stage 4 – implementing changes.

The analysis conducted indicated that there is a possibility of rationalization in this area. In order to limit the number of steps performed by the employee, the activities and area of the workplace were reorganized. The scope of changes that were introduced is presented in (Table 2).

Table 2.
Introduced activities for the analyzed workstation

No.	Actions introduced
1	division of activities performed during changeover into external and internal
2	changing the parking position of the tool trolley
3	determining new travel paths for the setting operator during the changeover
4	resignation from replacing separators in all drawers and permanent assignment of three drawers for the first product and two drawers for the second manufactured product
5	in order to eliminate the robot's faults while in operation, special covers were made for buttons confirming the readiness of the pallet for production for the drawers designated for the product that is not currently being manufactured

Source: own study.

Stage 5 – verification of the implemented changes and their effects at a given workstation.

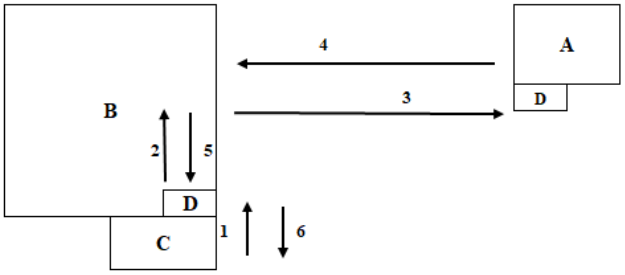
The list of the setting operator's activities after the reorganization and their workstation area after the changes is presented in (Table 3).

Table 3.
Setting operator's actions performed during the changeover – status after changes

Action No.	Activity Description	Type of activity internal/ external	Time [min.]
1	walking up to a tool trolley	ext.	1
2	taking the tool trolley	ext.	1
3	collecting grippers and tooling from rack 2	ext.	2
4	placing grippers and tooling on the tool trolley	ext.	1
5	transition with the tool trolley to the robotized manufacturing cell	ext.	3
Production stop			
6	removing grippers from the robot and installing new ones	int.	14
7	removing the tooling from the CNC machine tool and installing a new one	int.	17
8	selecting the appropriate robotized manufacturing cell's program on the HMI panel	int.	1
9	performing the entire cycle of exchanging pieces for 20% of the working capacity of the robot	int.	15
10	measurement of the first correct piece	int.	5
Production resumes			
11	change of the position of the buttons covers confirming the readiness of the pallet	ext.	5
12	passage with the tool trolley to the tool holding storage	ext.	3
13	putting the grippers and tooling back on rack no. 1	ext.	2
14	passage with the tool trolley to its designated parking place	ext.	1
15	return to the workstation	ext.	1
		Total	72

Source: own study.

Figure shows the Spaghetti Chart of the setting operator's movement during the changeover of a robotic pallet system at a semi-automatic workstation, after introducing the proposed improvements (Figure 3).



Route no.	Number of steps
1	2
2	4
3	11
4	11
5	4
6	11
Total	**34**

Legend:

A. Robotized manufacturing cell
B. Tool holding storage
C. Setting operator's workstation
D. Tool trolley

Figure 3. Workstation overview diagram – state after implemented improvements source own study.

Stage 6 – analysis and verification of changes made and effects obtained.

Illustrating the setting operator's actions in the tested robotized manufacturing cell using the Spaghetti Chart diagram allowed for the verification of the initial state and subsequently, the presentation of a new way of employee movement during the changeover of the robotized pallet system. As a result of the introduced changes, the number of steps performed by the setting operator was reduced during one changeover by the value of 42 steps[1]. The indicated change is presented in (Figure 4).

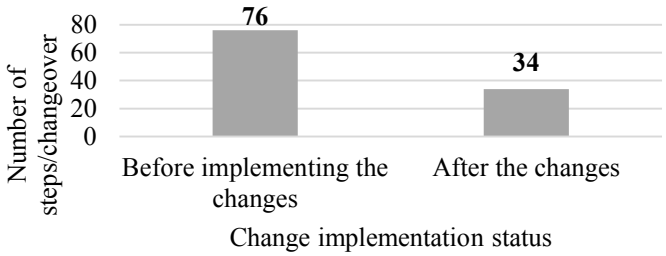


Figure 4. Number of steps performed by the setting operator before and after introducing improvements during a single changeover source own study.

The analysis of the actions performed by the setting operator after introducing improvements at the tested workstation, according to the data in (Table 2), showed a reduction in the time of one changeover of the robotized pallet system by 114 min. The duration of the changeover before and after the improvements made is shown in (Figure 5).

[1] Number of reduced steps – the total number of steps during one changeover performed by the setting operator before changes, minus the total number of steps made by him after the changes; 76 steps – 34 steps = 42 steps.

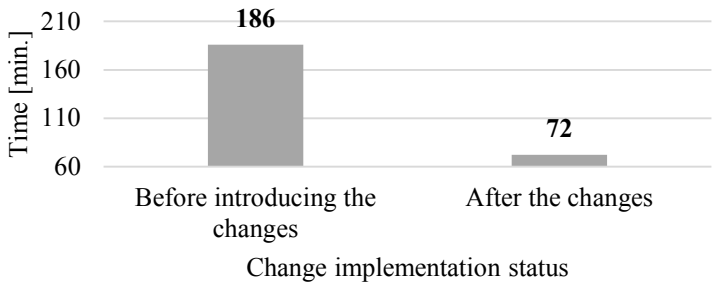


Figure 5. Change in the duration of the retooling of a semi-automatic workstation with a robotic pallet system as a result of improvements source own study.

5. Conclusions from the research

The analysis of the examined workstation allowed for drawing the following conclusion: as a result of the rationalization introduced at the semi-automatic workstation, the working time of the analyzed workstation was increased by 114 min./month. According to customer demand, the tooling changeover is performed once per month. Converted into the annual production plan, the availability of a semi-automatic workstation with a robotic pallet system has been increased by 1368 min/year, which amounts to 22.8 hours/year[2]. Figure presents the time change in annual terms, in which the analyzed semi-automatic workstation is stopped as a result of changing the tooling for subsequent manufactured products, before and after the introduced rationalizations (Figure 6).

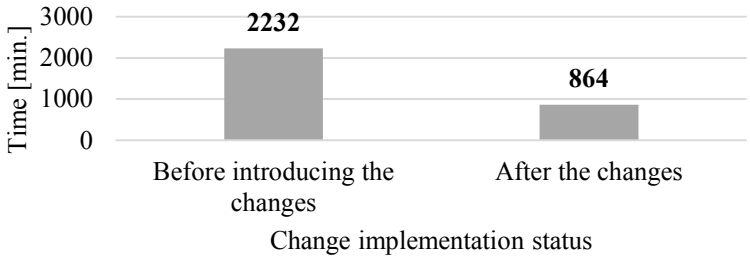


Figure 6. Change of the working time of the workstation on an annual basis resulting from the introduced rationalizations source own study.

[2] Improved accessibility of the workstation after the introduced rationalization – time limited during one changeover of tooling multiplied by the number of changeovers performed during one month and multiplied by the number of months during one calendar year; 114 min X 1 changeover X 12 months = 1368 min./year.

6. Discussion

The SMED methodology is universal and can be used to optimize production processes. In this article, the SMED Method was successfully used in the field of industrial production at the setting operator's workstation, who was performing a changeover at a semi-automatic workstation with a robotic pallet system.

The analysis carried out in accordance with the SMED methodology showed that its use at a given workplace allowed optimization of the waiting time associated with the changeover of a CNC machine tool. However, doubts are raised by the researchers as regards the problem that they noticed during their research, which could affect this study, as it points out certain limitations. Namely, while the nature of the SMED Method is universal, the following limitations were revealed during the study. In the SMED method, the Spaghetti Chart diagram is used in the third stage. The basis here is the calculation of employee steps. However, researchers note that the physical conditions of an employee are not included here. That is, will the number of steps for a 1.50 m tall employee be the same as for a 2.0 m tall employee? If a given workstation is served by several people (e.g. during three shifts), should the step values be determined as the arithmetical mean value in this situation, or should another methodology be used? What are the consequences for the value of the designated improvements? Another question is the employee's age criterion, because age has a direct impact on the efficiency of manual movements and elasticity of movement. Will a 64-year-old employee be able to manually unscrew/screw individual tooling attachments with the same work rhythm as a 19-year-old employee? Does the time needed to complete each step coincide between the indicated age groups of employees?

These doubts suggest that when performing analyses using the selected research method, there is always a necessity to look at the results obtained from a broader perspective, so that the implemented improvements are optimal due to the wide spectrum of analysis, and not only through the prism of the selected criterion.

7. Summary

During the conducted tests, an analysis of the real time changeover of the CNC machine station was carried out. Changes were proposed, and then the course and time of the setting operator's work after their application were verified. By carrying out the indicated activities, the intended objective of this work was achieved.

Conducting the analysis of retooling of the robotic pallet/palletizer system by the SMED method and applying to it the solutions resulting from the analyses carried out allows for the rationalization of the results obtained by different organizations on many levels. The work on the changeover of semi-automatic workstations, in particular in the context of MUDA, is a continuous type of work. Technological progress and development of the organization allows for continuous improvement of production processes also in the aspect of the necessary machine changeovers.

Working within the "continuous improvement" optics, development instruments are launched in all areas and planes of the organization (Hys, & Domagała, 2018). When analyzing the possibility of reducing the changeover time, the SMED method is used for this purpose. Appropriate application of it allows the development of a competitive advantage by obtaining greater availability of your machine park, increasing flexibility in production planning and makes it possible to reduce real and potential losses in the production process.

References

1. Basri, A.Q., Mohamed, N.M.Z.N., Yasir, K.A.S.H.M., Fazi, H.M., & Fudzin, A.F. (2019). The validation of productivity on the changeover activity at the automotive stamping press line by comparing the embedded SMED frame-work versus SMED approach: A witness simulation case study. *IOP Conference Series: Materials Science and Engineering, Vol. 469(1),* DOI: 10.1088/1757-899X/469/1/012005.
2. Bhamu, J., & Sangwan, K.S. (2014). Lean manufacturing: literature review and research issues, *International Journal of Operations & Production Management, Vol. 34(7),* pp. 876-940, DOI: 10.1108/IJOPM-08-2012-0315.
3. Bicheno, J., & Holweg, M. (2009). *The Lean Toolbox. The Essential Guide to Lean Transformation.* Buckingham: Production and Inventory Control, Systems and Industrial Engineering Books, p. 24.
4. Bikram, J.S., & Dinesh, K. (2011). SMED: for quick changeovers in foundry SMEs. *International Journal of Productivity and Performance Management, Vol. 59*, pp. 98-116.
5. Cakmakci, M. (2009). Int. J. Adv. Manuf. Technol., no. 41, p. 168. https://doi.org/10.1007/s00170-008-1434-4.
6. Camuffo, A., & Gerli, F. (2018). *Modeling management behaviors in lean production environments. International Journal of Operations & Production Management, Vol. 38(2),* pp. 403-423, DOI: https://doi.org/10.1108/IJOPM-12-2015-0760.

7. Da Silva, I.B. & Godinho, M.F. (2019). Single-minute exchange of die (SMED): a state-of-the-art literature review. *The International Journal of Advanced Manufacturing Technology, Vol. 102(9-10),* pp. 4289-4307, DOI:10.1007/s00170-019-03484-w.
8. De Boeck, G., Dries, N., & Tierens, H. (2019). The Experience of Untapped Potential: Towards a Subjective Temporal Understanding of Work Meaningfulness. *Journal of Management Studies, Vol. 56(3),* pp. 529-557, DOI: 10.1111/joms.12417.
9. Godina, R., Pimentel, C., Silva, F.J.G., & Matias, J.C.O. (2018). A structural literature review of the single minute exchange of die: the latest trends. *Procedia Manuf., Vol. 17,* pp. 783-790, DOI: https://doi.org/10.1016/j.promfg.2018.10.129.
10. Hys, K., & Domagała, A. (2018). Application of a spaghetti chart for streamlining production process. Case study. *Archives of Materials Science and Engineering, Vol. 89(2),* p. 71.
11. Hys, K. (2014). Tools and methods used by leading Polish automotive companies in quality management system. Results of empirical research. *Journal of Achievements of Materials and Manufacturing Engineering, Vol. 63(1).* International OCSCO World Press, pp. 30-37.
12. Hys, K. (2016). Inter mundus – designing the quality of hotel services: prospect of customer and manager. *Economics & Tourism, Book 2, Vol. 5,* pp. 393-400, 3rd International Multidisciplinary Scientific Conference on Social Sciences and Arts SGEM 2016, Doi:10.5593/SGEMSOCIAL2016/B25/S07.051.
13. Meng, X.H. (2019). Lean management in the context of construction supply chains. *International Journal of Production Research, Vol. 57(11),* pp. 3784-3798, DOI:10.1080/00207543.2019.1566659.
14. Moreira, A.C., & Campos Silva Pais, G. (2011). Single Minute Exchange of Die: A Case Study Implementation. *Journal of Technology Management and Innovation, Vol. 6(1),* pp. 29-46.
15. Nicholas, J. (2016). Hoshin Kanri and critical success factors in quality management and lean production. *Total Quality Management & Business Excellence, Vol. 27(3-4),* pp. 250-264, DOI: 10.1080/14783363.2014.976938.
16. Prasetyawan, Y., Suef, M., Rifqy, N., & Wardani, I.O.K. (2019). Manufacturing strategy improvement based on lean methodology. *IOP Conference Series: Materials Science and Engineering, Vol. 508(1),* DOI: 10.1088/1757-899X/508/1/012095.
17. Rosmaini, A., & Soberi, M.S.F. (2018). Changeover process improvement based on modified SMED method and other process improvement tools application: an improvement project of 5-axis CNC machine operation in advanced composite manufacturing industry *International Journal Of Advanced Manufacturing Technology, Vol. 94(1-4),* pp. 433-450, DOI:10.1007/s00170-017-0827-7.
18. Sayem, A., Islam, M.A., & Khan, M.M.A. (2014). Productivity enhancement through reduction of changeover time by implementing SMED technique – in furniture industry. *International Journal of Industrial and Systems Engineering, Vol.17(1),* pp. 15-33.

19. Shingo, S., & Dillon, A. (1985). *Revolution in Manufacturing: The SMED System*. Productivity Press Inc.
20. Womack, J.P., & Jones, D.T. (2001). *Odchudzanie firm. Eliminacja marnotrawstwa – kluczem do sukcesu.* Warszawa: Centrum Informacji Menadżera.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

ENVIRONMENTAL INFRASTRUCTURE AS A TOOL OF THE SLOVAKIA POPULATION LIVING STANDARDS RAISING FINANCED BY EU FUNDS

Katarína IŽOVÁ[1], Kateřina BOČKOVÁ[2]*

[1] DTI University; izova@dti.sk, ORCID: 0000-0003-3331-771X
[2] DTI University; bockova@dti.sk, ORCID: 0000-0002-3728-628X
* Correspondence author

Purpose: Presented paper deals with the environmental infrastructure in the field of water management, especially with the analysis of the possibilities of obtaining funds from the European Union to ensure the implementation of projects, namely construction of public water supply, public sewerage and wastewater treatment in municipalities to increase living standards. The level of the environmental infrastructure in the field of water management speaks of the quality of life of the population, their living standards.
Design/methodology/approach: To achieve this objective, we divided the paper into two main parts. The first part deals with the analysis of the use of funds from various EU funds from Slovakia's accession to the EU to the present – pre-accession period, shortened programming period 2004-2006, programming periods 2007-2013 and 2014-2020. In the second part, we analyse the use of available funds in the given periods by Východoslovenská Water Company, Plc. to build the environmental infrastructure in the eastern Slovakia. In processing the article, we mainly used methods such as literature search, analysis, synthesis, comparison. We relied on available Slovak and foreign literature, including current legislation in the relevant analysed period. We performed an analysis of the possibility of financing projects from EU funds in the period before Slovakia's accession to the EU, in the programming periods 2004-2006, 2007-2013 and 2014-2020, and then we processed the data into clear tables.
Findings: The existing differences in the economic and social development of individual regions of Slovakia, which arose in the past and gradually intensified, need to be systematically addressed in order to reduce the regional disparities. Supporting and strengthening the development of less developed regions is one of the priorities of the government's regional policy of Slovakia.
Originality/value: In 2017, there were 2,413 independent municipalities in the Slovak Republic, which were supplied with drinking water from public water mains. Their share of the total number of municipalities is 83.49%. Despite the fact that in the years 2012-2017 there were 66 more municipalities with public water supply in Slovakia, there are still 477 municipalities, tj. 16.51% of the total number of municipalities, without public water supply.

Keywords: environmental infrastructure, EU funds, living standard.

Category of the paper: Technical paper.

1. Introduction

The term environmental infrastructure has become generally accepted and is an equivalent form of the term for health and environmental protection equipment. The fulfillment of its content is a topical issue, as it has not yet been exhaustively defined which elements and activities fall under it. It intervenes in all areas of overlapping and cumulative activities of people related to environmental protection. However, we can say that environmental infrastructure represents sets of buildings, equipment, systems, as well as industrial and environmental technologies for the protection of public health, as well as for the preservation, protection and restoration of the natural environment.

In the field of water management in the communal sphere, these are facilities, structures and systems whose main task is to ensure the protection of drinking water sources, sewerage and wastewater treatment as cited in Augustínová, Daubner (2010).

Presented paper deals with the environmental infrastructure in the field of water management, especially with the analysis of the possibilities of obtaining funds from the European Union to ensure the implementation of projects, namely construction of public water supply, public sewerage and wastewater treatment in municipalities to increase living standards. The level of the environmental infrastructure in the field of water management speaks of the quality of life of the population, their living standards.

Statistics on this level show that the percentage of the population in Central and Eastern European countries linked to public water supply varies from 53.3% to 98.8%, depending on the country. The link of the population to the public sewerage and wastewater treatment plant lags behind the level of drinking water supply and is in the range of 30% to 80%. According to the latest Report on the state of the environment of the Slovak Republic in 2018, the number of inhabitants supplied with water from public water mains in 2018 reached 4,859.94 thousand, which represented 89.25% of the total population of the Slovak Republic. The number of inhabitants living in houses linked to the public sewerage system in 2018 reached the number of 3,724 thousand, which represents 68.40% of the total population. 1,128 municipalities had a built public sewerage system (39.03% of the total number of municipalities in the Slovak Republic).

The existing differences in the economic and social development of individual regions of Slovakia, which arose in the past and gradually intensified, need to be systematically addressed in order to reduce the regional disparities. Supporting and strengthening the development of less developed regions is one of the priorities of the government's regional policy of Slovakia.

2. Financing of projects in Slovakia in terms of meeting the requirements of the Water Framework Directive

The fact that the water sector is one of the basic sectors of the national economy has been and is being realized by every state. Therefore, in the interests of economic development, protection of public health, the environment and meeting the basic needs of citizens, states, including Slovakia, regulate this area with special legal regulations and monitor the actual state of supply of safe drinking water, drainage and treatment of municipal wastewater.

2.1. Financing of projects before the accession of the Slovak Republic to the EU

In the course of 1999-2001, a number of programming documents for the area of regional development (Integrated Plan of Regional and Social Development of the Slovak Republic, National Plan of Regional Development of the Slovak Republic, regional and sectoral operational programs, etc.) were prepared and approved, which formed the framework especially for drawing funds from the PHARE, ISPA and SAPARD pre-accession funds. The pre-accession funds were divided according to the intervention and determined to act as predecessors of the Structural Funds and the Cohesion Fund, as seen in Figure 1.

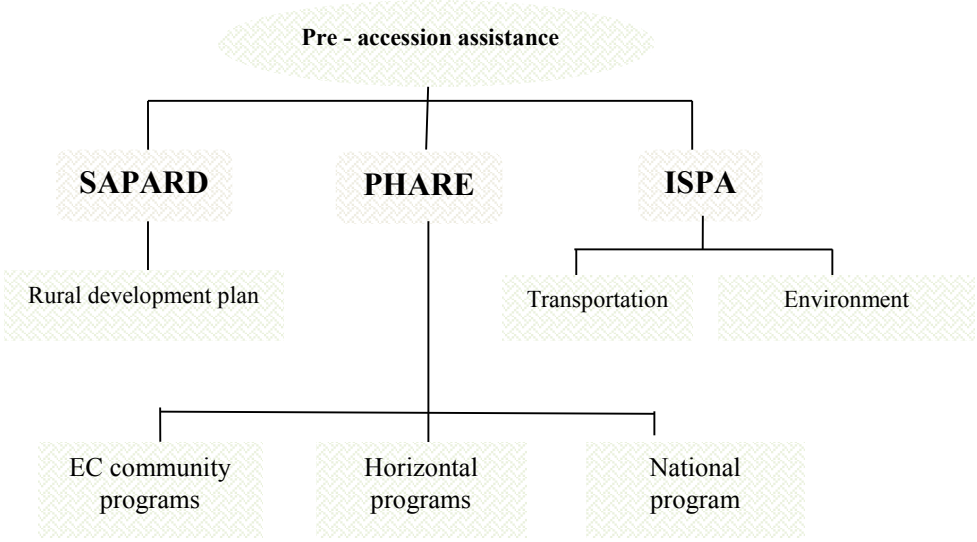


Figure 1. Pre-accession help (Source: PHARE©2003, ISPA©2003, SAPARD©2003).

In this way, PHARE and SAPARD were to be a preparation for the Structural Funds and ISPA a preparation for the Cohesion Fund. After Slovakia's accession to the European Union, the PHARE program ceased to exist. The latest assistance through this program was provided under the 2003 Financing Memorandum. However, Tóthová (2011) says, the absorption of funds continued after 2004 until the objectives of the individual programs were fully met.

ISPA, Instrument for Structural Policies for Pre-Accession was aimed at mobilizing other sources of funding (through public, private sources to international financial institutions of funding). ISPA has been used to help candidate countries comply with EU infrastructure standards and to provide part of the funding for environmental measures and transport infrastructure. The measures taken under ISPA should be implemented to the extent necessary to ensure a significant improvement in the quality and protection of the environment and also to improve the quality of the transport infrastructure network. The total cost of each of these measures was to be at least EUR 5 million. It was also necessary to strike a balance between environmental measures and transport infrastructure measures (see Table 1).

Table 1.
Approved ISPA investment projects

	Total eligible costs (EUR million)	ISPA grant (EUR million)
Total in 2000	**63,76**	**31,88**
Total in 2001	**31,31**	**15,52**
Total in 2002	**94,04**	**57,34**
Total in 2000-2002	**189,11**	**104,74**

Source: authors according to the Ministry of the Environment of the Slovak Republic.

The main priorities for improving the quality and protection of the environment were drinking water, wastewater, solid waste management and air pollution. In the area of drinking water and wastewater, according to PHARE©2003, ISPA©2003, SAPARD©2003, it was the financing of projects focused primarily on:

- reconstruction and intensification of existing wastewater treatment plants in municipalities above 2,000 registered inhabitants,
- equipping of existing large treatment plants (above 10,000 registered inhabitants) with equipment for the removal of nitrogen and phosphorus compounds,
- reconstruction of existing sewerage networks linked to wastewater treatment plants,
- completion of sewerage networks for wastewater treatment plants, construction of sewerage networks and wastewater treatment plants in municipalities with more than 2,000 registered inhabitants,
- construction of wastewater treatment plants in municipalities above 2,000 registered inhabitants,
- construction – reconstruction of drinking water treatment plants and of water supply network,
- construction of drinking water treatment plants and related water supply networks.

2.2. Project financing in years 2004-2006

The European Union is currently made up of 27 member states, representing the community and the internal market, with around 493 million citizens, which widens the economic and social disparities between them and their regions. The aim of European regional policy is to show the Union's solidarity through economic and social cohesion, by reducing disparities in the level of development of the various regions. European regional policy is based on solidarity and cohesion between regions, in that more than 35% of the EU budget, mainly from richer member states, can be used in disadvantaged regions. To this end, the European Union is developing various instruments, setting objectives and priorities in an effort to prevent the emergence and widening of regional disparities. The instruments for implementing regional policy are the EU structural funds. Slovakia gained access to them after its accession to the EU (1 May 2004). In the 2004-2006 programming period, regional development assistance was implemented in the EU through the aforementioned structural funds. A large part (up to 94%) of the structural funds was focused on three priority objectives:

- **Objective 1** – support for the development and structural changes of regions with lagging development, the so-called "lagging regions", in these regions the structural funds could provide up to 75% of the total cost of a given measure. The sources for this objective were the European Regional Development Fund, the European Social Fund and the European Agricultural Guidance and Guarantee Fund. In the case of Slovakia, all regions of Slovakia except the Bratislava region were eligible to draw assistance from the Structural Funds under this objective, i.e. the territory of the Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov and Košice regions. In the Bratislava region, it was possible to draw assistance only under Objective 2 and Objective 3. The implementation of measures under this objective was carried out through operational programs.
- **Objective 2** – to support the economic and social transformation of areas facing the structural difficulties. Under this objective, areas undergoing of the socio – economic changes in the industrial and service sectors as well as declining rural areas were supported. In this case, the structural funds could provide funding of up to 50% of the total cost. The resources for Objective 2 were the European Regional Development Fund and the European Social Fund. Under Objective 2, it was possible to draw assistance from the structural funds only in the Bratislava region.
- **Objective 3** – the support for the adaptation and modernization of education, training and employment policies and systems. This objective provided the financial assistance to regions other than the regions covered by Objective 1, i.e. in Slovakia it was possible to draw assistance from the structural funds only in the territory of the Bratislava region. The source for this objective was the European Social Fund.

The European Regional Development Fund (ERDF) has helped to reduce disparities between the levels of development and living standards of the various regions, to redress major regional imbalances by participating in the development and structural adjustment of regions whose development is lagging behind. It has provided financial assistance for development projects in poorer regions. In terms of financial resources, this fund is the largest of the European Union's structural funds. In the years 2004-2006, the ERDF in the Slovak Republic participated under Objective 1 in financing measures of the Basic Infrastructure Operational Program and in financing measures in the Sectoral Operational Program Industry and Services, as well as in financing measures under Objective 2.

European Social Fund (ESF) has helped to develop employment by promoting entrepreneurship and equal opportunities, investing in human resources, in the skills of individuals, especially people with special difficulties in finding work, keeping a job or returning to work. This fund provided support to member states in implementing new active policies and systems to combat unemployment. In the programming period 2004-2006, 3 basic documents were co-financed from the European Social Fund in Slovakia:

- Sectoral Operational Program Human Resources under Objective 1,
- Uniform Programming Document NUTS II Bratislava, Objective 3,
- EQUAL Community Initiative.

European Agricultural and Guarantee Fund (EAGGF) has financed the EU's common agricultural policy. Its purpose was to provide the market support and to support the structural reforms in agriculture. It was divided into two sections:

- the guarantee section financed the price support and export subsidies measures to ensure the stable prices for producers,
- the balancing (advisory, indicative) section provided the subsidies for rationalization schemes, modernization and structural improvements in farming. In 2004-2006, in Slovakia, the EAGGF participated in the financing of measures under the Sectoral Operational Program Agriculture and Rural Development under Objective 1.

Financial Instrument for Fisheries Guidance (FIFG), one of the main instruments of EC structural and regional policy aimed at ensuring the balanced, harmonious development of the fishing industry. In 2004-2006, in Slovakia, the FIFG, together with the EAGGF, under Objective 1, co-financed measures in the Sectoral Operational Program Agriculture and Rural Development.

The Cohesion Fund was set up by the Maastricht Treaty as a solidarity fund in 1993 to help four less prosperous Member States: Greece, Portugal, Ireland and Spain. It was to help these least prosperous countries (GDP per capita below 90% of the EU average) to participate in both economic and monetary union. Thanks to its help, Portugal, Greece, Ireland and Spain have been able to meet the strict convergence criteria and become part of the euro area. The main difference from the Structural Funds is that its basic cell was the state. The fund was designed to support large infrastructure investments in transport and the environment with

a cost of over ten million euros. Given that the GDP per capita of Slovakia did not reach 90% of the EU average, it also applied for these funds. The 50:50 principle applied to projects submitted under the Cohesion Fund, which means that half of the allocation for a given country had to go to the development of transport infrastructure and half to the development and protection of the environment. Between 2000 and 2006 (the EU budget period), the annual budget of the Cohesion Fund reached €2.5 billion, for a total of €18 billion over seven years. The amount of funds from the Cohesion Fund for the shortened programming period in the years 2004-2006 in the total amount of 576.13 mil. euros.

In the Slovak Republic, this fund in the field of the environment financed projects aimed at supplying the population with drinking water, sewerage and wastewater treatment. The projects supported by the Cohesion Fund for the environment were and are in accordance with the following principles:

- maintaining protection and improving the quality of the environment,
- significant impact on human health,
- compliance with the objectives and principles of EU environmental policy,
- respect for the "polluter pays" principle,
- contribution to the gradual achievement of economic and social cohesion of Slovakia with the EU,
- involvement of public-private property harmonized with EU and Slovak legislation.

Projects co-financed by the Cohesion Fund in the field of water management supported activities in accordance with the EU Water Framework Directive and related EU directives.

The Community Support Framework, which was the basic agreement on the provision of assistance from the European Union Structural Funds to the Slovak Republic, was followed by individual programming documents, which further determined and specified priorities in individual areas. The operational programs contained specific priorities on which structural support was focused under Objective 1. In the programming process for 2004-2006, the Slovak Republic adopted one operational program and three sectoral operational programs (SOPs) – Human Resources, Industry and Services, Agriculture and Rural Development.

The Basic Infrastructure Operational Program followed the objectives and priorities of the National Development Plan. It is a program document of the Slovak Republic for drawing assistance from the structural funds of the European Union, aimed at solving the problems of development of Objective 1 regions in the Slovak Republic. The Basic Infrastructure Operational Program focused on eliminating existing regional disparities, which were identified and described in the NDP (National Development Plan) for areas of transport, environmental and local infrastructure. The aim was to improve local conditions by ensuring the equal access of local development centres to individual infrastructures.

For the environment, within it and for the area of water, a detailed SWOT analysis (see Table 2) is prepared.

Table 2.
SWOT analysis

STRENGHT - the existence of a planning process for the protection and rational use of water and in water management by river basin, through hydro-ecological river basin plans and river basin management plans in accordance with the principle of the sustainable use of water resources creates conditions for conceptual action in this area, which includes deficit management drinking water in the relevant regions of the Slovak Republic, - charging for the discharge of polluted wastewater and for abstraction is an important means of applying the "polluter pays" principle, which is one of the economic instruments required in the framework of the implementation of the Water Framework Directive, - reduction of abstraction and use of groundwater and surface water, which is positively reflected in the balance assessment of water consumption and its available resources, but also by reduction of surface water pollution due to a decrease in wastewater production, - legislative and procedural protection against floods, - favorable situation in the field of water protection and use in terms of legislation, planning process and monitoring.	**WEAKNESS** - the persistent difference between ensuring the link of the population to public water mains and low links to sewers and wastewater treatment plants as well as the absence of wastewater treatment plants in smaller towns and villages causing continuous pollution of surface waters as well as groundwater, - despite the growing share of the population connected to public water supply, public sewerage and WWTPs, Slovakia is still below the average of EU member states in this area, - poor technical condition in distribution water supply networks, causing high losses in the amount of supplied water, - insufficiently implemented preventive measures for the protection of water quality and quantity, - requirements for the provision of new water resources also result from the tightening of drinking water quality indicators - polluted water resources are shut down. This situation requires the construction of new water sources, respectively to ensure the supply of water from other suitable sources or water treatment, for which it is necessary to use costly technologies, - insufficient flood protection measures, - uneven regional equipment with environmental infrastructure in the area of drinking water supply for the population and endangering the protection of surface waters and groundwater by insufficient wastewater treatment, - insufficient measures for protection against floods, lack of resources and material equipment for the management and operation of watercourses and insufficient material provision of the flood rescue service.
THREATS - in order to meet the proposed measures, the natural conditions in Slovakia have created a relatively favorable situation in the usable amount of water as well as the development of a decrease in water quantity requirements and a decrease in the volume of pumped water as a trend in their more efficient use. Also, the declining trend of wastewater discharges as point sources of pollution leads to a reduction in surface water pollution due to a decrease in outputs from industry and agriculture as a manifestation of the introduction of new technologies in production, - increasing the number of households linked to public water mains, public sewers and wastewater treatment plants will create conditions for improving the environment, drinking water quality and the degree of wastewater treatment. This will also meet environmental goals – good water status and thus better health of the population.	**OPPORTUNITIES** - unsatisfactory level of wastewater treatment and low level of the population link to sewerage networks pose major risks in terms of the preconditions for meeting the set measures and the overall high costs of complying with European Union directives in the field of water management. Overloading of some wastewater treatment plants, especially in large urban centres, in order to meet the requirements of the Municipal Wastewater Treatment Directive, it will be necessary to ensure their intensification in connection with the fact that Slovakia is a sensitive area and nutrient removal.

Source: authors according to the National Strategic Plan for Rural Development of the Slovak Republic.

2.3. National Strategic Reference Framework

The 2007-2013 programming period was the first period for the Slovak Republic in which it had the opportunity to use more than 11 billion euros from EU funds and their co-financing during its entire duration. Funding could be obtained from the same funds as in the previous shortened programming period in the years 2004-2006. In the past it was and still is the following funds:

- European Regional Development Fund,
- European Social Fund,
- Cohesion Fund,
- European Agricultural Guarantee Fund,
- European Agricultural Fund for Rural Development,
- European Fisheries Fund.

In the field of the environmental infrastructure, it was possible to obtain funding for projects in areas such as:

- supply of the population with drinking water, drainage and treatment of municipal wastewater,
- monitoring of the quantity and quality of surface and groundwater, flood protection, including the establishment of a flood warning and forecasting system,
- protection of the atmosphere, the ozone layer and minimization of the adverse effects of climate change, including the promotion of renewable energy sources,
- increasing of the share of separated waste through the introduction of new and streamlining of existing systems of separate collection of municipal waste,
- increasing of the amount of recovered waste,
- reduction of hazardous properties of waste and management of hazardous waste,
- reducing the risk of the impact of environmental burdens on human health and the ecosystem,
- care for protected areas, improving the public environmental awareness,
- reducing the risk of landfills affecting human health and the ecosystem.

It is also necessary to include the Norwegian Fund, which aims to contribute the reducing economic and social disparities in the European Economic Area through grants for investment and development projects in areas such as environmental protection, promoting sustainable development, preserving Europe's cultural heritage, health and children care, research, regional policy and cross-border activities.

Funding can also be obtained from the Swiss Fund for the support and improvement of the environment and environmental infrastructure, for its renewal and modernization. Switzerland provided the Slovak Republic with approximately EUR 44.57 million during the years 2008-2012. These funds are part of the Swiss contribution for the ten new member states of the European Union, which joined the EU on May 1, 2004 (HSSR©2020). Addressing the issues

of quality of economic growth, the implementation of projects in the field of drainage and wastewater treatment not only contributes to a higher quality of life and protection of water from pollution, but also plays a dominant role in fulfilling the vision in this programming period. Therefore, the strategic goal is formulated as: *Significantly increase the competitiveness and performance of the regions and the Slovak economy by 2013 while respecting sustainable development.* The NSRF strategy, priorities and objectives are implemented through 11 operational programs within the individual objectives of EU cohesion policy.

The Operational program Environment has been designated for the environment, the global goal of which is *improving the state of the environment and rational use of resources through the completion and improvement of the environmental infrastructure of the Slovak Republic in accordance with EU and Slovak regulations and strengthening the environmental component of sustainable development* and which is based on long-term principles, priorities and objectives of Slovakia's environmental policy, as well as the obligations of the Slovak Republic arising from the Integrated Approximation Strategy, from the Joint Strategy for the Implementation of the Water Framework Directive and the Treaty of Accession to the EU. EC funds in the amount of EUR 1,800,000,000 were prioritized to support activities aimed at fulfilling the obligations arising from the transitional periods, but according to the NSRF Report for 2007, as of 31 December 2007 to draw funds from EU assistance or from the state budget did not occur.

Table 3 lists the regional projects for the measure Integrated protection and rational use of water within the Operational program Environment in individual regions of Slovakia.

Table 3.
Implementation of regional projects of the OP Environment for the measure Integrated Protection and Rational Use of Water as of 31 March 2010

Region	Number of submitted projects	Number of approved projects	Number of rejected projects
Bratislava	18	8	3
Žilina	27	8	11
Trnava	40	14	6
Nitriansky	40	19	5
Trenčín	26	13	3
Banská Bystrica	43	20	7
Prešov	53	18	10
Košice	29	10	8
Total	**276**	**110**	**53**

Source: authors according to the Ministry of the Environment of the Slovak Republic.

Table 4 contains a summary of funds provided to individual large territorial units in a given programming period for the Operational program Environment.

Table 4.
Funds provided to individual large territorial units in the given programming period for the OP Environment

Large territorial unit	Contracted funds			Spent funds		
	EU sources	Slovakia sources	Total	EU sources	Slovakia sources	Total
Bratislava	75 164 069,6	10 852 568	86 016 637,7	28 842 739,7	4 547 608,2	33 390 347,9
PWM*	**43 617 685,9**	**5 616 018,8**	**49 233 704,7**	**7 589 344,9**	**892 864,2**	**8 482 209**
B. Bystrica	166 774 609,4	23 733 324,1	190 507 933,6	40 029 786,5	5 999 431	46 029 217,5
PWM*	**72 916 028,7**	**9 924 233,3**	**82 840 262**	**11 456 722,7**	**1 566 743,4**	**13 023 466,1**
Žilina	195 584 540,6	32 298 461,3	227 883 002	38 642 698,6	5 990 056,4	44 632 755
PWM*	**46 163 548,3**	**10 538 026,6**	**54 039 965,8**	**9 481 365,5**	**1 435 337**	**10 916 702,6**
Košice	125 317 139,6	16 622 501,8	141 939 641,4	27 362 165	3 550 189,4	30 912 354,4
PWM*	**81 001 324,8**	**12 376 356,1**	**93 377 680,9**	**13 377 956,9**	**2 199 726,6**	**15 577 683,5**
Prešov	197 341 184,6	27 844 560,7	225 185 745,3	55 632 559,8	7 921 239,7	63 553 799,5
PWM*	**60 265 479,2**	**8 177 377,8**	**68 442 857**	**18 963 777**	**2 590 414,9**	**21 554 192**
Nitra	137 024 805,4	19 357 846,2	156 382 651,5	19 737 092,2	2 686 366,7	22 423 458,9
PWM*	**81 958 047**	**12 219 185,9**	**94 177 232,9**	**6 794 730,9**	**985 585,9**	**7 780 316,9**
Trenčín	114 644 303,3	16 418 966,5	131 063 269,8	32 901 896,1	4 601 283,4	37 503 179,5
PWM*	**32 586 080,5**	**4 578 705,3**	**37 164 785,7**	**25 500**	**3 000**	**28 500**
Trnava	98 217 739,1	13 853 028,7	112 070 767,8	25 280 659,61	3 576 035,8	28 856 695,4
PWM*	**26 564 771,2**	**3 367 320,6**	**29 932 091,8**	**9 632 606,84**	**1 311 557,1**	**10 944 164**
Total	**1 110 068391,6**	**160 981 257,4**	**1 271049 648,9**	**268 429 597,6**	**38 872 210,6**	**307 30808,2**
PWM* total	**445 072 965,6**	**66 797 224,4**	**511 870 189,9**	**77 322 004,88**	**10 985 229,2**	**88 307 234,1**

PWM* - projects in the field of water management - drinking water supply, sewerage and municipal wastewater treatment.

Source: authors according to the Ministry of the Environment of the Slovak Republic.

Another financial instrument for the environment was the LIFE + program, which was designed to complement the main funding programs. This program supported in particular the implementation of the 6th Environmental Action Program, which aimed to combat the climate change, to halt nature decline and biodiversity loss, to improve the environment, health and the quality of life, to promote the sustainable use and management of natural resources and waste, as well as to develop the strategic approaches to policy development and implementation, to raise the awareness. LIFE + has two lines:

1. **LIFE+ Implementation and Management**. This line supported the modelling and development of scenarios, studies as well as concepts, proposals and demonstration of new approaches to monitor and evaluate the key priority areas including areas covered by strategic thematic programs (i.e. resources, waste reduction, air, soil, marine environment, pesticides, urban environment). This has contributed to consolidating the knowledge base, improving the synergies and consistency of monitoring and evaluation on a European basis, thus improving the development and implementation of EU environmental policy. The percentage of funds represents 75-80% of the total volume of funds.

2. **LIFE + Information and Communication**: This line supported EU environmental policy through information, communication, awareness raising and dialogue, thus helping to strengthen the participation of individuals and groups in European civil society in an informed and active way in environmental protection and sustainable use of resources. The percentage of funds for this line represents 20-25% of the total volume of funds.

The choice of a single instrument was based on the need for simplification, as well as on the lessons learned and recommendations of previous evaluations. The Directorate-General for the Environment currently manages several different programs centrally – LIFE, the Sustainable Urban Development Program, the NGO program, the Forest Focus Program, general policy development and implementation tools (which have both internal and external dimensions). Each of these different programs has its own remit and administration, as well as the committee procedures, the management of which requires considerable resources. LIFE+ also continues to support NGOs, local and regional authorities. The appropriations are sufficient to enable these activities to be financed in accordance with the commitments made in the previous period.

In terms of objectives, the funding could be provided, inter alia, to support the implementation of the priorities of the 6th EAP, on the following topics:

- climate change: the European Climate Change Program (and any ongoing program),
- nature and biodiversity,
- protection of the environment and health.

LIFE+ could finance the studies and surveys, the modelling and scenario building, the monitoring, capacity building assistance, demonstration of policy approaches and tools, training, seminars and workshops, networking, best practice bases, awareness campaigns, information and promotional activities (Regulation of the European Parliament and of the Council concerning the Financial Instrument for the Environment).

2.4. European Union Cohesion Policy 2014-2020

The European Union shall develop and pursue its actions leading to the strengthening of its economic, social and territorial cohesion in order to promote the overall balanced development of its Member States. It focuses primarily on reducing disparities between levels of development in individual regions and backwardness in the most disadvantaged regions. In the 2014-2020 programming period, the EU has set aside almost €349.4 billion to achieve its cohesion policy targets. The aim of this policy was and is to support job creation, business competitiveness, economic growth, sustainable development and improving the quality of life. To achieve these aims, funding is allocated to projects implemented by beneficiaries in the member states. Member state authorities select projects for funding and monitor their implementation. It is important that these funds are allocated efficiently, especially in terms of achieving the expected results. One of the funded thematic objectives is the preservation and

protection of the environment and the promotion of efficient use of resources. The LIFE program serves this purpose. The total EC budget for the LIFE program in the programming period 2014-2020 amounted to €3,456,655,000. From the above, the sub-program Environment receives financial coverage in the amount of €2,592,491,250 and the sub-program Climate Protection €864,163,750. The co-financing rate of LIFE projects from the LIFE program from EU resources in the period of the 1st multiannual work program (2014-2017) is 60% for the so-called traditional projects and in the period of the 2nd multi-annual work program (2018-2020) in the amount of 55% for the so-called traditional projects.

According to the Proposal for Ensuring the Coordination of EU Cohesion Policy after 2013, within the EU cohesion policy it was necessary to prepare at national level a main strategic document for the use of structural funds and Cohesion Fund after 2013, which was the result of negotiations between the Slovak Republic and the European Commission, and which determines the priorities for investment, allocation of domestic and European funds to priority programs and areas.

3. Analysis of the use of EU funds in eastern Slovakia

One of the obligations of the Slovak Republic in the field of public sewerage and municipal wastewater treatment, which are set out in the Treaty of Accession of the Slovak Republic to the European Union, is to continuously ensure adequate wastewater treatment in all agglomerations below 2,000 equivalent inhabitants, which have built a sewerage network and also gradually connect the population to the public water supply (Augustínová, Daubner, 2010).

3.1. Brief characteristics of eastern Slovakia

The region of eastern Slovakia covers an area of 15,729 km^2 (32% of Slovakia's area). Administratively, the region is divided into Košice and Prešov self-governing regions. These are further divided into 24 districts in which there are a total of 40 settlements with city status. The region has undergone complex developments throughout its history. It consists of the historical regions of Spiš, Šariš, Zemplín and Honta. The division of eastern Slovakia is shown in the following Figure 2.

Figure 2. Map of eastern Slovakia (WIKIEDIA.SK©2020).

As a part of a search of literature and available information, we mapped the situation in the field of municipal wastewater management in individual districts of eastern Slovakia and towns and municipalities, which are shareholders of the Východoslovenská Water Company, Plc. and with which they have an operating contract to ensure drinking water supply, drainage and treatment of municipal wastewater. We have summarized the results of this analysis in the following tables 5-7.

Table 5 shows the division of municipalities in the Košice and Prešov regions into size categories according to the number of inhabitants. Our intention is to point out the number of municipalities in individual districts, which have less than 2,000 inhabitants.

Table 5.
Distribution of municipalities by population

District	Up to 200 RI	200-500 RI	500-1000 RI	1000-1500 RI	1500-2000 RI	Total municipalities to 2000 RI	Municipalitis above 2000 RI	Total
Bardejov	18	36	24	5	0	83	3	86
Humenné	12	23	19	5	0	59	2	61
Prešov	8	30	30	12	6	86	5	91
Sabinov	5	14	10	7	2	38	5	43
Stará Ľubovňa	22	19	16	9	3	69	7	76
Svidník	55	36	12	1	0	104	3	107
Stropkov	22	15	3	0	0	40	1	41
Medzilaborce	10	11	1	0	0	22	1	23
Snina	14	8	6	2	0	30	4	34
Vranov n/T	13	21	15	8	3	60	8	68
Košice - neighborhood	11	41	29	17	5	103	11	114
Rožňava	10	19	22	4	3	58	4	62
Sobrance	5	33	6	2	0	46	1	47

Cont. table 5.

Michalovce	3	23	39	5	4	74	4	78
Trebišov	3	24	33	12	4	76	6	82
Total	**211**	**353**	**265**	**89**	**30**	**948**	**65**	**1 013**

Source: authors.

Table 6.
Municipalities with and without connection to public water supply and public sewerage in the districts of Východoslovenská Water Company, Plc.

	Municipalities up to 2000 RI				**Municipalities above 2000 RI**		**Total**		
District	**with public water supply**	**without public water supply**	**with public sewerage**	**without public sewerage**	**with public water supply**	**with public sewerage**	**up to 2000 RI**	**above 2000 RI**	**Total**
Bardejov	58	25	5	78	3	1	**83**	3	**86**
Humenné	32	27	1	58	2	2	**59**	2	**61**
Prešov	50	36	6	80	5	3	**86**	5	**91**
Sabinov	15	23	6	32	4	4	**38**	5	**43**
St. Ľubovňa	28	41	7	62	4	4	**69**	7	**76**
Svidník	35	69	6	98	2	2	**104**	3	**107**
Stropkov	19	21	0	40	1	1	**40**	1	**41**
Medzilaborce	9	13	0	22	1	1	**22**	1	**23**
Snina	5	25	1	29	4	2	**30**	4	**34**
Vranov n/T	33	27	5	55	4	3	**60**	8	**68**
KE - okolie	66	37	11	92	11	4	**103**	11	**114**
Rožňava	45	13	6	52	4	2	**58**	4	**62**
Sobrance	30	16	6	40	1	1	**46**	1	**47**
Michalovce	47	27	10	64	4	3	**74**	4	**78**
Trebišov	60	16	6	70	6	4	**76**	6	**82**
Total	**532**	**416**	**76**	**872**	**56**	**37**	**948**	**65**	**1 013**

Source: authors.

Table 7.
Spent funds from EU funds in eastern Slovakia

PROGRAMMING PERIOD 2004-2007	
ISPA	208 813 621,36
Cohesion Fund	11 444 046,28
PROGRAMMING PERIOD 2007-2013	158 179 656,48
PROGRAMMING PERIOD 2014-2020	
IROP	15 297 128,25
Total	**393 734 452,37**

Source: authors according to VODARNE.SK©2020.

The EU White Paper on Environmental Liability states that the protection of the environment is in the public interest and that the state (or the relevant territorial part) is obliged to act in the event of a threat. Therefore, it is the duty of the state to solve the sewerage and treatment of municipal wastewater in municipalities with less than 2,000 PE.

The problem of small municipalities to meet this requirement is the limited sources of funding for projects in the field of municipal wastewater management. Nevertheless, many of them, within their competences in the field of water management, are taking the initiative to build a public water supply, public sewerage and wastewater treatment plant.

Conclusion

The basic environmental objective in the field of water management is to achieve good water status in accordance with Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for community action in the field of water policy and thereby improving the standard of living and quality of life. The basic goal of the WFD is to implement measures to achieve good status of all waters by 2027 at the latest, through the fulfillment of environmental objectives. In the area of water management, Slovakia faces problems in meeting its obligations to the EU. Upon accession to the European Union, the Slovak Republic undertook to drain all agglomerations with more than 2,000 registered inhabitants by 2015 in accordance with the requirements of Council Directive 91/271/EEC on urban waste water treatment. At the same time, sewerage is an important factor in the case of smaller agglomerations, with an overlap on landscape protection, biodiversity, but also the quality of life and health of the population.

The basic environmental objective in the field of water management is to achieve good water status in accordance with Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for community action in the field of water policy. Important activities include the monitoring and evaluation of water, which is an important tool for effectiveness evaluating of measures taken to achieve this environmental goal.

Another priority of the Slovak Republic in the area of drinking water supply is to increase the number of inhabitants supplied from public water mains and to ensure the supply of safe drinking water without negative impacts on the health of the population and the environment and thus to increase and improve living standards. The number of inhabitants supplied with water from public water mains in 2017 reached 4,836.13 thousand, which represents 88.94% of the total population of the Slovak Republic. In 2017, there were 2,413 independent municipalities in the Slovak Republic, which were supplied with drinking water from public water mains. Their share of the total number of municipalities is 83.49%. Despite the fact that in the years 2012-2017 there were 66 more municipalities with public water supply in Slovakia, there are still 477 municipalities – 16.51% of the total number of municipalities, without public water supply. Residents are currently supplied with drinking water from individual domestic wells, in which regular monitoring is not provided as in public water supply and many times the quality of this water in domestic wells does not meet the requirements of Council Directive 98/83/EC on the quality of water intended for human consumption. The indexes indicate a huge inequality not only at the district level, but especially between the size groups of local governments. With the decreasing size of municipalities, the number and share of the population without access to sanitation infrastructure is growing rapidly. Completion of the sanitation infrastructure in small municipalities is therefore an important public interest and

should be the subject of investment measures financed by European Union funds in the years 2021-2027. At the same time, it will be necessary to proceed.

Monitoring of the status of surface waters and groundwater is an important tool enabling the evaluation of the effectiveness of the implemented measures and, if necessary, the adoption of new measures.

References

1. Augustínová, E., Daubner, P. (2010). *The level of municipal waste water treatment vs. available financial means from the resources of EU*. SGEM 2010: 10th. International Multidisciplinary Scientific Geoconference. Bulgaria, Sofia: Stepf92 Technology Ltd., pp. 89-96.
2. Commission Announcement No. 2007/725 accompanying the Announcement "A single market for 21st century Europe". Services of general interest, including social services of general interest. Available at http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri= CELEX:52007DC0725:SK:NO, 2020.04.10.
3. Council Directive no. 91/271/EC concerning urban waste water treatment.
4. Council Directive no. 98/83/EC on the quality of water intended for human consumption.
5. EU Commission (2008). *DG Environment Promoting Innovative Business Models with Environmental Benefits: Final report*.
6. European Commission (2020). Available at http://ec.europa.eu/environment/water/ waterurbanwaste/implementation/factsfigurs_en.htm, 2020-04-10.
7. Handelskammer Schweiz Slowakische Republic (2020). Available at www.hssr.sk, 2020.04.10.
8. Ministry of The Environment of the Slovak Republic (2008). *Plán rozvoja verejných vodovodov a verejných kanalizácií pre územie Slovenskej republiky.* Bratislava.
9. National Program of the Slovak Republic for the Implementation of Council Directive 91/271/EEC concerning urban waste water treatment as amended by Directive 98/15/EC in the format provided by Commission Decision 98/481/EEC, Annex 3.
10. National Strategic Reference Framework (2011). *Prehľad pomoci v programovom období 2007-2013 podľa VÚC.* Available at http://www.nsrr.sk/cerpanie/, 2020.04.10.
11. National Strategic Reference Framework (2011). *Prijímatelia finančnej pomoci z fondov EU pre roky 2007-2013 k 31.10.2011*. Available at http://www.nsrr.sk/cerpanie/, 2020.04.10.
12. Office for Publishing EU Publications (2011). *Politika súdržnosti 2014-2020. Investície do rastu a pracovných miest*. Luxemburg: Office for Publishing EU Publications.

13. PHARE, ISPA, SAPARD (2003). *Od nástrojov predvstupovej pomoci po štrukturálne fondy Európskej únie v Slovenskej republike*. Bratislava: Delegácia Európskej komisie v Slovenskej Republike.
14. Statistical office of the Slovak Republic. Available at http://portal.statistics.sk/showdoc.do?docid=95, 2020.04.10.
15. Tóthová, L. (2011). *Úloha MŽP SR v predvstupovom procese do Európskej únie.* Available at http://www.logincee.org/file/1689/library, 2020.04.10.
16. Water Framework Directive 2000/60/EC.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

GREEN LOGISTICS DEVELOPMENT PLANS OF HUNGARIAN COMPANIES

Tímea KOZMA[1*], Vivien Ágnes NAGY[2], Mónika PÓNUSZ[3], Balázs GYENGE[4]

[1] Budapest Business School, Budapest; kozma.timea@uni-bge.hu, ORCID: 0000-0002-6164-8922
[2] Szent István University, Gödöllő; nagy.vivien.agnes@phd.uni-szie.hu, ORCID: 0000-0002-1119-2840
[3] Károli Gáspár University of the Reformed Church, Budapest; ponusz.monika@kre.hu, ORCID: 0000-0002-3737-364X
[4] Szent István University, Gödöllő; gyenge.balazs@gtk.szie.hu, ORCID: 0000-0001-6823-0150
* Correspondence author

Purpose: When this abstract is completed, the economic situation caused by the pandemic will face serious problems. We have to do something. In our private and life and in our work also. The aim of our present study is to explore how environmental awareness is applied and in how it appears in companies, how it relates to the green supply chain, and what advantages and disadvantages companies could have they discovered.
Design/methodology/approach: Our research is based on a primary research, which was conducted with a structured questionnaire among Hungarian companies. Our main objectives were to see what is going on with the green logistics plans before the pandemic season what could be achieved in the near future.
Findings: Visible aspiration on the part of companies, we came across a number of good ideas, but unfortunately money is still a key motivation in the development plans of companies.
Research limitations/implications: For future research, we will consider the current study as a basis, and due to the current viral situation, it will most likely show a less favorable result than at present, especially in the field of innovation.
Practical implications: The article represents well the need for coordinated and collaborative developments more than ever, especially in the field of supply chain and green logistics.
Social implications: A layer has already emerged in society where individuals and companies take the irreversible problems of environmental pollution seriously. We hope that after the publication of our article, more people will think that more needs to be done for our environment at both the individual and corporate levels before it is too late.
Originality/value: The main originality of the study based on the fact that it is not enough to ask companies for their opinions on their own developments, it is also worth examining how much progress each development actually represents compared to the developments of others.

Keywords: developments, environmental protection, green supply chain, hungarian companies, logistics.

Category of the paper: Research paper.

1. Introduction

Environmental protection. One of the most important words today. According to the latest UN figures, there are 7.8 billion people in the world (UN, 2020). While more than 340,000 people died (Johns Hopkins University, 2020) in COVID-19, the Earth was able to breathe during the quarantine of the epidemic. Despite the mortality rate, it can still be said that the Earth is overpopulated. Flora and fauna are also victims of the problem of overpopulation. And this is the subject of much debate. Many people think that human life is more important than that of an animal or a plant. In their view, they exist only on Earth for the sake of serving people. We, the authors, do not agree with them. Absolutely. We need each other to maintain the chains. We need plants, animals, and we also need the resources they provide, which are essential for the development and maintenance of life. With pollution, with non-degradable materials, we only do damage to the maintenance of this chain. And the reason is often very simple. Expensive. Environmentally friendly materials are expensive so many times companies don't spend on them. They prefer to invest in other resources and assets, because their return is likely to be more spectacular and sooner than the environmental one.

We could argue about which is more important from a corporate or environmental perspective. But if we do not act, we cannot save the Earth. Greta Thunberg, a 17-year-old Swedish environmental activist, travels the world trying to raise awareness of how we can do more for our environment and wants an Earth where even our grandchildren can live, rather than one where atomic bombs are exploding or just famine, dehydration has occurred due to climate change. We have to pay attention. Not just to each other, but to our environment. Also for our own, our child, and our grandchildren. Also to the environment around our company so that we can still operate in the world. Use energy-saving light bulbs, collect garbage separately, do everything you can from a corporate and individual perspective! Our current study sheds light on how Hungarian companies apply the environmental mitigation tools that are potentially available to them and to us, how the company's approach to environmental protection appears, and how they raise environmental awareness in their employees. We also examine how these methods and their applications relate to the green supply chain and identify all their advantages and possible disadvantages. In addition to the methods and applications we want to describe, there are many others that can be used to make a small change in our workplace or even in our own lives, as change is needed.

2. The relationship of corporate value creation with environmental awareness

Nowadays, more and more articles about sustainability and sustainable development are published in the literature on management (Tóth-Kozma, 2016). According to The Economist, before the pandemic, most companies in the 21st century operated in an open trading system for many, many years. Mexican car exports showed a 90% downward trend in April, and overseas container shipments fell 21% in May. As countries reopen, economic activity will also begin to slowly return to normal. But this still takes a long time, as the financial impact of the economic changes that took place during the quarantine period could take up to 2022 (The Economist). The economic competitiveness is extremely important in the 21st century as well, but with a new approach. Two very important factors appear: sustainability and social development (Mester et. al., 2018). The companies must have a strong strategy, without it the realization of their goal would be impossible (Tóth et. al., 2017). According to Gáspár (2012), strategy is an approach, a system of thinking and a series of activities with sober judgment and insight. In this way, it can be said that it decides how to try to be consistent in the world of need and choice and the competitive revolution, market expansion and positioning, and it also has a huge role to play in coordinating functional areas and sustainability.

The sustainable development and control of supply chain, as well as the development and execution of strategies rank among the most important and most complex challenges of these days. All of these offer a chance to the treatment and control of future business crises, to the identification of possibilities of performance evaluation and to the formation of a deeply rooted sustainable production – with the purpose of surplus income (Tóth, Kozma, 2016).

Bian et al. (2020) believe that the social and environmental issues present in business practice have made CSR issues more important day by day. Unfortunately, there is plenty of evidence that companies violate social and environmental standards on a number of occasions. Achillas and his co-authors (2019) believe that companies operating today must already apply a modern corporate strategy, one of the most important points of which is social responsibility as well as, environmental sustainability. At the heart of these strategies are sustainability initiatives, and green supply chain management, which has a key role, what can provide a competitive advantage and increase corporate profits.

In a consumer-oriented world, there is a need for companies to make themselves unique, in as diverse a way as possible. Lehota (2001) argues that “the basic goal of market segmentation is to define sub-markets (segments) in the market where the behavior of the persons and organizations involved is minimally different, but the difference is maximum compared to other segments”. And Hochman (2010) interprets successful companies as having a treasure (thus different from the others), the so-called unique value. This is a value that no one else can copy, not even the competitors, because in this case we have to think not only

about the product itself, but also about the relationships that the company has already built with customers, customers, interactively. The corporate culture can be one of these value-drivers, which is also need to be controlled by the management (Kurucz, Potháczky-Rácz, 2018). These are built on trust and have a huge impact on brand loyalty and ultimately on profits as well. The values of a perfect company will no longer be unique but living. This statement is also evidenced by the authors Covey, Merrill (2011), who argue that "trust is an integral part of society. We all depend on trust, we take it for granted – until it gets dirty or disappears". Takács and co-authors (2015) believe that value is created when the costs that companies spend on employee motivation cannot exceed the reduction in individuals 'opportunity costs, because then the motivational factors begin to deteriorate. The concrete and abstract resources, competencies, and external opportunities of a firm can form the basis of its competitive advantage, especially if the corporate philosophy supports the exploitation of all of these. It is easy to see that building their continuous improvement is terribly important for realizing long-term profits (Nagy, Kozma, Gyenge, 2019). The authors Benedek, Takácsné (2016) believe that the large increase in corporate social responsibility in recent decades can be explained by the crisis of legitimacy of companies, which has been an important area in economic life due to constant changes. But in these times, the political, social, and technological changes that accompanied change in the economy also had an impact on natural factors. In summary, it is responsibility for all business entities – even if it is small, middle or big – to evaluate, analyze and strategically integrate external factors into the decision-making process (Kurucz, 2016). Kuisma (2017) explains that environmental responsibility appeared as early as the 1990s, but years later, with the advent of the ISO 14001 environmental standard, the principles and systems were better outlined in 1997. Environmental responsibility was followed by responsibility related to other areas, and then treating all of this as a large unit was called corporate social responsibility (CSR).

The WHO estimates that 7 million people die each year from air pollution. Smog and smoking in homes or factories also pose a serious threat to health and the climate. These contaminants significantly increase the number of deaths from stroke, cardiovascular disease, and lung cancer. (WHO, 2020) This is illustrated in Figure 1. The June issue of National Geographic was memorable in 2018. Because it shows the current status, what we are doing with the Earth and it has had the desired effect: it has shocked the world.

Figure 1. Planet or Plastic? Source: June issue of National Geographic, 2018.

We must not forget that if the pollution continues to such an extent, not only the fauna but also the flora will be destroyed around us. There will be nothing in our environment to filter the air, and smog and other gas emissions will have an even bigger and much more damaging effect on us. Do we really want this? In his book, Hawken (2019) believes that people should be encouraged to make a modal shift. This would reduce greenhouse gas emissions, which are responsible for 23% of the world's various modes of transport. As Yu et al. (2019) wrote in their publication „Once the unit emission exceeds the limit and breaks the environmental protection standard, a poor environment and serious emission problems are likely to produce a severe public health hazard, which will bring the involved companies harsh punishment from enforcement agencies and society". And this must be prevented. We also need to recycle the household waste. In this turbulent world, the vast majority of manufacturers think that they produce the product they want to put on the market, sell what they don't need (e.g. scrap from manufacturing), throw it away.

And for these reasons, companies that are self-conscious and even environmentally conscious will play a much bigger role in the supply chain market over time. The development and economic significance of the supply chain approach can be observed in almost every branch of industry. Thus, nowadays it is not only multinational companies enjoying the benefits of diversification, but small and medium-size enterprises also play an active role in global value chains (Tóth, Karmazin, 2016). According to Kozma, Pónusz (2016), the supply chain is a cross-company series of value-creating processes that can create products and services suitable for satisfying customer needs, the characteristics of which include cooperation, a strategic approach and customer focus. According to Yang and Lin (2020), green innovation and supply chain collaboration have not been adequately examined, as drivers and innovation relationships can help companies identify key elements of a common relationship that can have a positive impact on green innovation activities in the future. Today's companies operating within the supply chain should include figures affecting the environment in their strategy so they can get closer to entering the green supply chain by developing a program, strategy or strategies to reduce harmful emissions.

Hugos (2011) suggests that the supply chain is a network of companies that are able to work together and coordinate their operations in order to market their product (or service). He thought that traditional logistics companies are focusing their attention on activities such as e.g. sourcing, distribution, storage and warehousing. Supply chain management encompasses traditional logistics as a whole, and goes beyond even additional activities such as marketing, new product/service development, finance, and customer service. A study of Quintana, Garcia and co-authors (2019) by studying panel data found that selecting European manufacturing companies based on their environmental performance has a positive impact on increasing corporate reputation.

If we need to identify the most important factors in the supply chain, one of them would certainly be efficiency. The efficiency is a measurement process that can be used to demonstrate the amount of resources used to achieve goals (Frazer, 1994). The concept of sustainable development was formulated by Gro, Harlem, Bruntland (1987) in a form known to all in his study Our Common Future. According to this, sustainable development is not a harmonious state, but a process of change that the exploitation of resources, the direction of investment, the orientation of technological development and the direction of technological development and organizational changes, which are in line with the present and both in the future. Unfortunately, what kind of sources the author is talking about is not precisely defined. Popp et al. (2018) believe that "in relation to food production, it can be stated that the current mode of food production is unsustainable in the long run. Among other things, because the amount of irrigation water is reduced or, for example, meat production causes a serious burden on the environment. In the future, we need to produce more food with less water, chemicals and fertilizers". At least that's what we should do. But until we are not aware of the value of these resources, it is not possible to know whether a significant change will occur in the future.

But what if we can't find water anywhere? If there is a drought around us? What could we do, in a few years, if we are not able to show enough green logistics innovation to save ourselves, our business and the Earth? Today's companies can already detect many warning signs: epidemic, rising temperatures, constant storms, weather changes, which all indicate that humanity, corporations, must change their habitats. Profit will not be the most important thing if our grandchildren will have to look for water or food resources in order to survive. After all, the money does not equal the whole world. "Entrepreneurs and leaders who care about the health of our environment need a lot of courage and imagination. To the extent that the environmental condition of our planet is deteriorating, the more they need to act in an increasingly bold and innovative way. They need courage to rethink the habits of their lives. They need to consider the ecological impact of their activities and, in extreme cases, start all over again in a more environmentally sustainable industry". believes Winter (1997) in the late 1990s, a consideration that is becoming increasingly burning today.

3. Material and method

As the first part of our research, we needed to process the related international and Hungarian literature, which helped us to really feel our current topic. We are grateful to the following authors for their work – Yang and Lin (2020), Achillas et al. (2019), Popp et al. (2018), and the book of Kuisma (2017), the article of Takácsné (2016) and the work of Kozma, Pónusz (2016), which has allowed us to gain deeper insight into the topic we are researching. It will be seen later that the primary research was conducted on the basis of a corporate survey, what we processed like a case study. The study covers the green/inverse logistics activities of companies, that we examined in this publication.

Our study was conducted on the basis of corporate surveys at Hungarian companies, which play an important role in many areas of the supply chain, such as transport, automotive, manufacturing, etc. In analyzing the responses, we were able to learn about these companies and whether they have green/inverse logistics and, if so, what tools they use and how they are used. An important aspect of the research was to get a detailed picture of this activity or groups of activities that are used or, if they are not, for what reason it cannot be realized. Due to the sensitivity of the data, we do not disclose the names of the companies in our research. The research was conducted in 2019 and we are still working on it. The number of respondents is almost up to 200 companies, which continues to grow over time. This is a large number of data points, mainly large corporate research with a random search that is not representative but suitable for drawing approximate conclusions.

4. Results

In 2019, we created a structured questionnaire, the aim of which was not only to get to know Hungarian companies better, but also to put more emphasis on what green developments are taking place, have taken place or will take place in the future. Nowadays, more and more emphasis must be placed on such and similar developments, as the protection of the environment and the protection of our lives are extremely important, in addition to ensuring that business interests are not harmed.

In order to be better immersed in the green logistics activities/developments of the companies in the future, we first need to know the distribution ratio of the companies involved in the research. Table 1 shows the percentage distribution of companies currently operating in the supply chain market. It can be clearly see, that most of the companies are operating in the supply chain market more than 10 years.

Table 1.
Corporate presence in the supply chain market

Years	*Answers*	*%*
Less than 2 years	4	2%
Between 2-5 years	13	7%
Between 5-10 years	23	12%
More than 10 years	156	79%
Total	196	100%

Source: our own research, 2020.

Although our present research is not considered representative, we can state that a large part of the companies operating in the service sector are present in the distribution of large companies in the study. This distribution is shown in Figure 2.

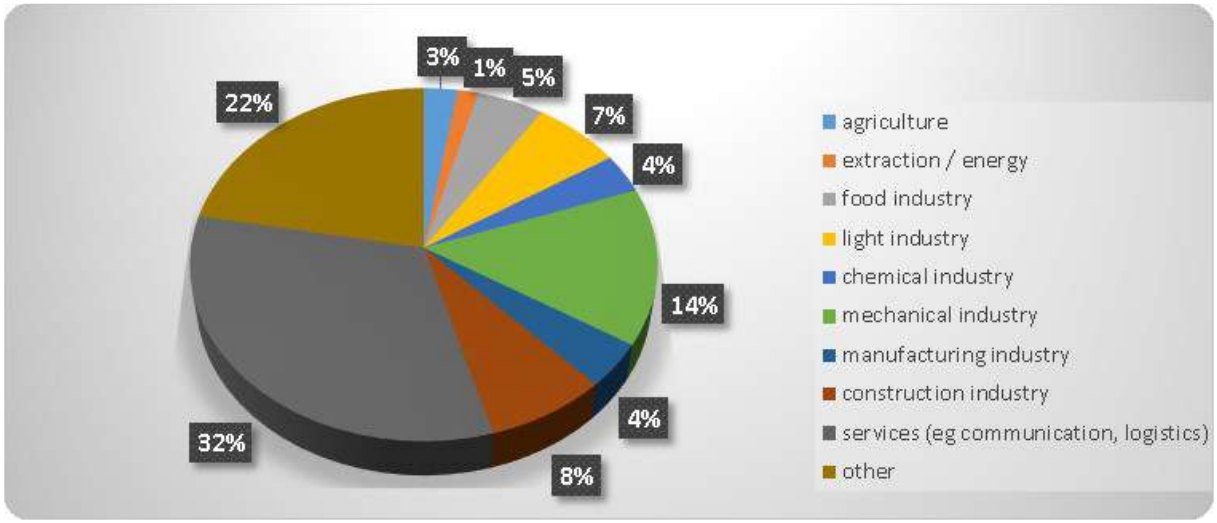


Figure 2. Companies distribution in the study. Source: our own research, 2020.

In second place in the distribution was the other category, which included the banking sector, hospitality and trade, and sectors not listed above. In third place was the mechanical engineering industry, which is only 14% in the distribution. We find it interesting that the construction industry is present in only 8% of the respondents, as there are many companies operating in this sector in Hungary. Unfortunately, the energy industry in Hungary is very insignificant, which is also well illustrated in the figure, with 1%. This is also unfortunate because, in our view, a number of wind farms could be installed across the country, which would not only provide jobs for people unemployed in the current coronavirus situation, but also help the economy to adopt greener solutions. Although the number of distributions in the statement cannot be related to the role in the supply chain, based on the above, we were very curious about the role of the responding companies. The ratio of this is illustrated in Figure 3.

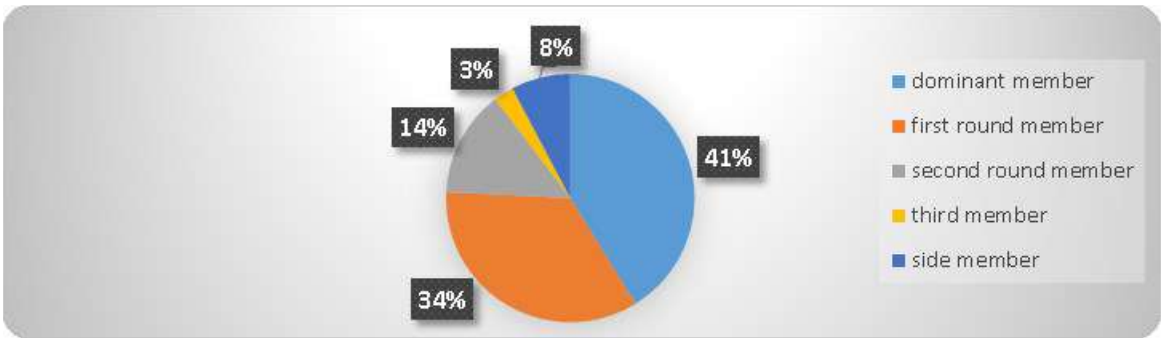


Figure 3. Companies role in the supply chain. Source: our own research, 2020.

For the better illustration, Figure 4 shows the position of the surveyed companies within the supply chain. As we can see most of the companies are manufacturers, that following closely the distributor (wholesaler) and the logistics provider companies and the main suppliers. There is no company among the respondents that deals with inverse logistics services, which will play an increasingly important role over the years (as increasingly modern and optimally offered green logistics technologies, tools and solutions become available).

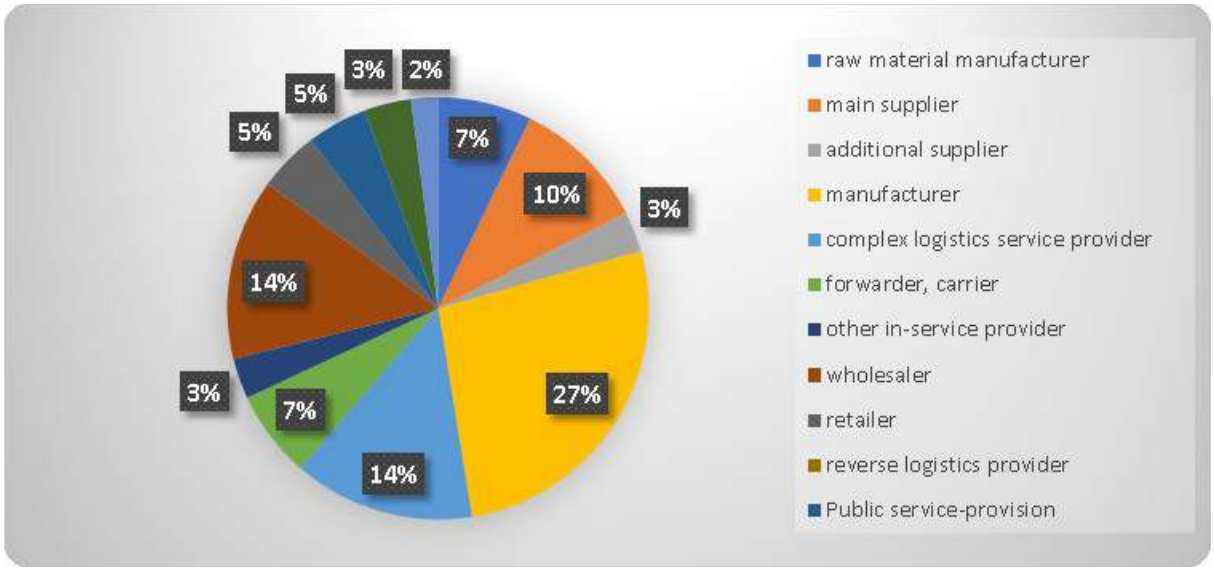


Figure 4. Companies main position in the supply chain. Source: our own research, 2020.

Previously, we described the companies, their roles, and their position in the supply chain that participated in the research. In the following, we will present their role in green logistics in more detail. We consider it important to look at this area, as the advantages and disadvantages of using green tools are closely linked to the supply chain market, where they have an extraordinary impact on market position as well as competition in the market.

Our current research was based on previous research by Kozma, Nagy, Pónusz authors (2020), regarding for the green implementations at the Hungarian companies. We asked some corporate employees about the companies where they work, what materials are most often recycled, and where and what they reuse. The most commonly used materials that can be found even in everyday life in our own household. By way of illustration, we have created the word cloud, based on the answers to the two questions side by side, as illustrated in Figure 5.

Figure 5. The employees answers about what do you recycling and where and what do you reusing at your company? Source: our own research, 2020.

The most recycled materials are still papers, glass, wood, cardboard, foils, and packaging. Interestingly, we would highlight one, perhaps less well-known method that could be useful to other companies as well: recycling coffee grounds. Used coffee grounds are collected by the company and used to fertilize the plants. The employees responses also highlighted that, if the company was willing and able to develop its green logistics area or just would have the opportunity, what would be:

- Transport.
- Solar panels for operating the office building.
- Wrapping.
- Modernization of buildings.
- Energy Reduction. Application of LED technology.
- Introduction of electronic processes.
- Purchase of hybrid cars.
- Container washing, electric milkrun network on site, application of Industry 4.0 solutions.

As part of the qualitative research, we would like to share some employee opinions that answered the question of what they think about sustainability, environmental protection in business. If they could spend extra money on the use of environmentally friendly technology in the short term, would you still use it?

- *My personal opinion is that it is in all our interests to support green investments, even if this is an extra cost for the company, as it can benefit the company and society in the long run.*
- *We strive to become an environmentally conscious company, but would not employ it in the event of over-spending.*

- *From an economic point of view, many environmentally friendly technologies, processes or materials represent an extra cost that can only be enforced in the consumer price at the expected profit margin.*
- *In my personal view, a company 's attitude towards the environment can be seen as a strategic investment in the long run. In the long run, you can create a win-win situation that can benefit both your company, its environment, and society, so if you put green technology at extra cost to a company in the short term, because it is a long-term investment.*

As we can see, in the modern world the employees want to take care about their environment. In the current situation, this is a very positive attitude, but there is no guarantee that it will remain so in the future. Respectively, the survey does not reveal the real motivation for sustainability, although individual goals largely determine future developments. We believe that these individual goals could be shared with managers or designated individuals within the company, who could potentially take steps toward green corporate solutions.

To prove this statement, we made some diagrams based on the responses shown in Figure 6. The questions focused on substitution with environmentally friendly materials and energy saving. It is clear from the figure that the replacement of environmentally friendly materials is not solved in most companies, while a lot of attention is paid to energy saving, either by upgrading the equipment or by solar panels. As the biodegradable packaging and filler has already appeared in Hungary, we hope that these responses will change in the later stages of the research (years from now).

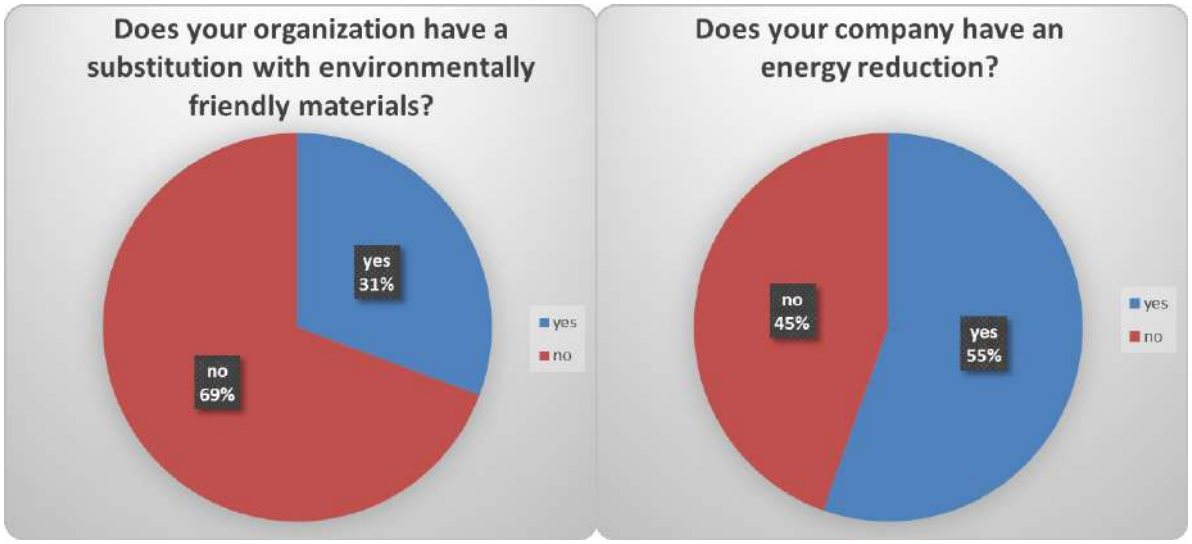


Figure 6. The answers regarding the environmental friendly solutions. Source: our own research, 2020.

There are many ways to approach environmentally friendly applications and why not apply them. Some companies have an environmental strategy and program that makes it mandatory for them (preferably) to have a corporate activity each year that can also demonstrate to company employees, managers, other organizations, and the government that they are doing something about their environment. For companies that (still in large numbers in our current

research) are unable or unwilling to sacrifice money to invest in the use of green tools. Unfortunately, in 2020, as well as in previous research, it can be observed that the strategic aspects of companies largely determine what money is spent on. We can say that money is still a determining factor in connection with the use of green technological innovations and tools, as these unfortunately do not always require easy and cheap corporate transformations. In our point of view the optimization also important due to the financial implications. One of the most common goals of the companies is to reduce their costs where possible, that is why optimization is a very important factor so that they can make efficient use of the resources and opportunities are available to them. And Figure 7 below shows whether respondents are recycling or reusing at companies. It is clear that, unfortunately, in the most cases, it still doesn't happen, but looking at the percentage distribution, the chances of these numbers changing later on are increasing. For companies that are reused, pallets and recycled packaging are the materials they reuse. In companies where the material of the products or the product itself is recycled, the most selective waste collection or recycling of the material of the product takes place.

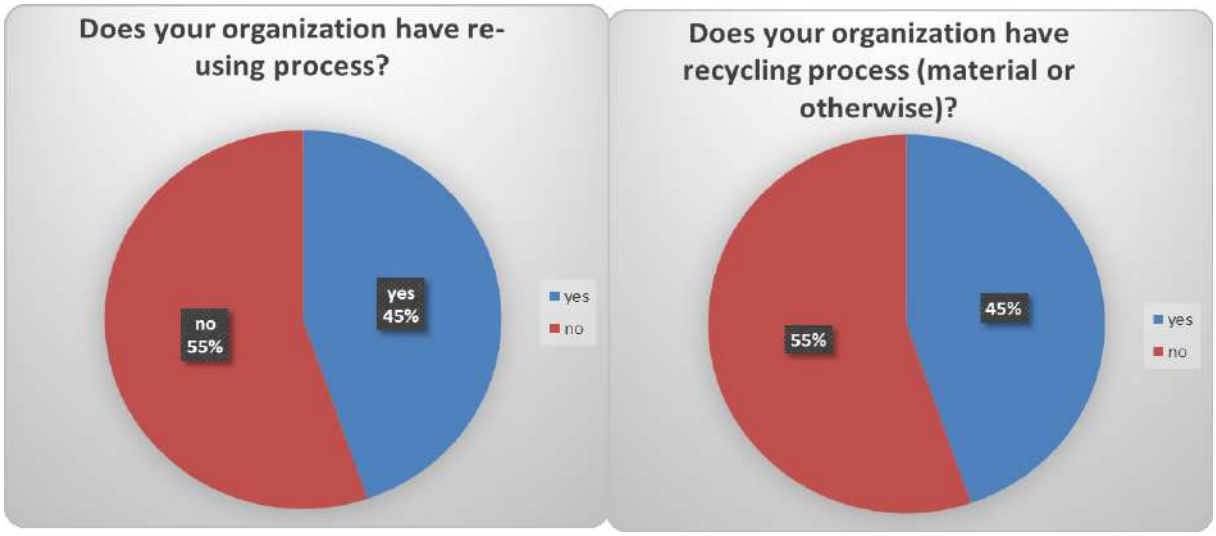


Figure 7. Re-using and recycling process at the companies. Source: our own research, 2020.

The question may arise, what can we say after this study that there is still so little focus on protecting our environment, using environmental technologies. Maybe you can't even say anything. Human attitudes, the fact that most people always want more, the more they have, cannot be changed. Yet, this needs to change. A change in individual and corporate attitudes could bring about an explosive change, even in the short term, in the supply chain market, where using green technologies would not only benefit our environment but also ourselves.

5. Summary

Based on the literature sources used for the research, we can state that in order to thoroughly examine the research topic, it is essential to map the corporate strategies and the goals to be achieved. Since it can be considered a basic need, it can be said to be like air. Without it, a company will be inoperable. During the secondary research, we tried to approach the topic from several sides, based on the research results of several authors.

Our primary research was based on a structured questionnaire, which is currently being completed among large companies in Hungary. Based on the responses provided by companies and corporate employees, it is clear that employees individually would like to do more for their environment, even within a company, but are aware that the hands of companies are tied to the decisions of senior management. You have to spend the money on what they set. Nevertheless, if we further examine these companies, of which a little more than half have an annual revenue of almost HUF 2 billion, the question arises as to why there is no technological innovation in the environment. This and similar issues will be further explored in another future study.

Based on our research, it can be said that one of the very important determinants of economic cycles and the supply chain is money, not natural resources, the exploitation of which would not only promote the use of greener technologies (e.g. wind power), but also the current market a gap could also be occupied.

We, the authors, do not intend to predict a dark future. But unfortunately, if this goes on like this and there is no change of any kind, then after a while we will not only have no medium but no water, which would help the survival of living organisms. We still believe that as long as someone sees hope that they can and will do for their environment, there is a chance that the world will change and green logistics activities will play a greater role within the supply chain.

References

1. Achillas, C., Aidonis, D., Bochtis, D., Folinas, D. (2019). *Green supply chain management*. New York, USA: Routledge Publishing.
2. Benedek, A., Takácsné, G.K. (2016). *A felelős vállalatirányítás személyi tényezői: A CSR-központú felelős vállalatvezetők attitűdjének vizsgálata a kis-és középvállalkozások körében.* Budapest: Vezetéstudomány, XLVII., évf. 1, sz., p. 58.
3. Bian, J., Liao, Y., Wang, Y., Tao, F. (2020). Analysis of Firm CSR Strategies. *European Journal of Operational Research*. Doi: https://doi.org/10.1016/j.ejor.2020.03.046.
4. Covey, M.R.S., Merrill, R.R. (2011). *A bizalom sebessége*. Budapest: HVG Kiadó Zrt., pp. 330-331.

5. *COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University*, https://coronavirus.jhu.edu/map.html, 14.05.2020.
6. Csillag, S., Csizmadia, P., Hidegh, A.L., Szászvári, K. (2019). *A kicsi szép? Tanulás és fejlődés a kisvállalkozásokban.* Vezetéstudomány. LI. évf. 2020. 01. szám.
7. Frazer, M. (1994). *What Is Quality in Higher Education?* In: D. Green. London, England: Society for Research into Higher Education, Ltd. and Open University Press, p. 104.
8. Gáspár, T. (2012). *Stratégia Sapiens*. Budapest: Akadémiai Kiadó, p. 11.
9. *Has Covid-19 killed globalisation?* https://www.economist.com/leaders/2020/05/14/has-covid-19-killed-globalisation, 14.05.2020.
10. Hawken, P. (2019). *Visszafordítható. 100 hatékony megoldás a klímakatasztrófa megállításához.* Budapest: HVG Könyvek.
11. Hochman, L. (2010). *A fogyasztóra hangolva*. Budapest: Akadémiai Kiadó.
12. Hugos, M.H. (2011). *Essentials of Supply Chain Management*. USA: John Wiley & Sons, Inc.
13. Karmazin, G., Tóth, R. (2016). Az ellátásilánc-menedzsment szervezeti struktúrájának alapjai. *Logisztika – Informatika – Menedzsment, 1, 1,* pp. 50-58, 9 p.
14. Kozma, T., Pónusz, M. (2016). *Ellátásilánc-menedzsment elmélete és gyakorlata-alapok*. Gödöllő, Károly Róbert Kutató-Oktató Nonprofit Kft.
15. Kozma, T., Nagy, V.Á., Pónusz, M. (2020). *The implementation of green logistics in the practice of Hungarian companies.* 6 th Winter Conference of Economics PhD students and Researchers.
16. Kuisma, J. (2017). *Managing corporate responsibility in the real world*. Helsinki, Finland: Palgrave Macmillan Publishing.
17. Kurucz, A., Potháczky-Rácz, I. (2018). *The Role of Group Work and Group Learning in Corporate Culture in Hungarian SMEs.* In: T., Löster, J., Langhamrová, J., Vrabcová, Confernce Proceedings, RELIK 2018, Reproduction of Human Capital – links and context. Prague, Csehország, University of Economics, Oeconomica Publishing House, pp. 184-194, 11 p.
18. Kurucz, A. (2016). Interdisciplinary field of strategy and change management in the groweing Hungarian SME's sector. In: C., Brătianu, A., Zbuchea, F., Pînzaru, R.-D. Leon, E.-M. Vătămănescu (eds.), *Opportunities and Risks in the Contemporary Business Environment* (pp. 417-428). Bucharest, Románia: Scoala Nationala de Studii Politice si Administrative, Faculty of Management, 12 p.
19. Lehota, J. (2001). *Élelmiszergazdasági Marketing*. Budapest: Műszaki Könyvkiadó, p. 127.
20. Mester, É., Tóth, R., Túróczi, I. (2018). A vállalatok stratégia-alkotására ható tényezők: A gazdasági növekedés, a társadalmi fejlődés a fenntarthatóság és a versenyképesség. *Economica (SZOLNOK), 9, 1,* pp. 39-48.

21. Nagy, V.Á., Kozma, T., Gyenge, B. (2019). Információ áramlási folyamat jelentősége egy logisztikai szolgáltató esetében. *Logisztikai Trendek És Legjobb Gyakorlatok, 5, 1,* pp. 4-11.
22. Popp, J., Lakner, Z., Pető, K., Oláh, J. (2018). Élelmezés – és táplálkozásbiztonság: lehetőségek és kihívások. *A Falu 33, 1,* p. 62.
23. Quintana-García, C., Benavides-Chicón, C.G., Marchante-Lara, M. (2020). Does a green supply chain improve corporate reputation? Empirical evidence from European manufacturing sectors. *Industrial Marketing Management. Vol. 84*. Doi: https://doi.org/10.1016/j.indmarman.2019.12.011.
24. Takács, S., Csillag, S., Kiss, C., Szilas, R. (2012). *Még egyszer a motivációról, avagy „hogyan ösztönözzük az alkalmazottainkat itt és most”?* Vezetéstudomány, XLIII. évf. 2012. 2. szám. 2-17 pp.
25. Tóth, R., Kozma, T. (2016). A fenntarthatóság és a környezettudatosság fontossága: vélemények a fenntarthatóság, környezettudatosság vállalati gyakorlatban való érvényesítési lehetőségéről. *Acta Carolus Robertus, 6, 2,* pp. 284-301, 18 p.
26. Tóth, R., Mester, É., Szíjártó, B., Túróczi, I., Zéman, Z. (2017). A vállalkozások beruházási döntéseinek elemzése és kontrollja = Analysis and Control of Corporate Investment Decisions. *Polgári Szemle: Gazdasági És Társadalmi Folyóirat, 13, 1-3*, pp. 51-71, 21 p.
27. WHO figures about the air pollution – https://www.who.int/health-topics/air-pollution#tab=tab_1, 16.02.2020.
28. Winter, G. (1997). *Zölden és nyereségesen*. Budapest: Műszaki Könyvkiadó.
29. World Population Prospects 2019 – UN figures about the population, https://population.un.org/wpp/Download/Standard/Population/, 15.02.2020.
30. Yang, Z., Lin, Y. (2020). The effects of supply chain collaboration on green innovation performance: An interpretive structural modeling analysis. *Sustainable Production and Consumption*. Doi: https://doi.org/10.1016/j.spc.2020.03.010.
31. Yu, Y., Zhou, S., Shi, Y. (2020). Information sharing or not across the supply chain: The role of carbon emission reduction.*Transportation Research Part E 137,* 101915. Doi: https://doi.org/10.1016/j.tre.2020.101915.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

GENERATIONAL DIFFERENCES IN KEY VALUES AND ETHICS

Tatiana KRAWCZYŃSKA-ZAUCHA

Uniwersytet Pedagogiczny w Krakowie; tatiana.krawczynska-zaucha@up.krakow.pl,
ORCID: 0000-0001-6530-4206

Purpose: The purpose of this article is to explore the generational differences between five generations of adult Poles including the Silent Generation, Baby Boomers, X Generation, Millennials and adult representatives of iGen exploring their key values. The study also examines the different approaches taken by the generations towards ethics.
Design/methodology/approach: 606 people from all over Poland took part in the survey. The participants included 4 people from the silent generation (0.7%), 85 from the Baby Boomers (14%), 197 from generation X (32.5%), 309 from the Millennials 309 (51%), and 11 from the iGen (1.8%). The *Computer Assisted Web Interview* (CAWI) method was applied which is used to reach a large number of respondents and obtain data for analyses in a short time.
Findings: The study showed that the Silent Generation, Baby Boomers, X Generation, Millennials and even the iGen share the family as a common key value. This finding should be taken into account in any work or research on generational differences and their relation to work values.
Research limitations/implications: The survey was conducted using sample and is therefore not representative of Polish society. This can be considered as an exploratory study.
Practical implications: The results of the study should encourage researchers involved in work values to take into account the life values of the generations that influence and even constitute the foundation for work values.
Social implications: The study demonstrates that values are present in the lives of individuals and societies. The key life values of a particular generation influence their work values, their motivation and their approach to cooperation. Understanding this should influence the actions of companies and HR departments.
Originality/value: The article contains new research on the key values of the Silent Generation, Baby Boomers, generation X, Millennials and iGen.

Keywords: generational differences, key values, life values, work values.

Category of the paper: Research paper.

1. Introduction

Whilst the differences between generations have been stark, they are becoming increasingly noticeable in modern day. However, globally, universal digitalization and computerization has made a significant difference in the way in which we understand the world around us. Part of this change has included learning the skills to take advantage of the latest hi-tech innovations which are becoming increasingly more significant in our lives. Today, generations are divided between those from before the era of digitization and those who have only ever known the digital era. The way in which people react to their environment as well as the values that guide them also differ between generations. Although differences in values, especially those correlated with work, have been studied for decades in Europe and the United States, there has only been interest in generational differences in Poland in the last several years. This paper aims to investigate the differences in the key life values of the Silent Generation, Baby Boomers, Millennials and the adult representatives of iGen which include ethics as one of the key values.

The study aims to fill a gap concerning the key life values, specifically the life values between the different generations in Poland. There are numerous studies and that have explored different work values (give examples). Some of these have included those that have a direct and indirect impact on employees' behavior as well as the choices that they have made or their motivation level. However, not as much importance has been given to the life values, or the key values of different generations of Poles. It is essential to focus on the life values as they are the starting point or even the foundation of work values.

2. Characteristics of the generations

A number of different approaches have defined the term generation (Mannheim, 1972; Smith, and Clurman, 1998; Szukalski, 2012). Given the aim of the study, the Mannheim definition has been chosen as the most appropriate one with minor changes, as described below. According to this definition, a generation is a group of people of a similar age, who have common life experiences that have developed from the same events in the world and a similar culture, politics, economic or environmental conditions (Mannheim, 1972; Smith, and Clurman, 1998). From this point of view, age, which is directly related to the cultural and social experiences of individuals and their worldviews, a specific style of thinking and their values, is crucial in defining a generation (Jurkiewicz, & Brown, 1998). However, it should not be assumed, that the values that characterize a specific generation do not change over time. On the contrary, it should be assumed that the above definition of a generation is compatible

with theories of value evolution (Beck, and Cowan, 2005; Barrett, 2017), and the European Values Study conducted over the last 20 years that will confirm these theories empirically (EVS, 1981-2017). This study focuses on main generations in Poland that include: Generations Silent, Baby Boomers, X Generation, Millennials, sometimes considered separately, as generations Y and Z, and adults from iGen, youngest generation.

The Silent Generation was discussed for the first time in 1951 in a Time Magazine article (Time, 1951). The term was intended to refer to the defining features of this generation, that is, silence and caution (Strauss, & Howe, 1991). The Silent Generation includes people born between 1925 and 1944 and primarily come from the period of the Great Depression and World War II, when Poland, having just gained independence was suffering through political upheaval and social and national instability. Mass culture also became popularized at this time and universal access to education emerged. This period was marked by a period of insecurity where people felt unrepresented however, also hoped for a better future.

The period between 1945 and 1964 became known as the Baby Boomers generation, during the post-World War II baby boom. This period in Poland was also heavily influenced by the communist regime, who placed the whole country under repression. The people lacked basic freedoms and lived on rations without the basic food necessities. Against this backdrop was the muzzle of Radio *Wolna Europa*, where people longed to emigrate to the West for a better life. While in other parts of the world the Baby Boomers took advantage of the emerging opportunities, the people in Poland were forced to submit to the politics authorities and to adapt a difficult situation. The Baby Boomers were divided into a "we" and "they". On one side were those with power and on the other side were those who were forced to blindly obey, left powerlessness and without opportunities. However, it was also at this time where women were first allowed to be educated and work in various occupations.

The next generation was generation born between 1965 and 1979 and grew up in Poland during an economic crisis. Due to the work of both parents and upbringing "with a key on their necks", X generation are resourceful and independent people. They grew up during a period of economic transition and a shift of power in Poland and when many other countries around the world were also experiencing a change of power. However, in Poland, this was also a generation that were able to experience a number of new opportunities and freedoms. As a result they were open to new challenges and believed that they could achieve anything and seize new opportunities. Generation X has also experienced new technological advances during their lives and have been able to make the most of them. This generation is aware that they must work to overcome the lost time of previous generations in order to achieve the same advancements in science and technology as the West.

The continual expansion of technology and globalization has led to more rapid and distinct differences between the generations. Although historically, the period for a change in generation has been roughly 30 years, this number has decreased to 25 and then 20 years in more recent times. The Xenials, the generation born between 1975 and 1985, stand out in

particular. Whilst this generation had a similar childhood to the previous generation, their youth has been shaped by the digital era (Woodman, 2017), which has significantly influenced their hunger for technology. As a result this generation has become more open to globalization.

Similar differences can be seen in the next generation born between 1980 and 2000 who have become known as the Millennials. This generation is usually divided between generation Y (1980-1990) and generation Z which is intended to show that the intergenerational differences are occurring only 10 years apart. Generation Z, those born after 1990, has also become known as generation C as this generation has been characterized by specific behaviors such as *connect, communicate* and *change* that have eased processes of communication and led them to be more open for change.

The Millennials have grown up in an environment of accelerated economic development where surrounding countries have shown significant interest in pulling Poland out of the circle of influence of post-Soviet Russia. The Millennials have had access to everything from MacDonald to computers, from Mars bars to Coca-Cola and 3D cinema. They have grown up as children of resourceful entrepreneurs and government officials who have shifted their thinking to being "pro-consumer". They are also the first generation where setting goals has become of prime importance. At the same time, their worldview has been shaped by unethical advertising, where the "I'm allowed everything" attitude that has emerged from the US where it is believed that if they work enough hard, they would be able to rise from poverty to become a millionaire.

Generation Y has grown up in constantly changing environment, that has embraced globalization, had increased access to the Internet and seen the increased digitalization of everyday life. They have also had unlimited possibilities of travel. The Millennials have seen significant shifts in authority and are now aware that authority and leadership should be related to their competence and skills, as opposed to their position. Their worldview has been shaped by hi-tech innovations, global social networks, growing social disparities associated with the emergence of social classes and a greater awareness of the opportunities available to them.

Generation Z (generation C), the second subgroup of the Millennials, only know the world with the Internet and social media, so fully explore the potential of technology. They are a generation that has been brought up, often from an early age, with unlimited access to network resources, computer programs that have allowed them to learn to read, write and play the keyboard. They have smartphone apps and fairy tales that are available 24 hours a day, on many different channels and in a number of different languages that often come to substitute real life. This is the first generation, whose worldview and values have been shaped by both local and global influences and where they are able to interact with people who are physically distant, such as celebrities or idols.

The iGen generation, also known as the "Me" generation is now entering adulthood. Although they are sometimes partly identified with generation Z, in principle this generation includes people born between 2001 and 2012. As only some of them are now adults, it is difficult to define what has specifically shaped this group and is an ongoing process. This could be reviewed in several years' time.

3. Generational differences

It is generally held that the values and beliefs of a particular generation differ and have a significant influence over the behavior of those within that generation. Intergenerational teams in organizations are particularly strong in their interaction with each other. For years researchers have explored whether these differences are a myth or a fact. To date, the largest long-term study has been the European Values Study which began in 1981. There have been nine waves of the study that have covered 16 to 47 European countries or regions (EVS, 1981-2017), the last of which took place in 2017. The European Values Study showed significant differences in the approach of denied generations to values correlated with different aspects of life. However, it does not ask about key values, nor about the place of ethics and individuals understanding of them.

4. Research hypotheses

In order to investigate the differences between the key values of the Silent Generation, the Baby Boomers, the Millennials and the adult representatives of the iGen generation in Poland and to learn more about their approach to ethics, the following hypotheses will be tested:

H1: There are differences in the key life values within different generations in Poland.

H2: Ethics are seen as a set of orders and prohibitions to be respected.

5. Methodology

The population in Poland as of December 2019 was 38,382,576 with adult Poles with 31 million being adults (GUS, 2019). The Polish "here and now" have been shaped by all of the above-mentioned generations including the Silent Generation, Baby Boomers, X generation, the Millennials (generation Y and generation Z) and adult representatives of the iGen.

Table 1.
Generations in Poland, persons over 18 years of age, statistics from the Central Statistical Office (GUS, 2019)

Generation		Quantitative
Z	**Millennials**	5 375 012
Y		6 189 856
X		7 830 063
Baby Boomers		9 330 923
Silent		2 722 733

Detailed data on the size of individual generations of Poles can be found in Table 1, while the percentage of generations of the adult population is presented in Figure 1.

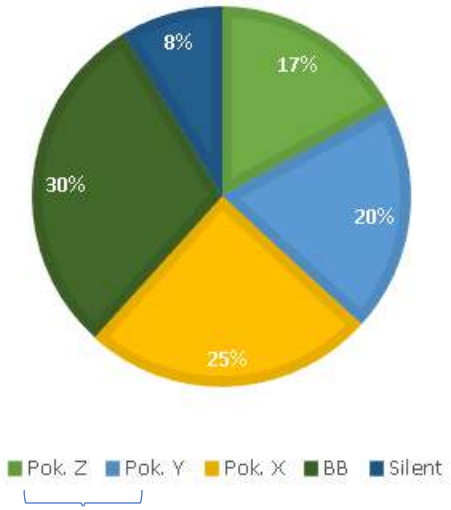


Figure 1. Generations in Poland, statistics from the Central Statistical Office (GUS, 2019).

A survey was used to collect data, which made it possible to reach a larger sample of the population. A selected group of people were chosen to do the survey. The data was then analyzed using quantitative methods. The *Computer Assisted Web Interviewing* (CAWI) method was used in the study where respondents were required to answer the questionnaire on his/her computer or mobile device equipped with a web browser. While the CAWI method allows for the quick collection of data for analysis, there are some limitations. For example, people from generation X, Millennials and IGen were the most willing to participate in the survey and were therefore more represented than the Baby Boomers or Silent generations. Thus, the survey is not representative of the entire population and is only exploratory in its nature.

An online questionnaire was sent by e-mail to local information journals in Polish provinces requesting to make it available to readers on social media (Facebook, LinkedIn). The research was conducted between May and June of 2020.

5.1. Participants

There were 606 responses to the questionnaire, of which 9 persons (1.5%) were not of Polish nationality, so they were not included in the analyses. There were 434 women (71.6%), 166 men (27.4%) who took part in the survey, two people declared as "other" (0.3%) and four people chose not to answer (0.7%). The majority of the survey participants were Millennials – 309 individuals (51%). The next largest group of participants were generation X – 197 participants (32.5%), while of the Baby Boomers there were 85 participants (14%). The smallest groups of participants were adult representatives from the iGen generation 11 persons (1.8%) and there were 4 participants from the Silent Generation (0.7%) (Table 2).

Table 2.
Demographic data of the survey

Gender = 597	number	%
F	434	71.60%
M	166	27.40%
Other	2	0.3%
Silent	4	0.7%
BB	85	14%
X	197	32.50%
Mil	309	51%
iGen	11	1.8%

The participants were also asked about their place of residence. Among the respondents the largest group were 144 inhabitants of Małopolskie Province (23.8%); 137 persons from Silesian Province (22.6%); 72 participants from Mazowieckie (11.9%); 41 persons from Łódzkie (6.8%) and 33 persons from Pomorskie (5.5%). The smallest groups were represented by residents from Warmińsko-Mazurskie – 5 persons (0.8%), Podlaskie – 6 persons (1%), and Opolskie and Lubuskie – 7 persons each (1.2%). The vast majority of the survey participants lived in a city with a population greater than 500,000 (31,2 %), 24% participants lived in a city with a population between 100,000 to 500,000, 20% lived in the countryside and 14.9% lived in cities with a population between 20,000 to 100,000. The remaining participants – 8.8% lived in cities with a population less than 20,000.

Responders were also asked about their education. Out of the 462 participants surveyed, 462 (76.2%) had a higher education, 119 (19.6%) had completed secondary education, 19 (3.1%) had completed a vocational education and 5 people had completed basic education (0.8%).

5.2. Survey structure

The survey questionnaire was divided into four sections. In the first section, participants assessed their life satisfaction by answering "I think I am satisfied with my life" by answering 1 to 5 with 1 being "I do not agree at all" and 5 being "I agree completely". The life satisfaction section contained two components, the affective aspect (how well a person usually feels) and

the cognitive aspect (what a person thinks about his/her life and how he/she consciously evaluates it). These two components can be used to measure two sides of happiness, or life satisfaction (Veenhoven, 1991). Their positive or negative evaluation influences the degree of credibility of the test results, since many researchers suggest that life satisfaction is correlated with values and vice versa (Furnham, 1991; Brandstätter, 1994).

In the second question the participants were asked to assess how important in her/his life the following were: family, work, hobbies, friends, internet presence, rest and entertainment, study/education, religion/faith, politics, money, environment and health. Each value was assigned a number from 1 to 5, with 1 being completely unimportant and 5 very important.

The questions in section two were as follows:

1. Which of the values are the most important to you?
2. Which of the values do you set as second most valuable?
3. If five people closest to you were asked what your life is all about, what would they say?

In all the questions the respondents could choose the same values as in the second question of the first section as well as choose to answer "other".

The third section was related to ethics and contained the questions, "What is ethics to you?" and the possible answers that are closest to the person in question: "an unnecessary set of orders and prohibitions", or "a set of orders and prohibitions that I try to follow", or "a value in itself that enables a consistent life", or "I don't think about it at all", and "other". The respondents were then asked to choose the answer closest to them, matching the statement that ethics is needed, from among the possibilities, in personal life, in professional life, in personal life and work life, there is no need at all or "other" answer. The last section of the survey contained a demographic label.

6. Results

The majority of the Poles surveyed answered that they were satisfied with their lives. Of the total participants, 75.4% chose the answer "I completely agree" and "I agree"; 18.5% had no opinion; 4.5% disagreed and 1.7% completely disagreed with the statement. The three generations, the Baby Boomers, Generation X and the Millennials scored close to 4. The least satisfied with life were the Silent Generation (3,25).

From the data collected in the second question of the survey, it appears that the most important value in all the examined generations was the family. Of the participants, 374 respondents (61.7%), consisting of 199 Millennials (67%); 126 persons from generation X (65.6%); 19 persons from Baby Boomers (30.6%); 4 persons from iGen (36.4%) and 2 persons from Silent generation (66.6%) chose this answer. From the Baby Boomers generation,

the family as a key value prevails over religion/faith only 1.6 p.p., while 27 % of individuals from iGen chose friends as the most important value. The discussed data can be found in Figure 2.

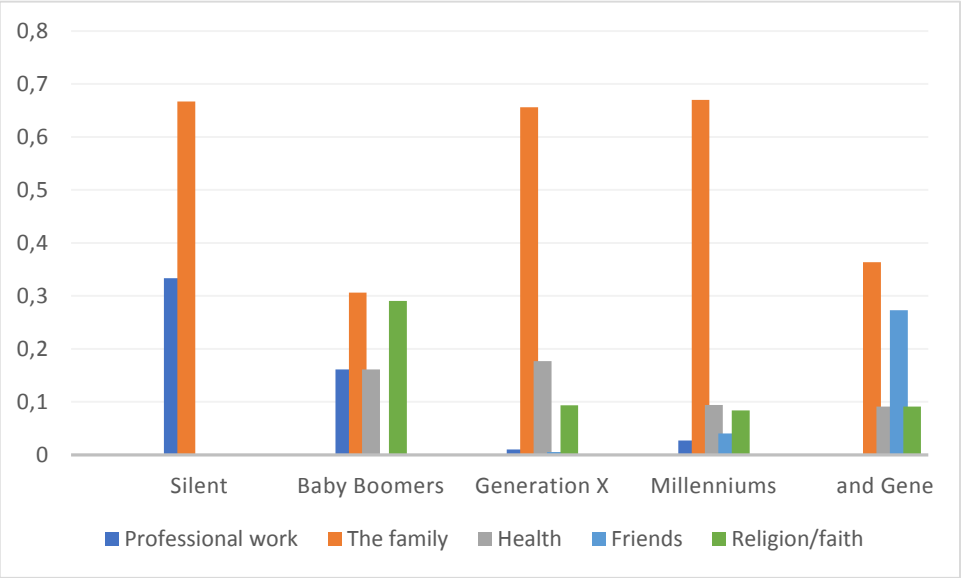


Figure 2. Key values of the generations under investigation.

The answers collected in section two confirmed the most important value declared by the respondents in the previous section. Answering the question "Which is the most important value for you?" as many as 61.7% (374 persons) of all the participants chose family, 12% chose health (73 persons); 9.1% religion/faith (55%) and 3.6% professional work (22 persons).

As the second value, which participants chose as being the most important in their life, 21.1% of respondents indicated professional work (128 persons); 20.3% for family (123 persons); 20.1% for health (122 persons); 10.6% for friends (61 persons) and 7.3% for religion/faith (44 persons).

In the third question, the participants were asked, "If five people closest to you were asked what your life is all about, what would they say?". Although 41.4% (251 persons) of the participants chose family, as many as 16.3% (99 persons) chose professional work, 8.9% (54 persons) chose study/education and 6.3% (38 persons) chose religion/faith.

To the question, "What is ethics to you?" 73% of the participants replied that the value of a coherent life in itself (445 persons), 16.7% that a set of injunctions and prohibitions it tries to comply with (101 persons), 2% (12 persons) that an unnecessary set of injunctions and prohibitions, and 5.1% did not think about it at all (31 persons).

For the question, "Are ethics necessary?" 90.6% responded that they are needed in their personal and professional life (549 persons); 4.1% that they are only needed in their personal life (25 persons); 2% only in professional life (12 persons) and 2.8% that they are not needed at all (17 persons).

7. Discussion

The aim of the study was to answer the hypotheses. H1 was: There are differences in the key life values within different generations of Poles. It can be concluded from the data that amongst all the generations, the most important value was the family. It is worth noting that in the Baby Boomers generation the family as a value was almost equal to religion/faith and for iGen the family is equal in value to friends. Hypothesis 1 has not been confirmed.

However, the space for further deliberations opens up the question, which in the study was only checking, i.e. what is the key value realized in participants life seen by others. This question aimed to establish whether the values chosen by the participants were also realized in their lives. The answers from the participants indicated that they are not. In the first question, 61.4% of the participants declared that family was the most important value in their life, but only 41.6% put this into practice. In actual fact, family was not the most important value in their lives. Of the participants, 12% answered health as being the most important value in their life however, according to those closest to them only 3.7% practiced this in their lives.

One unexpected result was work being chosen as the main life value. In the first question, it was only chosen by 3.7% of the participants however, as many as 16.5% say that in the eyes of other people they realize this particular life value as the main one. There were similar responses with the value of science/education. In the first question, only 1.9% of the participants said that science/education were a key value in their lives, however as many as 8% of those closest to them indicated that this value would be important to them. The results can be seen in Table 3. In order to discuss the significance of these variations, more extensive data is required, opening a space for further research, as it touches on an important topic such as axiological or ethical cohesion of individuals.

Table 3.
Differences in the responses and realization of the main value of Poles.

Value	1st question	2nd question	Differences
Family	61.4%	41.6%	↓ by 19.8%.
Work	3.7%	16.5%	↑ by 12.8%.
Health	12%	3.7%	↓ by 8.3%.
Education	1.9%	8%	↑ by 6.1%.

The second hypothesis of the study, "Ethics are seen as a set of orders and prohibitions to be obeyed" has also not been confirmed. Nearly three quarters of the respondents said that they considered it to be a value that enables coherent life. It should be pointed out that more than three quarters of the participants have a higher education, which is not representative of the Polish population (PARP, 2013). This area also requires further research and analysis. Nevertheless, in the question on ethics, over 90% of the participants said that ethics is needed

in both their personal and professional life. This should be considered as a good indicator of ethical awareness in Polish society, even if the surveyed group is not representative of the entire population.

8. Summary

This study has shown that the Silent Generation, Baby Boomers, X, Millennials and even the iGen have more in common with each other than has been acknowledged by society. One value that was consistently chosen among the generations was the family. This finding should be taken into account in any further research on the differences among generations in relation to work values. There may be many reasons why people choose their work and the values related to these choices. However, as demonstrated in this study, personal values often influence work values. As it has been demonstrated, work values influence motivation and personal values which can also influence the choice of work values, the degree to which they are achieved and other factors related to life choices. Work values should therefore not be analyzed in isolation from personal values of both individuals and generations. In relation to personal values, the differences between generations may not be so significant and behind these differences there may be a value that is common to all.

References

1. Barrett, R. (2005). *The Values-Driven Organization: Cultural Health and Employee Well-Being as a Pathway to Sustainable Performance*. London-New York: Routledge.
2. Beck, D., and Cowan, Ch. (1996). *Spiral Dynamics: Mastering Values, Leadership, and Change*. Hoboken: Wiley-Blackwell.
3. European Values Study (1981-2017). https://europeanvaluesstudy.eu/methodology-data-documentation/previous-surveys-1981-2008/, 18.07.2020.
4. Furnham, A. (1991). Work and Leisure Satisfaction. In: F. Strack, M. Argyle, N. Schwarz (Eds.), *Subjective well-being. An interdisciplinary perspective* (pp. 235-259). Oxford-Toronto: Pergamon Press.
5. GUS. *Ludność według płci i pojedynczych roczników*. Available online: http://swaid.stat.gov.pl/Demografia_dashboards/Raporty_predefiniowane/RAP_DBD_DEM_2.aspx, 10.06.2020.

6. Jurkiewicz, C.L., and Brown, R.G. (1998). GenXers vs boomers vs Matures: Generational comparisons of public employee motivation. *Review of Public Personnel Administration*, *Vol. 18*, pp. 18-37.
7. PARP (2013). *Aktywność zawodowa i wykształcenie Polaków*. Available online: https://www.parp.gov.pl/files/74/81/713/20012.pdf, 20.07.2020.
8. Smith, J.W., and Clurman, A. (1998). *Rocking the ages, the Yankelovich report on generational marketing*. New York, NY: Harper Collins.
9. Strauss, W., and Howe, N. (1991). *Generations: The history of America's future, 1584 to 2009*. New York, NY: Quill William Morrow.
10. Time Magazine (1951). People: The Younger Generation. Retrieved from: http://content.time.com/time/subscriber/article/0,33009,856950-1,00.html, 10.07.2020.
11. Veenhoven, R. (1991). Questions on happiness: Classical topics, modern answers, blind spots. In: F. Strack, M. Argyle, N. Schwarz (Eds.), *Subjective well-being. An interdisciplinary perspective* (pp. 7-26). Oxford-Toronto: Pergamon Press.
12. Woodman, D. (2017). *From Boomers to Xennials: we love talking about our generations, but must recognise their limit*. Retrieved from: https://theconversation.com/from-boomers-to-xennials-we-love-talking-about-our-generations-but-must-recognise-their-limits-80679, 10.07.2020.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE IMPACT OF THE DIRECTION OF PRODUCTION OF THE EUROPEAN UNION AGRICULTURAL ENTERPRISES AT THE LEVEL OF TOTAL FARMING OVERHEADS

Sebastian KUBALA

Department of Organizations Development, Cracow University of Economics; kubalas@uek.krakow.pl,
ORCID: 0000-0003-4021-9173

Purpose: The main aim of the study is to analyse the relationship between the production direction of the European Union agricultural enterprises and the different types of total farming overheads incurred by these agricultural enterprises. Additionally, the achieved results are to present how the direction of production of the European Union agricultural enterprises influences on the incurred total farming overheads relating to the functioning of the agricultural enterprises.
Design/methodology/approach: The one-way analysis of variance ANOVA was used to realise the aim of the study. To present the production directions the data relating to the eight agricultural types listed in the FADN base were used. The conducted studies have been focused on the four types of total farming overheads relating to the performed production activities. The study covers all European Union member countries from the period from 2005 to 2017.
Findings: The most frequent differences in bearing the different types of total farming overheads are evident between the type of horticulture, wine and permanent crops and the types of agricultural enterprises focused on livestock production. The several differences may be observed in case of the agricultural enterprises oriented on the same food sources
Originality/value: There are significant differences in the level of the incurred total farming overheads between the agricultural enterprises oriented on crop production and livestock production. The much higher costs may be observed in the agricultural enterprises oriented on crop production, in particular in case of horticulture, wine and permanent crops.

Keywords: agriculture, FADN, costs, analysis of variance.

Category of the paper: Research paper.

1. Introduction

The incurred costs are one of the essential factors determining the competitive advantage of agricultural enterprises. They constitute an element contributing to the financial profit in the future. As presented by W.F. Samuelson and S.G. Marks (2006) the accurate knowledge of

costs is a condition to define the actual level of profitability of an organization. Thus, the costs may be considered as a measure of development of the future competitive potential of agricultural enterprises.

The measure frequently used to assess the achieved effects is the difference between the production value and total costs (Józwiak, 2014). According to the criterion of place of costs generation, it is possible to select direct and indirect costs from the total amount of costs, which are divided into farming overheads and total production costs. As E. Kołoszycz and M. Świtłyk (2004) remarked, the agricultural enterprises aim at the best adjustment of the costs level to the prices they acquire from selling their products. However, there are significant differences between the cost level in the individual types of agricultural enterprises. As A. Skarżyńska (2011) emphasizes it is, among others, due to the effectiveness of the farmers' activities. Additionally, A. Skarżyńska adds that running an agricultural enterprise is a very complicated process and achieving good results depends on knowledge, entrepreneurship and innovation of undertaken activities.

There is a necessity to determine the level of agricultural enterprises costs and to analyse their diversity. The appropriateness of conducting this kind of studies is connected with performing the analysis of empirical data from the point of view of meso- or macroeconomics. It is possible to carry out the studies, among others, due to implementation of Polish FADN (The Farm Accountancy Data Network) in 2004 (Goraj et al., 2004). This system allows to select a representative sample based on farming type criterion, which indicates the focus on production of agricultural enterprises (Goraj, Osuch and Sierański, 2006). The studies based on this agricultural enterprises sample enable to draw conclusions relating to the whole population of agricultural enterprises.

The issue of analysing the costs connected with functioning of agricultural enterprises is frequently taken into consideration. It was addressed, among others, by J. Sharples (1990), who emphasised that when analysing competitiveness, it is necessary to add marketing costs to the production costs, E.M. Tegtmeier and M.D. Duffy (2004) who referred to the analysis of the external costs of the agricultural production in the USA, V. Bašek and J. Kraus (2011) who analysed the total costs of agricultural production, D. Czakowski and A. Czyżewski (2017) who analysed costs as one of the determinants of the effectiveness of agricultural enterprises functioning on the major markets of agricultural products, and K. Firlej (2017) proving in his studies that the costs level is one of the most important conditions limiting the use of organization resources.

However, these studies do not contain the analysis of the existing correlation between the type of production of the agricultural enterprises in the European Union and the level of total farming overheads. Addressing the total farming overheads in the research derives from their relative importance in the costs incurred by the agricultural enterprises. The studies performed by M. Chmielowska and M. Madra (2008) emphasise that total farming overheads represent 20% of total production costs. Due to the fact that the studies based on the use of tools for the

analysis of variance have also not been carried out, the main aim of this study is to analyse the relationship between the direction of production of the agricultural enterprises in the European Union and the individual types of total farming overheads incurred by these enterprises. Additionally, the achieved results are to present how the direction of production of the European Union agricultural enterprises affects the total farming overheads incurred on the functioning of the agricultural enterprises. The implementation of the aims is based on the analysis of variance.

2. Research methodology

The study covers all European Union member countries. The analysed period was limited to the years 2005-2017 due to restrictions for access to statistical data. To present the directions of production the data related to eight agricultural types listed in the FADN (The Farm Accountancy Data Network) database were used. The following types of agricultural enterprises were identified: fieldcrops (1), horticulture (2), wine (3), permanent crops (4), milk (5), other grazing livestock (6), granivores (7), mixed (8).

The conducted studies are focused on the four types of total farming overheads connected with production activities that are part of the FADN system variable of SE336 symbol. They include: machinery and building current costs (A), energy (B), contracts work (C), other costs (D).

One-factor analysis of variance ANOVA was used to achieve the research aim. In accordance with the definition, ANOVA shall be understood as a method that determines the differences between means in several populations (Aczel and Sounderpandian, 2018). Therefore, it is used to analyse measurable observations, that depend on one or several factors, and at the same time it explains if they may be a reason of differences between group means. ANOVA tests the hypothesis of equal means, i.e.:

$H_0: m_1 = m_2 = \ ... = \ m_k$

$H_1: m_i \neq \ m_j \ for \ definite \ i \ \neq$ j

The test statistics gives answer to the question how much proportion of the total variability results from a factor and random nature of phenomenon. The distribution of statistics is F with $k-1$ and $n-k$ degrees of freedom, where k means the number of degrees of an analysed factor, and n the size of the sample. To verify the hypothesis of equal means the table of variance analyses should be completed (table 1).

Table 1.
Variance analysis table (single classification)

Source of variation	Degrees of freedom	Sum of squares	Mean square	Test statistics
between groups (objects)	k - 1	$SSA = \sum_{i=1}^{k} (\bar{X}_i - \bar{X})^2 n_i$	$MSA = \frac{SSA}{k-1}$	$F = \frac{MSA}{MSE}$
within groups (error)	n - k	$SSE = \sum_{i=1}^{k} \sum_{j=1}^{n_i} (X_{ij} - \bar{X}_i)^2$	$MSE = \frac{SSE}{n-k}$	
total	n - 1	$SSA = SSA + SSE$	$MST = \frac{SST}{n-1}$	

Adapted from: own study based on: Górecki, T. (2011). *Podstawy statystyki z przykładami w R*. Legionowo: Wydawnictwo BTC, p. 255.

The important aspect of performing research with the use of ANOVA method is taking into account a number of assumptions (Rabiej, 2012):

1. independency of random variables in the analysed populations (groups),
2. measurability of analysed variables,
3. normal distribution of variables in every population (group),
4. uniformity of variables in all populations (groups).

The assumption of normal distribution of variables in every population (group) was carried out with the use of Anderson-Darling test that includes two opposite statistical hypotheses (Anderson and Darling, 1952):

H_0: the distribution of data is consistent with normal distribution,

H_1: the distribution of data is not consistent with normal distribution.

In order to determine if there are premises to reject the null hypothesis, the p value is used. If the p value is lower than the accepted level of test significance 0,05, there are no grounds to reject the null hypothesis of normal distribution of the analysed characteristic.

The study of uniformity of variables in all populations (groups) was conducted with the use of Bartlett test. The test focuses on a comparison of weighted arithmetic mean of variance with the weighted geometric mean of variance (Stanisz, 2007). It is based on statistics with the asymptotic distribution chi-square.

If any of the conditions are not fulfilled, it is appropriate to use nonparametric Kruskal-Wallis test. The way the test is interpreted is similar to the one-factor parametric ANOVA, with the exception that the test shows the equality of average ranks, not average values.

3. The study results

The following hypotheses were formulated to determine the dependencies between the direction of production of the European Union agricultural enterprises and the types of costs incurred by these agricultural enterprises:

- $H_{0(i)}$: the distribution of value of the reached value of i- total economic cost by the agricultural enterprises of the European Union is the same in every direction of production of these enterprises (the direction of production of the European Union agricultural enterprises does not significantly influence on the achieved value of i- total economic cost of these enterprises),
- $H_{1(i)}$: at least two directions of production of the European Union agricultural enterprises differ in terms of the value of i- total economic cost of these agricultural enterprises from the others (the direction of production of the EU agricultural enterprises significantly affects the reached value of i- total economic cost of these enterprises).

When reviewing dependent variables (table 2), it should be concluded that in the case of machinery and building current costs the lowest mean was observed for the agricultural enterprises oriented on granivores, then milk and other grazing livestock. The wine had highest level of costs and the similar level was also recorded in horticulture.

The lowest average energy costs were observed in the same types of agricultural enterprises as in the case of running costs of machinery and construction. On the other hand, the highest average was noticed in agricultural enterprises focused on horticulture, then on permanent crops and wine (the average costs of this type of agricultural enterprises amounted to 9316.62 Euro, 6182.00 Euro and 6048.15 Euro).

In the dependent variable: the lowest level of contracts work costs and the remaining costs is observed in four types of agricultural enterprises: granivores (in both cases the lowest level), milk, other grazing livestock and mixed. On the other hand, the highest costs of contracts work were noticed in wine, however, the highest in the category remaining costs is in the agricultural enterprises oriented on horticulture.

Table 2.
Basic data of dependent variables in individual groups

	Dependent variable: machinery and building current costs							
Types of agricultural enterprises	1	2	3	4	5	6	7	8
Average	16881.77	36847.85	37242.38	22552.08	10555.54	12091.54	6181.85	17581.77
Kurtosis	-1.62	-1.76	-1.39	-0.58	-1.32	0.32	-1.69	-1.73
Skewness	-0.33	-0.07	0.03	-0.87	-0.36	1.17	0.19	-0.03

Cont. table 2.

	Dependent variable: energy costs							
Types of agricultural enterprises	1	2	3	4	5	6	7	8
Average	3995.85	9316.62	6084.15	6182.00	2748.00	3485.54	1320.15	3658.23
Kurtosis	-1.52	-1.35	-1.37	-0.99	-1.61	-1.70	-1.40	-1.40
Skewness	0.61	0.37	0.49	-0.39	-0.08	0.26	0.58	0.59
	Dependent variable: contracts work costs							
Types of agricultural enterprises	1	2	3	4	5	6	7	8
Average	5255.92	12293.38	16367.77	5796.15	3265.85	3014.15	1891.62	2685.00
Kurtosis	-1.55	-1.84	-1.40	-1.17	-1.29	-1.32	-1.75	-1.74
Skewness	-0.09	-0.08	0.60	-0.20	-0.48	-0.42	-0.19	-0.20
	Dependent variable: other costs							
Types of agricultural enterprises	1	2	3	4	5	6	7	8
Average	3565.77	5948.77	3723.77	5020.69	2004.00	2325.15	836.77	2909.38
Kurtosis	-1.56	-1.73	-1.12	-0.96	-1.42	-0.43	-0.14	-0.90
Skewness	-0.31	-0.07	0.42	-0.69	-0.44	0.86	0.97	0.67

Source: own study.

The conducted study of the average levels of particular types of total farming overheads allows initially assume the rejection of the null hypothesis in most cases. Additionally, on the basis of kurtosis and obliquity it may be stated that in some cases of costs there may be problems with normality of distribution. In order to confirm the initial assumptions, box graphs were created (fig. 1).

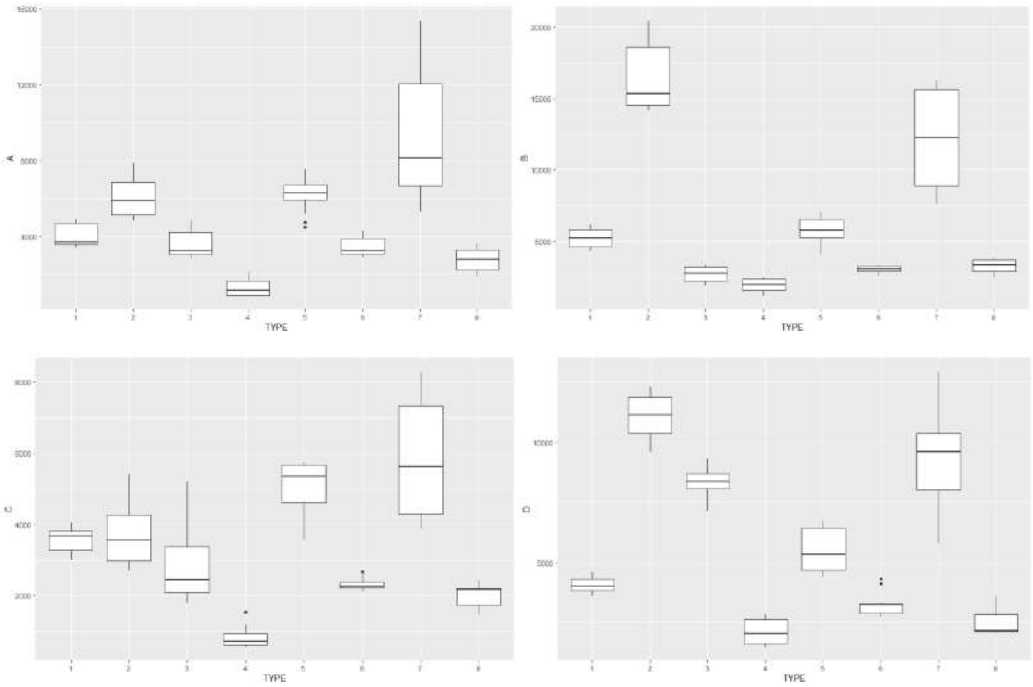


Figure 1. Box-and-whisker plot illustrating the relationship between the direction of production of the European Union agricultural enterprises and individual dependent variables. Source: own study.

The Anderson-Darling test was performed to check the normality of distribution of dependent variable. In each group of total farming overheads of the European Union agricultural enterprises there is a p-value smaller than 5% (table 3). Therefore, it should be assumed that the normal distribution does not exist in any groups.

Table 3.
Results of the Anderson-Darling test for individual dependent variables

	Dependent variable: machinery and building current costs		**Dependent variable: energy costs**	
Types of agricultural enterprises	Test statistics A	p-value	Test statistics A	p-value
1	1.106	0.004	0.302	0.525
2	0.399	0.313	0.680	0.058
3	0.546	0.128	0.877	0.017
4	0.314	0.505	0.211	0.820
5	0.337	0.446	0.452	0.229
6	0.634	0.076	0.423	0.272
7	0.782	0.031	0.612	0.087
8	0.823	0.024	0.565	0.116
	Dependent variable: contracts work costs		**Dependent variable: other costs**	
Types of agricultural enterprises	Test statistics A	p-value	Test statistics A	p-value
1	0.523	0.148	0.387	0.335
2	0.626	0.080	0.172	0.909
3	0.352	0.409	0.366	0.379
4	0.587	0.102	0.785	0.030
5	0.698	0.052	1.054	0.006
6	0.673	0.060	0.948	0.011
7	0.638	0.075	0.403	0.304
8	0.607	0.090	0.146	0.955

Source: own study.

In order to verify uniformity of variance the Bartlett test was carried out. The obtained figures are presented in table 4. The obtained p-value values are at the level of less than accepted level of materiality (0.05). Therefore, it should be concluded that there is no uniformity of variance in any groups of total farming overheads incurred by the European Union agricultural enterprises.

Table 4.
Bartlett test results for individual dependent variables

Dependent variable: machinery and building current costs		**Dependent variable: energy costs**	
K-squared	p-value	K-squared	p-value
91.783	< 2.2e-16	120.53	< 2.2e-16
Dependent variable: contracts work costs		**Dependent variable: other costs**	
K-squared	p-value	K-squared	p-value
82.519	= 4.217e-15	63.91	= 2.489e-11

Source: own study.

The conducted Anderson-Darling and Bartlett tests indicate that in the case of each dependent variable the ANOVA tests assumptions are not met. As a result it is necessary to use non-parametric Kruskall-Wallis test in further studies to analyse relationship between the direction of production of the European Union agricultural enterprises and individual dependent variables. Table 5 presents the results of ANOVA test Kruskall-Wallis ranks for individual dependent variables.

The obtained values allow to observe that at the level of materiality 0,05 the individual null hypotheses should be rejected as they indicate that the distribution of value of incurred total farming overheads by the agricultural enterprises in every production direction is the same for alternative hypothesis, which emphasises that at least two production directions differ in terms of incurred total farming overheads and remaining costs.

The obtained results permit the conclusion that the production directions of the European Union agricultural enterprises cause significant differences in the values of incurred total farming overheads, thus the running costs of machinery and construction, energy, contracts work and the remaining costs.

Table 5.
Results of the Kruskal-Wallis rank ANOVA test for individual dependent variables

Dependent variable: machinery and building current costs		**Dependent variable: energy costs**	
Chi-squared	p-value	Chi-squared	p-value
89.433	< 2.2e-16	94.469	< 2.2e-16
Dependent variable: contracts work costs		**Dependent variable: other costs**	
Chi-squared	p-value	Chi-squared	p-value
85.458	1.056e-15	95.666	< 2.2e-16

Source: own study.

In order to determine the reasons of significant differentiation of the production direction of the European Union agricultural enterprises and the values of individual variables the multiple comparison test was used (table 6).

Table 6.
Dunn test results with Bonferroni correction

	Dependent variable: machinery and building current costs						
Types of agricultural enterprises	1	2	3	4	5	6	7
2	0,006*[1]	-	-	-	-	-	-
3	0,247	1,000	-	-	-	-	-
4	0,182	1,000	1,000	-	-	-	-
5	0,361	0,000*	0,000*	0,000*	-	-	-
6	1,000	0,000*	0,011*	0,007*	1,000	-	-
7	0,003*	0,000*	0,000*	0,000*	1,000	0,085	-
8	1,000	0,000*	0,021*	0,014*	1,000	1,000	0,049

Cont. table 6.

	Dependent variable: energy costs						
Types of agricultural enterprises	1	2	3	4	5	6	7
2	0,525	-	-	-	-	-	-
3	0,094	1,000	-	-	-	-	-
4	1,000	1,000	0,289	-	-	-	-
5	0,595	0,001*	0,000*	0,214	-	-	-
6	0,126	0,000*	0,000*	0,037	1,000	-	-
7	0,000*	0,000*	0,000*	0,000*	0,163	0,738	-
8	0,019*	0,000*	0,000*	0,005*	1,000	1,000	1,000
	Dependent variable: contracts work costs						
Types of agricultural enterprises	1	2	3	4	5	6	7
2	0,226	-	-	-	-	-	-
3	1,000	0,462	-	-	-	-	-
4	0,550	1,000	1,000	-	-	-	-
5	0,027	0,000*	0,010*	0,000*	-	-	-
6	0,465	0,000*	0,228	0,000*	1,000	-	-
7	0,000*	0,000*	0,000*	0,000*	1,000	0,156	-
8	1,000	0,002*	1,000	0,006*	1,000	1,000	1,000
	Dependent variable: other costs						
Types of agricultural enterprises	1	2	3	4	5	6	7
2	0,018*	-	-	-	-	-	-
3	0,000*	1,000	-	-	-	-	-
4	1,000	0,663	0,038	-	-	-	-
5	0,373	0,000*	0,000*	0,008*	-	-	-
6	1,000	0,000*	0,000*	0,270	1,000	-	-
7	0,060	0,000*	0,000*	0,001*	1,000	1,000	-
8	0,108	1,000	1,000	1,000	0,000*	0,002*	0,000*

*1 – statistically significant differences.

Source: own study.

The results of Dunn's test with Bonferroni's adjustments reveal that significant differences in all types of total farming overheads are visible in the case of horticultural type agricultural enterprises with the enterprises with the production direction: milk, other grazing livestock and granivores, vineyard type with enterprises oriented on milk and granivores and permanent crops type with granivores. In the case of running costs of machinery and construction, energy and contracts work costs significant differences are observed in agricultural enterprises specialising in fieldcrops and granivores type, as well as mixed crops with horticulture and permanent crops type.

In summarising the significant differences of individual types of total farming overheads, it should be concluded that they are not observed in every type of agricultural production. This occurs in the case of agricultural enterprises directed at fieldcrops with a type permanent crops, milk, other grazing livestock, directed at horticulture with a type wine and permanent crops, directed at wine with a type permanent crops and mixed enterprises, other grazing livestock type with the enterprises oriented on permanent crops and milk type as well as granivores type with a type of milk and other grazing livestock.

4. The final conclusions

The conducted studies revealed that the most frequent differences in incurring individual types of total farming overheads are observed between the type of horticulture, wine and permanent crops and permanent crops with a type of agricultural enterprises directed at livestock production. Several differences can be observed in the case of agricultural enterprises directed at the same source of food.

In such a way the diversification of these two types of production is demonstrated, which results from different specifications of production. The main objective of crop production is to obtain high, good quality and full-value crop yields. Their subsequent purpose may be directed at food products for people, feed for animals or resources for industry. It can therefore be considered that crop production affects the development of livestock production. At the same time, it results in significant diversification of the level of incurred costs. Greatly increased costs may be observed in agricultural enterprises directed at crop production, in particular in the case of horticulture, wine and permanent crops.

In the cost structure of agricultural enterprises directed at crop production as well as livestock production the highest level of costs is observed in the case of machinery and building current costs and contracts work costs. On the other hand, in mixed production the highest costs, apart from running costs of machinery and construction, include energy costs.

At the same time it should be emphasised that the studies on the addressed topic need to be further developed. Indicating the main determinants of the existing diversification, and conducting similar studies on the other costs relating to production process in agricultural enterprises, would be particularly recommended. This would allow to present a comprehensive comparative study of different types of costs incurred by individual types of agricultural enterprises.

Acknowledgements

The article is financed within the subsidy granted to the Cracow University of Economics. Program Potencjał No. 13/EER/202/POT.

References

1. Aczel, A.D., Sounderpandian, J. (2018). *Statystyka w zarządzaniu*. Warszawa: PWN.
2. Anderson, T.W., Datling, D.A. (1952). Asymptotic theory of certain "goodness-of-fit" criteria based on stochastic processes. *Annals of Mathematical Statistics, 23,* pp. 193-212.
3. Bašek, V., Kraus, J. (2011). Comparison of selected indicators of farms in the EU member states. *Agric. Econ. – Czech*, *57*, pp. 71-84.
4. Chmielewska, M., Mądra, M. (2008). Wskaźniki kosztowe w indywidualnych gospodarstwach rolniczych. *Zeszyty Naukowe SGGW – Ekonomika i Organizacja Gospodarki Żywnościowej, 64*, pp. 201-213.
5. Czakowski, D., Czyżewski, A. (2017). *Podstawowe rynki rolne w Polsce przed i po akcesji do Unii Europejskiej. Poziom i uwarunkowania rozwoju*. Bydgoszcz: Wydawnictwo Kujawsko-Pomorskiej Szkoły Wyższej.
6. FADN. Available online https://ec.europa.eu/agriculture/rica/database/database_en.cfm, 31.08.2020.
7. Firlej, K. (2017). *Przemysł spożywczy w Polsce. Nowa ścieżka rozwoju*. Warszawa: PWN.
8. Goraj, L., Mańko, S., Sass, R., Wyszkowska, Z. (2004). *Rachunkowość rolnicza*. Warszawa: Difin.
9. Goraj, L., Osuch, D., Sierański, W. (2006). *Opis realizacji próby gospodarstw rolnych dla Polskiego FADN w 2005 r.* Warszawa: IERiGŻ-PIB.
10. Górecki, T. (2011). *Podstawy statystyki z przykładami w R*. Legionowo: Wydawnictwo BTC.
11. Józwiak, W. (2014). *Efektywność, koszty produkcji i konkurencyjność polskich gospodarstw rolnych obecnie i w perspektywie średnio- oraz długoterminowej*. Warszawa: IERiGŻ-PIB.
12. Kołoszycz, E., Świtłyk, M. (2004). *Koszty, dochodowość i efektywność produkcji mleka*. Warszawa: Związek prywatnych producentów mleka.
13. Rabiej, M. (2012). *Statystyka z programem Statistica*. Gliwice: Helion.
14. Samuelson, W.F., Marks, S.G. (2006). *Ekonomia menedżerska*. Warszawa: PWE.
15. Sharples, J. (1990). Cost of production and productivity in analyzing trade and competitiveness. *American Journal of Agricultural Economics, 72(5),* pp. 1278-1282.
16. Skarzyńska, A. (2011). Koszty ekonomiczne produkcji mleka – metodyczne ujęcie rachunku oraz wyniki badań w 2009 roku. *Zagadnienia Ekonomiki Rolnej, 3*, pp. 143-161.
17. Stanisz, A. (2007). *Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 2 – Modele liniowe i nieliniowe*. Kraków: StatSoft Polska Sp. z o.o.
18. Tegtmeier, E.M., Duffy, M.D. (2004). External Costs of Agricultural Production in the United States. *International Journal of Agricultural Sustainability, 2(1),* pp. 1-20.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

APPLICATION OF ECONOMIC POINT ANALYSIS WITH CREDIBILITY AND ENTRY LINES

Magdalena LESIAK

University of Lodz, Faculty of Economics and Sociology, Department of Market and Capital Investments;
magdalena.lesiak@edu.uni.lodz.pl, ORCID: 0000-0003-1320-4961

Purpose: The aim of the research is to present the practical application of economic and financial analysis when assessing the creditworthiness of a food industry company.
Design/methodology/approach: The research sample included data for four years. Based on the review of the literature, full reporting – balance sheet and profit and loss account (comparative variant), an interpretation and evaluation of the areas of activity of the analyzed entity were made through the ratio analysis.
Findings: The results of the ratio analysis showed that the company pursued a moderate net capital management strategy in the analyzed period. The company opted for a conservative strategy in terms of liabilities and aggressive in terms of assets due to high operating costs. Therefore, it can be concluded that the surveyed company focused primarily on ensuring financial security.
Research limitations/implications: The economic and financial analysis itself has a certain limitation, i.e. a relatively large number of indicators, which complicates and lengthens the assessment process. Therefore, in practice, in order to obtain the best results, the most important measures should be selected in a thoughtful and conscious manner. Thus, further research in the area of financial efficiency of enterprises is recommended.
Practical implications: Scoring takes into account the qualitative and quantitative characteristics of the enterprise. The quantitative method, which is the subject of the research in this study, uses an economic and financial analysis containing a synthetic assessment of the financial efficiency of an enterprise, which allows for the identification of phenomena indicating both the strengths and weaknesses of an economic unit. It covers the areas of liquidity, profitability, debt and operational efficiency (turnover), which indicates the practical application of the analyzes presented in the article.
Originality/value: The result of the analysis is a comprehensive assessment of the financial situation, as well as the use of its practical application to assess the credibility and creditworthiness of the audited company.

Keywords: economic and financial analysis, standing, credibility and creditworthiness.

1. Introduction

The company's creditworthiness is assessed on the basis of an analysis of the economic and financial situation in the period preceding the credit transaction, as well as in the current period through the use of: historical and current financial data and the terms of the requested credit transaction. The company's credit risk assessment using the scoring method is a component of the triad that includes:

- creditworthiness understood as the readiness to meet the obligations towards the bank resulting from the agreement, regardless of economic or financial conditions,
- creditworthiness, i.e. the ability to timely repay the contracted liability with interest,
- security quality.

The literature on the subject assumes that the economic and financial analysis is an extension of the initial analysis of the balance sheet, profit and loss account and cash flow statement. Moreover, the main purpose of the ratio analysis is to establish the relationship between various items of the balance sheet and the profit and loss account, and to compare them with the levels generally accepted as desirable or borderline. It is also worth confronting the obtained results with the results achieved in a given industry, because such action will allow to find out what position the examined enterprise has in its competitive environment (Szyszko, Szczepański, 2003). Therefore, it can be concluded that this analysis allows for in-depth and detailing of the research results obtained through the preliminary analysis of financial statements.

Therefore, there is no doubt that in company management, the areas of financial liquidity, profitability, debt and operational efficiency are a fundamental link that determines the modeling of relations with the broadly understood external environment and the implementation of the company's goal, which may be, for example, maintaining financial stability.

The aim of the research in this article is to show the wide application of economic and financial analysis, taking into account the areas of liquidity, debt, profitability and operational efficiency (turnover), which, thanks to the use of full reporting, i.e. balance sheet and profit and loss account (comparative variant), is a rich source of information about the company.

Such a cross-sectional application spectrum of economic and scientific analyzes has its place in banking, because a comprehensive study of the company is particularly important in the process of credibility assessment, and thus experience business decisions in terms of development. The article includes the results of the research as well as comprehensive interpretations confirming the data for the final analysis.

2. Research methodology and results

Financial liquidity is one of the micro and macro drivers of the company's value (Michalski, 2001), therefore it belongs to the key economic categories that determine the shaping of the company's financial standing understood as showing the company's competitive position in the market, its economic strength and credibility, determining its reputation and shaping the level of trust of contractors (Bień, 1991). It is necessary to point out the necessity to keep the advantage of inflows over the company's financial expenses and to strive to increase the market value of equity (Burzykowska, Duraj 2009).

Table 1.
Current ratio (CR), quick liquidity (QR) and cash solvency (MR)

Year	CR	QR	MR
1	1,23	0,21	0,03
2	1,22	0,23	0,11
3	1,23	0,19	0,03
4	1,96	1,01	0,02

Source: own study based on financial documents of the surveyed enterprise.

The current liquidity ratio (CR) shows the number of times current assets cover current liabilities. The level of this indicator depends on the type of activity. Its high value usually indicates irregularities in the structure and value of current assets. On the other hand, the low value of the indicator is a signal that the company's payment capacity is at risk (Pomykalska, Pomykalski, 2007).

In the examined enterprise, the obtained results are within the normal range (1.2-2.0) (Bragg, 2010). The industry average in 2 covered by the survey was 0.97 (PONT Info. ECONOMY based on GUS data). In the years 1-3, the level of the ratio fluctuates at the lower end of the range, which proves that the company pursues an aggressive policy regarding assets. However, year 4 shows an increase in the indicator, which is close to the upper limit of the range. The value of current assets is almost twice as high as current liabilities. The quick liquidity ratio (QR) shows the degree of coverage of current liabilities with highly liquid assets (Jerzemowska, 2006). The industry average in 2 years was 0.43 (PONT Info. ECONOMY based on GUS data). In the above case, it has extreme values, because in the years 1-3 it is below 1.0. This result may indicate some payment difficulties. When comparing the CR and QR indicators, it should be noted that in years 1-4 the level of inventory accumulation is high. This condition is responsible for generating significant inventory and storage costs. They are certainly the main determinant of problems with timely payments. It should be noted that both current liabilities and current assets tend to increase. As a result, in year 4 the situation changed dramatically, namely this indicator assumed a satisfactory, almost perfect value. On this basis, it can be concluded that the company is able to cover its current liabilities thanks to liquid financial assets.

The monetary ratio (MR) protects the company in a way, in the event of liabilities with a short maturity that cannot be covered by other sources. A sufficient level of the most liquid assets, i.e. cash in hand or in a bank account, not only enables the repayment of the aforementioned liabilities, but also concluding efficiently and quickly transactions and taking advantage of emerging opportunities on the market (http://finansopedia.forsal.pl/…). In the analyzed enterprise, the level of cash is very low throughout the entire period under examination. In 2, the level of cash made it possible to cover only 11% of this type of liabilities, and in 4 of the audited year – only 2%.

Table 2.
Constant capital of the enterprise, Net working capital in terms of capital and property

Year	Constant capital	KON in terms of capital	KON in terms of assets
1	2 595 614,19	1 459 329,39	171 700,58
2	1 956 509,41	392 208,30	230 444,00
3	1 715 083,30	-361 905,43	280 822,89
4	1 599 784,78	-337 394,26	1 261 442,97

Source: own study based on financial documents of the surveyed enterprise.

Working capital acts as a safety buffer in the enterprise. Its task is to reduce the risk of losing financial liquidity, the determinant of which is the reduction of the liquidity of current assets, in particular inventories and receivables or the related loss (difficulties with selling) (Kowalik, 2015).

The net working capital in terms of capital in the 1st and 2nd audited periods is positive. This means that fixed assets are financed with fixed capital, i.e. equity and long-term liabilities. Part of the fixed capital also finances current assets. On the other hand, in the third and fourth years, the net working capital in terms of capital is negative, therefore the constant capital is not sufficient to finance all fixed assets. The company has to use the current liabilities to finance part of its fixed assets. This situation is typical for trade and service enterprises, i.e. such as the analyzed entity. The period of collecting receivables is shorter than that of paying liabilities. Free cash is available, which can be used to finance fixed assets, e.g. investments, construction of halls or warehouses. In this case, the silver balance sheet rule (Fixed capital/Fixed assets ≥ 1) is not respected.

Working capital in terms of assets in the years 1-4 is positive, so the current assets financed outweigh the current liabilities. The surplus of current assets may also finance fixed assets or be allocated to other investments.

The debt analysis shows the significant importance of external capital in financing the enterprise. Determining the degree of the share of foreign capital in financing assets allows to verify whether the capital structure is correct, and thus whether the enterprise does not predispose it to be considered a financially unstable entity (Gabrusewicz, 2014).

Table 3.
Overall Debt Ratio (GDR), Debt Equity (D / E), Inverse of Debt to Equity and Long Term Debt Ratio - Debt Ratio (LDR)

Year	GDR	D/E	The inverse D/E	LDR
1	0,43	0,80	1,26	0,12
2	0,46	0,99	1,01	0,19
3	0,45	0,93	1,08	0,24
4	0,4	0,73	1,36	0,20

Source: own study based on financial documents of the surveyed enterprise.

In the literature on the subject, it is considered that the value of the overall debt ratio (GDR) should be in the range (0.5; 07). In the case of the examined entity, a given indicator fluctuates in the lower limit of the range. On this basis, it can be assumed that there is a relatively low financial dependence. The indicator remains at the same level in the analyzed period, i.e. the enterprise is financially independent. At the same time, it abandoned the use of the financial leverage effect, which is a consequence of adopting a conservative liability policy (low share of short-term financing).

Equity debt ratio (D/E) determines the degree of debt involvement in relation to equity. The level of 0.5 is considered the norm for this indicator. A large share of liabilities in financing the enterprise is associated with serious debt servicing costs, but at the same time allows the use of the financial leverage effect. On the other hand, limiting liabilities and a high share of equity eliminate such a chance. In the literature on the subject it is assumed that the most advantageous situation, which guarantees security and financial independence, is the share of 2/3 of equity in the fixed capital, although the aspect in which the enterprise operates (Sierpińska, 1997) should be taken into account. In the analyzed case, in the entire four-year period, a significant share of costly and inflexible equity in financing the enterprise is visible. The reciprocal of the debt to equity ratio (the inverse of D/E) tells you how much equity goes to one monetary unit of long-term liabilities (Patterson, 2002). In the above case, in 1 year one monetary unit of liabilities generates a demand for PLN 1.26 of equity. Between years 2 and 3 there was a decrease in demand, but already in 4 it has the highest value in the analyzed period, i.e. PLN 1.36.

The most favorable range of this indicator is 0.5-1.0. The value of 1.0 means that long-term liabilities are equal to equity, while the ratio exceeding 1 indicates an increased risk of insolvency (https://eanaliza.pl/...). In 1 year, in the examined enterprise, equity was financed by long-term liabilities (LDR) in 12%, in subsequent years in 19%, 24% and 20% respectively. It should be noted that the company significantly limited the use of long-term external capital, which is an expensive source of financing.

The analysis of the company's operational efficiency shows the way of using material resources and intellectual capital. It allows you to determine whether the company has an appropriate amount of assets in relation to the scale of its activity. This analysis examines economic activity, management and resource rotation (Klemke-Pitek, Zarzycki, 2000).

Table 4.
Total assets turnover (TATA), inventory turnover (IT) and short-term receivables turnover (RT)

Year	TATA	IT	RT
1	-	-	-
2	5,27	15,20	101,30
3	5,70	17,19	119,71
4	3,96	13,76	21,48

Source: own study based on financial documents of the surveyed enterprise.

The higher the value of the total assets turnover ratio, the shorter the recovery time for the funds invested in assets (Gołębiowski, Tłaczała, 2009). The surveyed enterprise obtains average results in this area. Moreover, in the last period under study, they deteriorated due to the extension of the cycle, which is determined by excessive stockpiling, lower efficiency of their processing into finished products or problems with their sale, which in turn results in charging the company with additional costs.

The inventory turnover ratio determines how many times during the year the inventory level was restored. It is used to research and determine the optimal stock level. Too low level of the discussed indicator means excessive stockpiling, which is associated with high maintenance costs and freezing of funds in cowshed assets in the form of stocks (Jaworski, Zarzycki, 2009). The average results of enterprises in the food industry in which the analyzed enterprise operates in 4 ranged around 38 days. Decile 5 was 30 and decile 9 was 97. 90% of enterprises had inventory levels sufficient for less than 97 days, and 50% performed worse than the industry average (PONT Info. ECONOMY based on GUS data). This also applies to the examined company, which was burdened with excessive costs of maintaining stockpiling.

The short-term receivables turnover ratio informs how many times during the year the enterprise renewed the state of short-term receivables (Biznes tom 4, finances, 2007). In some publications you can find information that this ratio should not exceed by 50% the term contained in the terms of sale. The average value in the industry in 2 years was 11 days, and the duration of the receivables turnover cycle of 90% of enterprises was shorter than 32 days. In the analyzed case, there were extremely high values, especially between the second and third year covered by the study. This situation proves that the company had a very strict policy of crediting customers. It preferred cash transactions and prompt payment for its services. Such an attitude provides guarantees of receiving payment (limited risk of overdue and bad debts), but at the same time means that the company exposes itself to the loss of some recipients. In 4, there was a sharp change and approximation to the average value in the industry.

The assessment of the company's profitability performs various functions in management that are oriented towards the implementation of many different goals of its stakeholders who first allocate certain capital to set up an enterprise, and then strive to multiply its value throughout the entire period of operation of a given economic unit (Sajnóg, 2011).

Table 5.
Return on Assets (ROA), Return on Equity (ROE) and Return on Sales (ROS)

Year	ROA	ROE	ROS
1	-	-	4,03%
2	23,85%	48,33%	4,52%
3	23,86%	50,45%	4,18%
4	22,44%	43,33%	5,67%

Source: own study based on financial documents of the surveyed enterprise.

The return on assets ratio (ROA) informs about the profitability of all assets of the enterprise in relation to the generated profit (Kątnik, 2011). Several dozen percent that the enterprise obtains is satisfactory. The profit per PLN 1 invested in assets, which amounted to PLN 0.24 in 2 and 3 years, decreased slightly in 4 years, by PLN 0.2. However, such a minimal change does not adversely affect the assessment, because the results in this area obtained by competing companies are much worse. Only 10% of enterprises operating in this industry achieve a result higher than 17% (PONT Info. Economy based on GUS data). The effectiveness of own funds involved (ROE) in the examined enterprise is quite high. It oscillates around the average values in the industry. However, the worst result was achieved by the audited entity last year, which may be a bit worrying, especially in the context of the average achieved in the industry, which is 56% (PONT Info. Economy based on GUS data). The profit from each PLN involved in equity was 0.48 PLN in 1 year, 0.50 PLN in 3, while in 4 it decreased to 0.43 PLN.

The sales profitability ratio (ROS) determines how many zlotys of profit generates one zloty of revenues. The company's sales profitability level oscillates around only a few percent (Majewska, 2009). The main reason is the high operating costs characteristic of this type of activity. In the analyzed case, the profit per PLN 1 obtained from revenues in the entire analyzed period is higher than the industry average, which is approximately 3%. Only 10% of enterprises achieve ROS higher than 5.8% (PONT Info. Economy based on GUS data). Therefore, the above results should be considered positive.

3. Conclusions from carried out economic and financial analysis

To sum up, the results of the ratio analysis, it should be stated that the company pursues a moderate net capital management strategy. It decided to be conservative in terms of liabilities and aggressive in terms of assets. The relationship ROE > ROA > ROS is maintained. However, the ROS parameters are disproportionately low in relation to the other two profitability ratios. The main reason for the situation is high operating costs. The company in the area of financial liquidity achieved satisfactory results, although the current liquidity ratio fluctuates within the analyzed period within the acceptable norm, or even on the verge of the risk of insolvency, because it decided to pursue an aggressive policy concerning assets, which was eased in year 4. Apart from the significant operating costs, the audited entity is also characterized by a high level of freezing inventories. This state has contributed to the incurring of excessive costs

and proves some problems with the sales market. This translates into a low ROS value. Nevertheless, these values tend to decline. In recent years, the company was very protective in terms of engaging foreign capital, not using the financial leverage effect and involving largely inflexible and expensive equity capital. Therefore, the earlier thesis about the adopted policy of net capital management is confirmed. The company focused on ensuring financial security. The costs of lost opportunities became a consequence of these actions. However, in 3, this situation changed. The company's financial dependence has decreased. Additionally, it limited long-term loans, which are an expensive source of financing. This was possible due to the simultaneous shift in counterparty lending, which evolved from an extremely strict, conservative policy, especially in 1-2 years, to an increasingly aggressive one (see Table 6). This procedure has a dual dimension, because in order to increase both the group of recipients and the company's profit, the company exposes itself to the risk of overdue and bad debts.

Table 6.
Position indicator credit

Year	Position indicator credit
1	0,11
2	0,08
3	0,13
4	0,90

Source: own study based on financial documents of the surveyed enterprise.

This indicator confronts the efficiency of settlements with customers and suppliers. Moreover, it is the relation of receivables from customers to liabilities to customers. The result above 1 means that the enterprise credits its contractors to a greater extent than it uses credits (http://www.epodatnik.pl/…). The surveyed enterprise is characterized by the opposite relationship. It uses loans to a greater extent, although this trend is slowing down as in 4 the indicator hovers around 1. This may mean a change in the company's lending policy aimed at acquiring new customers by easing it.

4. Assessment of credibility and creditworthiness of the analyzed enterprise

The above information has been enriched with supplementary data to the balance sheet, i.e. data that represent the level of: receivables from the owner (in the audited enterprise they amounted to PLN 1,150,465.06 in the last period subject to the audit), receivables and overdue liabilities, which are not present in this case. The company's credibility assessment included a scoring as well as an assessment of the historical and current proceedings. The performed assessment of the creditworthiness of the examined enterprise (see Table 7), in accordance with financial practice, takes into account the scoring assessment, credit history and other elements of creditworthiness (Kitowski, 2011).

Table 7.
Business creditworthiness assessment

Scoring evaluation	System recommendation	Positive
	Risk class	B
Credit history assessment	Entrepreneur's credit report	Positive
	Owner credit report	Positive
Other elements of credibility	Inspection	Good
	Relationship risk	Positive
	The risk of enforcement activities	Positive
	Risk of external fraud	Positive

Source: own study based on financial documents of the surveyed enterprise.

The final phase of the credit report is the assessment of creditworthiness, collateral and the bank's commitment both before and after the transaction. The creditworthiness assessment contains the disposable income elements necessary to calculate the investment loan limit and the maximum loan amount relating to the creditworthiness assessment algorithm and the maximum loan amount. These components are the basis for making a credit decision (Juszczyk, 2008).

5. Summary

The company obtained a positive assessment of its credibility and creditworthiness. The methodology used to assess the company's creditworthiness differs depending on the organizational and legal form and the form of accounting used. The performance of a credit transaction is conditional on the economic entity having credibility and creditworthiness in terms of both qualitative and quantitative terms (Ermel, Oral, Reisman, Yolalan, 2003). The main factor that affects the assessment of creditworthiness is the completeness and compliance with the current factual and legal status of information and documents collected by the bank on the economic and financial situation of the enterprise. The company credibility assessment includes scoring, historical and current proceedings (Gaspodarowicz, 2000). The use of ratio analysis, which is holistic in nature, allows to determine whether the examined economic entity is capable of continuing operations in the future and with what result. It is also an important tool that is used both for system monitoring and internal control in the company. All factors that affect creditworthiness are thoroughly analyzed, and then assessed and scored according to the bank's guidelines (Schab, 2005). However, one should also take into account the imperfections present in this process, namely the incorrectly adopted rules for conducting creditworthiness assessment by a bank. On the other hand, from the opposite perspective, i.e. the entity subject to assessment, it is possible to indicate the risk of manipulating by the enterprise to its advantage the financial documents constituting the basis for the research and, consequently, significantly affecting the final assessment of creditworthiness. The economic and financial analysis itself also has a certain limitation, i.e. a relatively large number of

indicators, which complicates and extends the evaluation process. Therefore, in practice, in order to obtain the best results, the most important measures should be selected in a thoughtful and conscious manner. Nevertheless, due to the fact that this analysis has a wide range of applications and covers various areas of the company's operations, i.e. liquidity, debt, profitability, operational efficiency (turnover), it gives the opportunity to conduct objective research evaluating the results achieved by the company in a given time horizon.

References

1. Bień, W. (1991). *Zarządzanie finansami przedsiębiorstw*.Warszawa: Difin.
2. Biznes, tom 4 (2007). *Finanse*. Seria: Biblioteka Gazety Wyborczej. PWN.
3. Bragg, S.M. (2010). *Wskaźniki w analizie działalności przedsiębiorstwa*. Warszawa: Wolters Kluwer.
4. Burzykowska, M., Duraj, J. (2009). *Controllingowy wymiar oceny płynności finansowej przedsiębiorstwa.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
5. Emel, A.B., Oral, M., Reisman, A., Yolalan, R. (2003). A credit scoring approach for the commercial banking sector. *Socio-Economic Planning Sciences, 37*.
6. Gabrusewicz, W. (2014). *Analiza finansowa przedsiębiorstwa. Teoria i zastosowanie*. PWE.
7. Gołębiowski, G., Tłaczała, A. (2009). *Analiza finansowa w teorii i w praktyce.* Warszawa: Difin.
8. Gospodarowicz, M. (2000). Procedury analizy i oceny banków. *Materiały i Studia, nr 103*, Warszawa: NBP.
9. Hitt, M.A., Harrison, J.S., Ireland, R.D. (2001). *Mergers & Acquisitions: A Guide to Creating Value for Stakeholders*. New York: Oxford.
10. http://finansopedia.forsal.pl/encyklopedia/finanse/hasla/912250,wskaznik-wyplacalnosci-gotowkowej.html.
11. http://www.epodatnik.pl/artykul/poradnik_malej_firmy/7523/Zarzadzanie_naleznosciami_w_firmie.html.
12. https://eanaliza.pl/wsk-zadluzenia-dlugoterminowego.php.
13. Jaworski, J. (2009). Mierniki rotacji i ich zastosowanie w pomiarze cyklu operacyjnego przedsiębiorstwa. In: Zarzecki D. (ed.), Zarządzanie finansami. Wycena przedsiębiorstw i zarządzanie wartością. *Zeszyty Naukowe Uniwersytetu Szczecińskiego, nr 534.* Szczecin: WNUS.
14. Jerzemowska, M. (2006). *Analiza ekonomiczna w przedsiębiorstwie.* Warszawa: PWE.

15. Juszczyk, S. (2008). Zdolność kredytowa w ocenie banku na przykładzie małych i średnich przedsiębiorstw. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego. Ekonomika i Organizacja Gospodarki Żywnościowej*. Warszawa.
16. Kątnik, J. (2011). Analiza i ocena wskaźników pomiaru rentowności przedsiębiorstwa jako instrument jego rozwoju. *Zeszyty Naukowe, nr 863*. Kraków: Uniwersytet Ekonomiczny.
17. Kitowski, J. (2011). Próba oceny wiarygodności diagnostycznej bankowych metod badania kondycji finansowej przedsiębiorstw. In: Wrzosek S. (ed.), Finanse – nowe wyzwania teorii i praktyki. Finanse przedsiębiorstw. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, nr 172*. Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego.
18. Klemke-Pitek, M. (2010). Zewnętrzne bazy porównań w ocenie wskaźników finansowych – wybrane zagadnienia. Zarzycki D. (ed.). *Zeszyty Naukowe Uniwersytetu Szczecińskiego*. *Finanse, Rynki Finansowe, Ubezpieczenia, nr 35*. Szczecin.
19. Kowalik, M. (2015). Kapitał obrotowy w analizie ekonomicznej przedsiębiorstwa. *Finanse, Rynki Finansowe, Ubezpieczenia. Zeszyty Naukowe Uniwersytetu Szczecińskiego*. Szczecin.
20. Majewska, M., Pacuła, W. (2016). Wskaźniki rentowności i ich analiza na przykładzie sektora bankowego. In: Śnieżek E., Czechowski F., Doroba S. (eds.), *Ewolucja rachunkowości w teorii i praktyce gospodarczej*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
21. Michalski, M. (2001). *Zarządzanie przez wartość. Firma perspektywy interesów właścicielskich.* Warszawa: WIG-Press.
22. Patterson, R. (2002). *Kompendium terminów z zakresu rachunkowości i finansów po polsku i po angielsku.* Warszawa: Fundacja Rozwoju Rachunkowości w Polsce.
23. Pomykalska, B., Pomykalski, P. (2007). *Analiza finansowa przedsiębiorstwa.* Warszawa: PWN.
24. PONT Info. Gospodarka na podstawie danych GUS, http://www.pkobp.pl/media_files/4809fd34-736b-4356-b68e-d4430c88101b.pdf.
25. Sajnóg, A. (2015). *Rola zysku całkowitego w ocenie rentowności przedsiębiorstwa.* Lublin: Oeconomia.
26. Schab, I. (2005). Ocena ryzyka kredytowego w ramach wewnętrznych systemów ratingowych – charakterystyka pojęcia oraz podstawowych wymogów. *Bezpieczny Bank, nr 1(26).*
27. Sierpińska, M. (1997). *Zarządzanie płynnością finansową*. Kraków: PWN.
28. Szyszko, L., Szczepański, J. (2003). *Finanse przedsiębiorstwa.* Warszawa: PWE.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

REMUNERATIONS OF MANAGEMENT BOARDS OF LISTED COMPANIES IN THE FOOD SECTOR IN 2016-2019

Sławomir LISEK

University of Agriculture in Krakow, Department of Statistics and Social Policy;
slawomir.lisek@urk.edu.pl, ORCID: 0000-0001-6520-7203

Purpose: The purpose of the article is to examine whether the remunerations of management boards of listed companies in the food sector are related to the performance of companies, i.e. whether they perform a motivational function.
Design/methodology/approach: Analysis of secondary data from reports of listed companies. Statistical methods, correlation analysis, selection of diagnostic variables using the Bartosiewicz method and construction of econometric models.
Findings: Remunerations of management boards are strongly correlated with both the size of companies and their performance. They thus perform a motivational function.
Research limitations/implications: As not all companies report remunerations in an identical manner, there is no possibility to analyse in more detail e.g. remuneration of the leader and other management board members, or to break down remunerations of the management board into base salary and bonuses.
Practical implications: Advice to shareholders and supervisory boards regarding the amounts of management board remunerations.
Originality/value: The originality of the research consists in analysing the remunerations of management boards of listed companies in the food sector in terms of their relation to the results of operations and the size of their companies. Solutions for shareholders and supervisory boards were also proposed.

Keywords: stock exchange, food companies, director's remunerations.

Category of the paper: research paper.

1. Introduction

Goals of company operations are currently defined in different ways. However, regardless of the view of individual researchers on company goals, practically always at least one of the goals is the performance of the company measured by the financial result (Sudoł, 1999). Goals can only be achieved through proper management. One of the functions of management is motivation. Motivation is mainly considered in terms of the influence of management board on

the executive level. However, also management boards should be motivated, so as to make them focus on acting in the interest of the managed company.

Motivation as an important factor of human resources management has been analysed in research literature on management. According to Bagozzi et al., in the process of motivation, the goals of an organisation should be compared to the desires of the motivated. Motivation should be a model that allows to satisfy the desires when the goals are achieved (Bagozzi et al., 2003). Horwitz et al. provide a comprehensive model of motivation. One of the factors is remuneration (Horwitz et al., 2003). Sobocka-Szczapa, Banasiak and Kamińska (Sobocka-Szczapa, Banasiak, Kamińska, 2019) believe that motivation is considered to be a key activity determining the organisation's level of performance and competitiveness. According to them, both financial and non-financial motivational tools can be used. The financial ones mainly include remunerations and their derivatives. According to Armstrong and Taylor (Armstrong, Taylor, 2016) people are motivated when they expect that their actions lead to achievement of a goal and receipt of an appropriate reward. Motivated persons participate in non-mandatory activities. Their motivating factors include higher salaries and bonuses. Oleksyn lists motivation as one of the key functions of management. According to him, motivation is often perceived as manipulation (Oleksyn, 2017). He quotes President Eisenhower: *motivation is the art of getting people to do what you want them to do because they want to do it*. According to him, remuneration is one of the methods of motivation, although it also performs other functions.

Remuneration is one of the most strategically important objects of management (Witczak, 2017). Armstrong and Cummins devoted part of their study to the rules of management remuneration (Armstrong, Cummins, 2015). They suggest that the management board's remuneration should be open, be in line with corporate governance, reflect both the market value and the overall contribution of the board’s work, but also perform a motivational function.

The purpose of the article is to examine whether the remunerations of management boards of WSE-listed companies in food sector seated in Poland are related to the performance of companies, i.e. whether they perform a motivational function. The selected sector results from the author's interest in food economy.

2. Material and methods

The research was based on secondary data from the annual reports of the analysed companies. The selected explanatory variables included data concerning the company size: sales revenues, employment, total assets, as well as data concerning the results of the companies' operations: financial result and ROE. ROE was calculated as the quotient of net profit and equity (Gabrusewicz, 2019). Total annual management board remuneration was selected as a response variable.

The relationship between the response variable and the explanatory variables was examined using Pearson's correlation coefficients between the response variable and respective explanatory variables (Woźniak, 2002). In order to examine whether the explanatory variables are mutually interdependent or not, the linear correlation coefficients between the explanatory variables were used.

An econometric model was then created to illustrate the relationship between the response variable and the explanatory variables. A linear model with the number of explanatory variables resulting from the method of variable selection was applied (Kukuła et al., 2009). For the purposes of selection of diagnostic variables, the Bartosiewicz method was applied with a terminal correlation of significant relationships $r^* = 0.5$, combined with a substantive selection of variables (Nowak, 1990).

3. Results

Tables 1, and 2 below present the research material from the reports of the analysed companies.

Table 1.
Data of the analysed companies year 2016 part 1

2016	Ambra	Atlanta	Gobarto	Żywiec	Helio	Krynica V	MP	Pamapol
Revenues in millions of PLN	241,5	262,59	1144	2357,69	137,5	166,68	112,39	248,95
Assets in millions of PLN	285,02	135,01	512,4	1799,58	85,83	117,54	120,26	205,38
Nett profit in millions of PLN	14,04	4,53	7,02	300,46	4,06	3,68	4,97	2,14
Equity in millions of PLN	211,82	66,54	248,69	201,85	54,38	47,72	69,22	121,37
Employees	413	325	760	1075	226	214	121	541
Remunerations of directors in thousand of PLN	3355	860	2126	10706	1826	1198	662	1517
ROE	0,0663	0,0681	0,0282	1,4885	0,0747	0,0771	0,0718	0,0176
Number of directors	3	3	4	7	2	2	1	3

Source: own study based on data from www.gpw.pl, 06.07.2020.

Table 2.
Data of the analysed companies year 2016 part 2

2016	Pepes	Seko	Tarczyński	Wawel	Otmuchów	Kruszwica	Kania
Revenues in millions of PLN	143,77	152,23	657,68	645,9	154,69	2411,38	1287,54
Assets in millions of PLN	210,96	119,91	475,2	672,81	199,56	997,77	802,77
Nett profit in millions of PLN	15,92	5,58	11,17	85,09	-34,71	65,34	46,18
Equity in millions of PLN	126,69	59,52	137,79	550,31	94,66	653	266
Employees	271	495	1255	908	502	893	849
Remunerations of directors in thousand of PLN	1136	608	2157	7489	520	5839	1130
ROE	0,12567	0,0938	0,0811	0,1546	-0,3667	0,1001	0,1736
Number of directors	2	3	4	2	3	7	4

Source: own study based on data from www.gpw.pl, 06.07.2020.

The analysed companies differ in size, which is expressed by three parameters, i.e. sales revenues, employment and balance sheet total. In terms of balance sheet total, the largest company is Grupa Żywiec S.A. with a balance sheet total of PLN 1,799.58 million; the largest number of employees is at Tarczyński S.A. (1,255 FTEs); and Zakłady Tłuszczowe Kruszwica S.A. lead in terms of sales revenues with revenues amounting to PLN 2,411.38 million. The lowest balance sheet total is reported by Helio S.A. (PLN 85.83 million); the lowest number of employees is at Makarony Polskie S.A. (121 FTEs); the latter also generates the lowest revenues amounting to PLN 112.39 million. The average size of the balance sheet total is PLN 449.33 million, median is PLN 210.96 million, standard deviation is PLN 468.05 million, coefficient of variation is 1.04. The average employment is 589.87 FTEs, median is 502 FTEs, standard deviation is 346.69 FTEs, coefficient of variation is 0.59. The average sales revenues amount to PLN 674.97 million, median is PLN 248.95 million, standard deviation is PLN 787.05 million, coefficient of variation is 1.17. In the case of balance sheet total and sales revenues, these measures inform about a very high diversity of those companies both in terms of the size of assets and the generated sales; they are relatively the least diverse in terms of employment, although such diversity is also significant. In the context of sales revenues and balance sheet total, it should be noted that the median is significantly lower than the mean, which is particularly noticeable for sales revenues. This means that for more than a half of the analysed companies both the balance sheet total and revenues are significantly below the mean, and a relatively high value of the mean is due to the sensitivity of the mean to extreme values. In the case of employment, the mean is close to the median.

It is worth verifying whether the three company size measures were collinear in 2016. To this end, Pearson's correlation coefficient was applied (Woźniak, 2002). The correlation coefficients between employment, total assets and sales have been presented in Table 3.

Table 3.
Linear correlation coefficient between revenues, assets and employee in 2016 year

	Assets	**Revenues**	**Employees**
Assets	1	0,92	0,74
Revenues	X	1	0,70
Employees	X	x	1

Source: own study based on tables 1 and 2.

The data from Table 3 show that the company size measures are strongly correlated with each other, it is thus sufficient to use one company size measure.

In a situation where companies are highly diverse in terms of size, logic would dictate that the number of management board members should be larger for larger companies, which should be reflected in the correlation coefficient. In 2016, the correlation coefficient between the number of management board members and the size of assets was 0.84, which means that in general the relationship between the number of board members and the size of the company was maintained.

Pearson's correlation coefficient was also used to verify the relationship between management board's remuneration and the size or results of the company.

Table 4.
Correlation coefficient between management board's remuneration and the size or results of the companies in 2016 year

Assets	0,864
ROE	0,770
Revenues	0,731
Nett profit	0,894
Employees	0,599

Source: own study based on tables 1 and 2.

The data from Table 4 show that the remunerations of management boards of listed companies in the food sector are strongly correlated both with the data relating to the size of the company and with the data reflecting the performance of the company. The strongest correlation is between total annual remuneration of the management board and financial result; secondly, total assets; and thirdly, ROE, which is a relative value, thus it does not result from the size of the company.

Correlation coefficients between the explanatory variables have been presented below.

Table 5.
Correlation coefficients between the explanatory variables in 2016 year

	Assets	**ROE**	**Revenues**	**Nett profit**	**Employees**
Assets	1	0,814	0,920	0,915	0,738
ROE	X	1	0,624	0,960	0,405
Revenues	X	X	1	0,737	0,702
Nett profit	X	X	X	1	0,528
Employees	x	x	x	x	1

Source: own study based on tables 1 and 2.

After applying the Bartosiewicz variable selection method, it should be noted that all variables form a single graph. ROE and employment each have 3 correlations with others, while total assets, financial result and sales revenues each have 4 correlations. When applying the classic Bartosiewicz method, one should choose the variable with the most correlations with others and the highest correlation coefficient with the response variable, i.e. financial result. The econometric (stochastic) model describing the relationship between the management board's remuneration and the financial result is as follows:

$$y = 1535{,}62 + 33{,}79X_{wf} + \varepsilon, \quad (1)$$

where:

y – remunerations of directors in thousand of PLN,

X_{wf} – Nett profit in millions of PLN,

ε – random.

For this model, R^2 is 0.8, the average constant term error is 394.40, the average coefficient error at X_{wf} is 4.69, which means that at a significance level of 0.05 ($t_{0,05;13}$ = 2.16) both parameters are significant.

On the basis of this model it can be concluded that on average, each additional PLN 1 million of net profit generates PLN 33.79 thousand of additional remuneration for the management board per year.

Tables 6, and 7 below present the research material from the reports of the analysed companies.

Table 6.
Data of the analysed companies year 2017 part 1

2017	Ambra	Atlanta	Gobarto	Żywiec	Helio	Krynica V	MP	Pamapol
Revenues in millions of PLN	252,37	199,47	1319,66	2245,74	178,56	206,83	124,19	259,9
Assets in millions of PLN	278,8	136,15	647,47	1778,28	90,69	127,93	122,88	206,55
Nett profit in millions of PLN	21,18	0,65	15,23	261,49	10,92	5,91	5,25	2,22
Equity in millions of PLN	219,89	65,17	264,19	165,47	65,73	50,03	72,16	123,59
Employees	404	303	792	1073	225	223	139	522
Remunerations of directors in thousand of PLN	3280	601	3693	11635	2595	716	628	1341
ROE	0,0963	0,0100	0,0576	1,5803	0,1661	0,1181	0,0728	0,0180
Number of directors	3	3	4	7	2	2	1	3

Source: own study based on data from www.gpw.pl, 06.07.2020.

Table 7.
Data of the analysed companies year 2017 part 2

2017	Pepes	Seko	Tarczyński	Wawel	Otmuchów	Kruszwica	Kania
Revenues in millions of PLN	162,45	184,67	739	618,46	161,85	2561,89	1415,08
Assets in millions of PLN	236,9	120,51	518,83	732,32	185,07	957,35	1068,81
Nett profit in millions of PLN	12,32	9,01	27,57	113,32	1,38	40,67	53,75
Equity in millions of PLN	139,11	66,47	154,38	630,7	98,62	639,3	319,75
Employees	286	471	1168	966	445	862	822
Remunerations of directors in thousand of PLN	1530	624	2378	7583	834	5341	1200
ROE	0,0886	0,1356	0,1786	0,1797	0,0140	0,0636	0,1681
Number of directors	2	3	3	2	3	7	4

Source: own study based on data from www.gpw.pl, 06.07.2020.

As it has been the case in 2016, in terms of balance sheet total, the largest company is Grupa Żywiec S.A. with a balance sheet total of PLN 1,778.28 million; the largest number of employees is at Tarczyński S.A. (1,255 FTEs); and Zakłady Tłuszczowe Kruszwica S.A. lead in terms of sales revenues with revenues amounting to PLN 2,561.89 million. Therefore, the leading companies are the same as in 2016. The lowest balance sheet total is reported by Helio S.A. (PLN 90.69 million); the lowest number of employees is at Makarony Polskie S.A. (139 FTEs); the latter also generates the lowest revenues amounting to PLN 124.19 million. The average size of the balance sheet total is PLN 480.57 million, median is PLN 236.90 million, standard deviation is PLN 482.93 million, coefficient of variation is 1.00.

The average employment is 580.07 FTEs, median is 471 FTEs, standard deviation is 337.68 FTEs, coefficient of variation is 0.58. The average sales revenues amount to PLN 708.67 million, median is PLN 252.37 million, standard deviation is PLN 805.95 million, coefficient of variation is 1.14. As it has been the case in 2016, for the balance sheet total and sales revenues, these measures inform about a very high diversity of those companies both in terms of the size of assets and the generated sales; they are relatively the least diverse in terms of employment, although such diversity is also significant. Again, similarly to 2016, in the context of sales revenues and balance sheet total, the median is significantly lower than the mean, which is particularly noticeable for sales revenues.

The correlation coefficients between employment, total assets and sales in 2017 have been presented in Table 8.

Table 8.
Linear correlation coefficient between revenues, assets and employee in 2017 year

	Assets	**Revenues**	**Employees**
Assets	1	0,89	0,78
Revenues	X	1	0,72
Employees	x	x	1

Source: own study based on tables 6 and 7.

The data from Table 8 show that, as it has been the case in 2016, the company size measures for 2017 are strongly correlated with each other, with little differences compared to 2016, it is thus sufficient to use one company size measure.

In 2017, the correlation coefficient between the number of management board members and the size of assets was 0.80, which means that in general the relationship between the number of board members and the size of the company was maintained.

Pearson's correlation coefficient between management board remuneration and explanatory variables in 2017 was:

Table 9.
Correlation coefficient between management board's remuneration and the size or results of the companies in 2017 year

Assets	0,822
ROE	0,791
Revenues	0,684
Nett profit	0,916
Employees	0,658

Source: own study based on tables 6 and 7.

The data from Table 9 show that, similarly to 2016, the remunerations of management boards of listed companies in the food sector are strongly correlated both with the data relating to the size of the company and with the data reflecting the performance of the company. The strongest correlation (stronger than in 2016) is between total annual remuneration of the management board and financial result; secondly, total assets; and thirdly, ROE.

Correlation coefficients between the explanatory variables have been presented below.

Table 10.
Correlation coefficients between the explanatory variables in 2017 year

	Assets	ROE	Revenues	Nett profit	Employees
Assets	1	0,930	0,888	0,873	0,785
ROE	X	1	0,530	0,930	0,452
Revenues	X	X	1	0,624	0,716
Nett profit	X	X	X	1	0,658
Employees	x	x	x	X	1

Source: own study based on tables 6 and 7.

As it has been the case in 2016, all variables form a single graph. ROE and employment each have 3 correlations with others, while total assets, financial result and sales revenues each have 4 correlations. The highest coefficient of correlation with the response variable applies to the financial result. The econometric (stochastic) model describing the relationship between the management board's remuneration and the financial result is as follows:

$$y = 1304{,}87 + 42{,}02X_{wf} + \varepsilon, \quad (2)$$

where:

y – remunerations of directors in thousand of PLN,

X_{wf} – Nett profit in millions of PLN,

ε – random.

For this model, R^2 is 0.84, the average constant term error is 391.34, the average coefficient error at X_{wf} is 5.12, which means that at a significance level of 0.05 ($t_{0,05;13}$ = 2.16) both parameters are significant.

On the basis of this model it can be concluded that on average, each additional PLN 1 million of net profit generates PLN 42.02 thousand of additional remuneration for the management board per year.

Tables 11, and 12 below present the research material from the reports of the analysed companies.

Table 11.
Data of the analysed companies year 2018 part 1

2018	Ambra	Atlanta	Gobarto	Żywiec	Helio	Krynica V	MP	Pamapol
Revenues in millions of PLN	271,26	232,72	1254,87	3339,53	177,27	269,94	134,46	228,52
Assets in millions of PLN	298,42	141,07	627,41	1790,06	97,18	146,45	132,64	195,51
Nett profit in millions of PLN	24,11	7,75	8,32	312,7	11,07	5,38	5,07	0,6
Equity in millions of PLN	228,88	72,92	271,5	314,31	76,8	51,97	74,43	124,18
Employees	415	275	778	1094	239	295	139	508
Remunerations of directors in thousand of PLN	271,26	232,72	1254,87	3339,53	177,27	269,94	134,46	228,52
ROE	0,1053	0,1063	0,0306	0,9949	0,1441	0,1035	0,0681	0,0048
Number of directors	3	3	5	7	2	2	1	5,5

Source: own study based on data from www.gpw.pl, 06.07.2020.

Table 12.
Data of the analysed companies year 2018 part 2

2018	Pepes	Seko	Tarczyński	Wawel	Otmuchów	Kruszwica	Kania
Revenues in millions of PLN	175,79	183,76	766,25	559,16	143,7	2683,78	1142,34
Assets in millions of PLN	257,78	139,71	619	773,68	179,5	1051,11	1196,46
Nett profit in millions of PLN	17,44	8,89	28,46	77,03	-13,35	97,81	64,4
Equity in millions of PLN	156,7	72,36	190,95	670,24	110,31	706,53	360,08
Employees	284	489	1015	1062	449	835	946
Remunerations of directors in thousand of PLN	1378	624	2257	7304	954	5127	1213
ROE	0,1113	0,1229	0,1490	0,1149	-0,1210	0,1384	0,1788
Number of directors	2	3	3	2	2	7	4

Source: own study based on data from www.gpw.pl, 06.07.2020.

As it has been the case in 2016 and 2017, in terms of balance sheet total, the largest company is Grupa Żywiec S.A. with a balance sheet total of PLN 1,790.06 million; it also employs the largest number of staff (1,094 FTEs) and leads in terms of sales revenues amounting to PLN 3,339.53 million, becoming the largest company in every aspect. The lowest balance sheet total is reported by Helio S.A. (PLN 97.18 million); the lowest number of employees is at Makarony Polskie S.A. (139 FTEs); the latter also generates the lowest revenues amounting to PLN 134.46 million, thus the smallest entities remained unchanged compared to 2017. The average size of the balance sheet total is PLN 509.73 million, median is PLN 257.78 million, standard deviation is PLN 502.32 million, coefficient of variation is 0.99. The average employment is 588.2 FTEs, median is 489 FTEs, standard deviation is 333.10 FTEs, coefficient of variation is 0.57. The average sales revenues amount to PLN 770.89 million, median is PLN 269.94 million, standard deviation is PLN 985.91 million, coefficient of variation is 1.28. As it has been the case in 2016 and 2017, for the balance sheet total and sales revenues, these measures inform about a very high diversity of those companies both in terms of the size of assets and the generated sales; they are relatively the least diverse in terms of employment, although such diversity is also significant. Again, similarly to 2016 and 2017, in the context of sales revenues and balance sheet total, the median is significantly lower than the mean, which is particularly noticeable for sales revenues.

The correlation coefficients between employment, total assets and sales in 2018 have been presented in Table 13.

Table 13.
Linear correlation coefficient between revenues, assets and employee in 2018 year.

	Assets	Revenues	Employees
Assets	1	0,91	0,84
Revenues	X	1	0,69
Employees	X	X	1

Source: own study based on tables 11 and 12.

The data from Table 13 show that, as it has been the case in 2016 and 2017, the company size measures for 2018 are strongly correlated with each other, with little differences compared to 2016 and 2017, it is thus sufficient to use one company size measure.

In 2018, the correlation coefficient between the number of management board members and the size of assets was 0.70, which means that in general the relationship between the number of board members and the size of the company was maintained.

Pearson's correlation coefficient between management board remuneration and explanatory variables in 2018 was:

Table 14.
Correlation coefficient between management board's remuneration and the size or results of the companies in 2018 year

Assets	0,781
ROE	0,761
Revenues	0,779
Nett profit	0,868
Employees	0,671

Source: own study based on tables 11 and 12.

The data from Table 14 show that, similarly to 2016 and 2017, the remunerations of management boards of listed companies in the food sector are strongly correlated both with the data relating to the size of the company and with the data reflecting the performance of the company; it should be noted, however, that the correlation is much weaker. The strongest correlation (although notably weaker than in 2017) is between total annual remuneration of the management board and financial result; secondly, total assets; and thirdly, ROE.

Correlation coefficients between the explanatory variables have been presented below.

Table 15.
Correlation coefficients between the explanatory variables in 2018 year

	Assets	**ROE**	**Revenues**	**Nett profit**	**Employees**
Assets	1	0,756	0,908	0,885	0,844
ROE	X	1	0,746	0,946	0,467
Revenues	X	X	1	0,868	0,687
Nett profit	X	X	X	1	0,630
Employees	X	X	X	X	1

Source: own study based on tables 11 and 12.

As it has been the case in 2016 and 2017, all variables form a single graph. ROE and employment each have 3 correlations with others, while total assets, financial result and sales revenues each have 4 correlations. As it has been the case in previous years, the highest coefficient of correlation with the response variable applies to the financial result. The econometric (stochastic) model describing the relationship between the management board's remuneration and the financial result is as follows:

$$y = 1567{,}87 + 33{,}14X_{wf} + \varepsilon, \quad (3)$$

where:

y – remunerations of directors in thousand of PLN,

X_{wf} – nett profit in millions of PLN,

ε – random.

For this model, R^2 is 0.75, the average constant term error is 470.14, the average coefficient error at X_{wf} is 5.26, which means that at a significance level of 0.05 ($t_{0,05;13}$ = 2.16) both parameters are significant.

On the basis of this model it can be concluded that on average, each additional PLN 1 million of net profit generates PLN 33.14 thousand of additional remuneration for the management board per year.

In 2019, due to the declared bankruptcy and lack of reliable data, Zakłady Mięsne Kania S.A. had to be excluded from the analysis.

Tables 16, and 17 below present the research material from the reports of the analysed companies.

Table 16.
Data of the analysed companies year 2019 part 1

2019	Ambra	Atlanta	Gobarto	Żywiec	Helio	Krynica V	MP
Revenues in millions of PLN	254,29	253,54	1483,13	3199,24	167,14	297,18	151,25
Assets in millions of PLN	283,57	158,31	668,96	2479,54	104,88	166,38	151,71
Nett profit in millions of PLN	28,09	2,92	-3,44	330,34	4,83	7,5	5,59
Equity in millions of PLN	239,83	69,74	268,05	187,6	81,63	51,38	77,37
Employees	226	269	947	1095	211	286	162
Remunerations of directors in thousand of PLN	4201	757	2965	13272	2456	900	788
ROE	0,1171	0,0419	-0,0128	1,7609	0,0592	0,1460	0,0723
Number of directors	3	3	5	7	2	2	1

Source: own study based on data from www.gpw.pl, 06.07.2020.

Table 17.
Data of the analysed companies year 2019 part 2

2019	Pamapol	Pepes	Seko	Tarczyński	Wawel	Otmuchów	Kruszwica
Revenues in millions of PLN	213,43	172,93	192,29	886,76	564,44	144,74	2683,78
Assets in millions of PLN	192,14	275,66	130,2	705,14	803,72	156,34	1051,11
Nett profit in millions of PLN	-9,2	19,18	7,01	29,66	57,86	-10,64	97,81
Equity in millions of PLN	114,98	164,44	74,99	214,43	690,6	99,64	706,53
Employees	482	281	480	1028	1118	497	835
Remunerations of directors in thousand of PLN	1410	1819	623	3854	6649	1597	5127
ROE	-0,0800	0,1166	0,0935	0,1383	0,0838	-0,1068	0,1384
Number of directors	2	3	3	2	2	7	4

Source: own study based on data from www.gpw.pl, 06.07.2020.

As it has been the case in 2016, 2017 and 2018, in terms of balance sheet total, the largest company is Grupa Żywiec S.A. with a balance sheet total of PLN 2,479.54 million; the largest number of employees is at Wawel S.A. (1,118 FTEs); Grupa Żywiec also leads in terms of sales revenues amounting to PLN 3,199.24 million, becoming the largest company based on the two out of three criteria. The lowest balance sheet total is reported by Helio S.A. (PLN 104.88 million); the lowest number of employees is at Makarony Polskie S.A. (162 FTEs); the lowest revenues are reported by Zakłady Cukiernicze Otmuchów S.A., amounting to PLN 144.74 million. The average size of the balance sheet total is PLN 523.40 million, median is PLN 233.90 million, standard deviation is PLN 640.30 million,

coefficient of variation is 1.22. The average employment is 565.5 FTEs, median is 481 FTEs, standard deviation is 360.28 FTEs, coefficient of variation is 0.64. The average sales revenues amount to PLN 761.72 million, median is PLN 253.92 million, standard deviation is PLN 1,000.80 million, coefficient of variation is 1.31. As it has been the case in 2016, 2017 and 2018, for the balance sheet total and sales revenues, these measures inform about a very high diversity of those companies both in terms of the size of assets and the generated sales; they are relatively the least diverse in terms of employment, although such diversity is also significant and higher than in previous years. Again, similarly to 2016, 2017 and 2018, in the context of sales revenues and balance sheet total, the median is significantly lower than the mean, which is particularly noticeable for sales revenues.

The correlation coefficients between employment, total assets and sales in 2019 have been presented in Table 18.

Table 18.
Linear correlation coefficient between revenues, assets and employee in 2019 year

	Assets	**Revenues**	**Employees**
Assets	1	0,91	0,74
Revenues		1	0,69
Employees			1

Source: own study based on tables 16 and 17.

The data from Table 18 show that, as it has been the case in 2016, 2017 and 2018, the company size measures for 2019 are strongly correlated with each other, with little differences compared to 2016, 2017 and 2018, it is thus sufficient to use one company size measure.

In 2019, the correlation coefficient between the number of management board members and the size of assets was 0.73, which means that in general the relationship between the number of board members and the size of the company was maintained.

Pearson's correlation coefficient between management board remuneration and explanatory variables in 2019 was:

Table 19.
Correlation coefficient between management board's remuneration and the size or results of the companies in 2019 year

Assets	0,954
ROE	0,857
Revenues	0,801
Nett profit	0,934
Employees	0,697

Source: own study based on tables 16 and 17.

The data from Table 19 show that, similarly to 2016, 2017 and 2018, the remunerations of management boards of listed companies in the food sector are strongly correlated both with the data relating to the size of the company and with the data reflecting the performance of the company; it should be noted, however, that the correlation is much weaker. The strongest

correlation is between total annual remuneration of the management board and financial result; secondly, total assets; and thirdly, ROE. The correlations are generally stronger than in 2018.

Correlation coefficients between the explanatory variables have been presented below.

Table 20.
Correlation coefficients between the explanatory variables in 2019 year

	Assets	**ROE**	**Revenues**	**Nett profit**	**Employees**
Assets	1	0,891	0,910	0,957	0,739
ROE	X	1	0,719	0,964	0,419
Revenues	X	X	1	0,830	0,693
Nett profit	X	X	X	1	0,543
Employees	X	X	X	X	1

Source: own study based on tables 16 and 17.

As it has been the case in 2016, 2017 and 2018, all variables form a single graph. ROE and employment each have 3 correlations with others, while total assets, financial result and sales revenues each have 4 correlations. Unlike in previous years, the highest correlation coefficient with the response variable applies to the balance sheet total. The econometric (stochastic) model describing the relationship between the management board's remuneration and the financial result is as follows:

$$y = 665{,}23 + 5{,}06X_{sb} + \varepsilon, \quad (4)$$

where:

y – remunerations of directors in thousand of PLN,

X_{sb} – Assets in millions of PLN,

ε – random.

For this model, R^2 is 0.91, the average constant term error is 373.71, the average coefficient error at X_{sb} is 0.46, which means that at a significance level of 0.05 ($t_{0,05;12} = 2.18$) constant term is insignificant, while the coefficient of X_{sb} is significant.

On the basis of this model it can be concluded that on average, each additional LN 1 million of net profit generates PLN 5.06 thousand of additional remuneration for the management board per year.

However, considering the fact that in previous years remunerations showed the strongest correlation with the financial result, this correlation is also very strong in 2019 (stronger than in 2018); the model was also estimated with the financial result as the explanatory variable.

$$y = 1858{,}94 + 35{,}93X_{wf} + \varepsilon, \quad (5)$$

where:

y – remunerations of directors in thousand of PLN,

X_{sb} – Assets in millions of PLN,

ε – random.

For this model, R^2 is 0.87, the average constant term error is 375.48, the average coefficient error at X_{wf} is 3.98, which means that at a significance level of 0.05 ($t_{0,05;12} = 2.18$) both parameters are significant.

On the basis of this model it can be concluded that on average, each additional PLN 1 million of net profit generates PLN 35.93 thousand of additional remuneration for the management board per year.

4. Summary

The conducted research has shown that in the case of listed companies in the food sector there is a strong correlation between the amount of management board remuneration and the results of the company's operations, as well as between the management board remuneration and the size of the company. Each additional million PLN of net profit generates on average, depending on the year, from PLN 33.14 to 42.02 thousand of additional remuneration for the management board. This proves that the level of remuneration is reasonable and performs the motivational function for board members, encouraging them to improve the performance of their operations. There is also a strong correlation between the size of the company and ROE, which means that generally larger companies benefit from economies of scale and are more economically efficient. It would be good to maintain these positive trends. We suggest increasing the differentiation of management board remuneration depending on the company's performance.

References

1. Armstrong, M, Cummins, A. (2015). *Zarządzanie wynagrodzeniami. Zestaw narzędzi.* Warszawa: ABC a Wolters Kluwer business.
2. Armstrong, M., Taylor, S. (2016). *Zarządzanie zasobami ludzkimi.* Warszawa: Wolters Kluwer.
3. Bagozzi, R., Dholakia, U., Basuroy, S. (2003). How effortful decision get *e*nacted: The motivating role of decision processes, desires, and anticipated emotions. *Journal of Behavioral Decision Making, 16,* pp. 273-295.
4. Gabrusewicz, W. (2019). *Metody analizy finansowej przedsiębiorstwa*. Warszawa: PWE.
5. Horwitz, F., Heng, C., Quazi, H. (2003). Finders keepers? Attracting, motivating and retaining knowledge workers. *Humane Resource Management Journal, Vol. 13 No. 4*, pp. 23-44.

6. Kukuła K. (ed.) (2009). *Wprowadzenie do ekonometrii*. Warszawa: PWN.
7. Nowak, E. (1990). *Metody taksonomiczne w klasyfikacji obiektów społeczno-gospodarczych*. PWE.
8. Oleksyn, T. (2017). *Zarządzanie zasobami ludzkimi w organizacji*. Warszawa: Wolters Kluwer.
9. Sobocka-Szczapa, H., Banasiak, A., Kamińska, B. (2019). *Zarządzanie zasobami ludzkimi. Model 3D: wiedza – jakość – kultura organizacyjna.* Łódź: Społeczna Akademia Nauk.
10. Sudoł, S. (1999). *Przedsiębiorstwo. Podstawy nauki o przedsiębiorstwie. Teorie i praktyka zarządzania.* Toruń: TNOiK.
11. Witczak, R. (2017). *Strategiczne zarządzanie zasobami ludzkimi. Studium systemu.* PWN.
12. Woźniak, M. (2002). *Statystyka ogólna.* Wydawnictwo Akademii Ekonomicznej w Krakowie.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

PENSIONERS' QUALITY OF LIFE IN MODERN UKRAINE: SOCIO-ECONOMIC AND VALUE-REGULATORY ASPECTS

Alla LOBANOVA[1*], Liudmyla BRATCHENKO[2], Olena KOMAROVA[3]

[1] Silesian University of Technology, Faculty of Organization and Management, Department of Applied Social Sciences, Zabrze, Poland; alla.lobanova@polsl.pl, ORCID: 0000-0003-3852-2675
[2] Kryvyi Rih State Pedagogical University, Department of Sociology and Economics, Kryvyi Rih, Ukraine; ludmilabratchenco@gmail.com, ORCID: 0000-0002-1798-5251
[3] Kryvyi Rih State Pedagogical University, Department of Sociology and Economics, Kryvyi Rih, Ukraine; komarovaalena@i.ua, ORCID: 0000-0002-1054-0268
* Correspondence author

Purpose: Is to clarify the content of the category "quality of life", identify its indicators, as well as to explain the level of quality of life of population, including Ukrainian pensioners and the state of the pension system as its basic financial basis, and also to determine social and economic, value and normative factors that form the quality of life of the elderly people.
Design/methodology/approach: The paper uses theoretical methods: analysis and synthesis, formalization, hypothetical-deductive, systematization and generalization, as well as empirical: observation, description, comparison.
Findings: The content of the category "quality of life" is specified; the Ukrainian method of determining indicators of quality of life is presented. The socio-economic condition and quality of life of Ukrainians, in particular pensioners, as well as the state of the pension system as a basic factor that forms the basis of their life opportunities are analyzed. Insufficient efficiency of the pension system in Ukraine, absence of effectiveness of private pension funds are substantiated, which limits the ability of retirees to implement such vital values as proper recreation, medical services, cultural and educational development, travel, assistance and support of children and grandchildren. Ways to improve the pension system in Ukraine, including the second (mandatory funded system) and third levels (voluntary private pension provision) are proposed.
Research limitations/implications: Perspective areas of further research are the search for ways to implement the elements of the best standards of pension systems of foreign countries, in particular Poland, in the pension system of Ukraine.
Practical implications: The results of the research can be used by state institutions to improve the pension system in Ukraine, and thus bring the lives of Ukrainian pensioners closer to European standards.
Social implications: The results of the research are of great social importance, as they identify trends in improving the lives of the most vulnerable people in Ukraine - pensioners, most of whom live below the poverty line.
Originality/value: The originality of research paper is to determine the socio-economic and value-normative factors that form the quality of life of modern Ukrainian pensioners; in particular, it has been proved that the pension system in Ukraine is imperfect, does not meet

European standards, as a result of which almost 60% of pensioners live below the poverty line, as they cannot provide the minimum material and socio-cultural needs; ways to improve pension provision in Ukraine are outlined.

Keywords: pensioners, quality of life, pension system, life values, social and economic needs.

Category of the paper: Research paper.

1. Introduction

The economy of modern Ukraine is experiencing a difficult period of crisis. This is due to a number of both internal and external factors. Internal problem areas include the following: the six-year military conflict in the east of the country (since March, 2014) with the assistance of the Russian Federation, the existence of the hidden economy and informal employment practices, the instability of the financial and banking system, labor migration of able-bodied citizens to European countries, an ineffective system of state social insurance and others. External factors include the global economic crisis and the global COVID-19 pandemic, which strict quarantine measures have significantly complicated the activities of business structures. These internal and external factors lead to the fact that incomes of taxes to the state budget from the activities of the hidden economy and informal employment practices are not fully realized. Thus the revenues to public consumption funds are reduced. At the same time, significant financial flows are aimed at overcoming the effects of the COVID -19 pandemic.

According to the first results of the hidden economy of Ukraine research, which was conducted by Ernst & Young with the support of MasterCard in the framework of the Memorandum of Cooperation with the Ministry of Economy, Trade and Agriculture of Ukraine, the National Bank of Ukraine and the State Statistics Service of Ukraine at the beginning of 2020, hidden transactions amount to 846 billion UAH (about 32 billion dollars). This is a quarter of Ukraine's official GDP (about 125 billion USD) (Doslidzhennia tinovoi ekonomiky, 17.02. 2020).

Certainly, in an underdeveloped economy, the state budget, in particular its public consumption funds, cannot fully meet the real needs of those social groups that demand state social support. Ukrainian pensioners are particularly vulnerable, and their quality of life requires to be improved significantly.

The social question at issue is the pensioners' quality of life, and also the state and nature of their social support in Ukraine need to be improved, and the pension insurance system also needs immediate improvement and/or reforming.

Thus, the aim of this article is to clarify the content of the category "quality of life", identify its indicators, as well as to explain the level of quality of life of population, including Ukrainian pensioners and the state of the pension system as its basic financial basis, and also to determine

social and economic, value and normative factors that form the quality of life of the elderly people.

2. Methods

The writing of the research paper was based on the use of such general scientific methods as analysis and synthesis, deduction and induction, abstraction and concretization, formalization and comparison, systematization and generalization. Sociological, psychological, economic and legal, as well as systemic, structural-functional, statistical, value-normative were the main approaches to solving research problems. Empirical methods used in the study were observation, description, comparison, methods of socio-economic statistics.

Analytical processing of the scientific literature made it possible to clarify scientific approaches to understanding the concept of "quality of life", and the method of systematization and generalization – to specify its content and internal interdependencies. The sociological approach revealed the social aspects of pensioners' lives, the economic one – the level of their material security, the legal – the guarantee of pension provision, the psychological – the state of satisfaction of pensioners with the level and quality of their lives.

The state, structure and problems of the pension system that functions in Ukraine have been identified with the help of systematization and structural-functional method. Value-normative method helped to find out the level of satisfaction of Ukrainian pensioners with their standard of living and moral and psychological state. The use of statistical analysis allowed to identify indicators of quality of life of pensioners and compare them with the standard of living in European countries. Empirical methods such as observation, description and comparison were used to clarify theoretical conclusions and positions and helped to find answers to the purpose and tasks of the research paper.

3. Results

Quality of life is one of the most popular issues in almost all sciences: social, economic, law and others. Meanwhile, there is still no common scientific definition of this notion. Although the intentions to understand the phenomenon it describes were inherent to social scholars of all historical epochs experienced by mankind.

Probably, this is due to the extraordinary importance of this phenomenon for people's lives, as the ultimate goal of each state is to improve the level and quality of life of the population. It is worth paying attention to the multifaceted nature of the social phenomenon it describes.

Therefore, there are different scientific approaches to understand the quality of life. According to I. Romaniuk, there are at least three scientific approaches in the process of defining this concept:

- objective approach (R. Bayer, A. Biederman, B. Gross, F. Forrester, M. Morris, D. Johnston and others), which determines the quality of life through a set of statistical indicators that are summarized to one index;
- subjective approach (subjective well-being), which studies the quality of life through the prism of the subject's consciousness, his satisfaction of life and private aspects, as well as through feelings of happiness or unhappiness (M. Bradburn, S. McCall, K. Terhune, A. Mitchel, Th. Logoletti, R. Kantor, Ph.E. Converse, W. Rodgers, A. Campbell, M. Abrami, F.M. Andrews, S.B. Whitty);
- economic approach, whose supporters (R. Aron, T. Attali, D. Bell, J. Galbraith, M. Guillaume, D. Meadows, W. Rostow, A. Touraine, J. Forrester) consider quality of life as a necessary attribute of the new post-industrial society and link this indicator with the achievement of a certain level of material well-being, economic development and try to measure it through a system of objective indicators, including factors such as living standards, income levels, demographic rates, environmental pollution and others (Romaniuk, 2014).

The World Health Organization (WHO) defines quality of life as "a person's perception of his or her life position in the cultural context and the value system in which he or she lives and with the help of which he or she is guided by in accordance with tasks, expectations and environmental standards (WHOQOL Group, 1995). In other words, the emphasis is on the subjective assessment of the state of life and its assessment, which, by the way, depends entirely on external circumstances.

At the same time, it is expedient to describe the quality of life also through value and normative, structural, historical, comparative, psychological and other approaches. After all, it lays a wide range of vital planes of human life and activity. Therefore, it can be analyzed both from the individual's point of view and from the point of view of the external circumstances in which he lives: law, economic, social, cultural, geographical, climatic and other conditions. A broad context of the quality of life in relation to the concept of sustainable development is presented by A. Kuzior (Kuzior, 2006; 2008, 2013; 2014).

I. Hukalova points out that the complexity of this category led to the intention of representatives of different sciences to structure the concept in their own way and select for its evaluation the most interesting indicators in terms of specific science (Hukalova, 2009, p. 26).

For instance, the Ukrainian researcher A. Kolot believes that the quality of life is "the level of human needs satisfaction, which is determined in relation to the relevant norms, social standards, traditions, customs or in accordance with the established personal requirements" (Kolot, 2003, p. 74). Russian economist V. Adamchuk considers the standard of living as "the structure of the material needs of the population and the degree of their satisfaction;

integral indicator that characterizes the consumption of material and mental goods by the population and the needs satisfaction degree for these goods at a certain historical moment of social production (Adamchuk, 1999).

In the conditions of technogenic nature and climate changes load, quality of life more and more often began to be considered through a prism of a physical condition of the person. It is no coincidence that Polish researchers B. Szyguła-Jurkiewicz, M. Kowalska, M. Mościński, emphasize that in recent years more and more often there is a tendency in clinical studies and in everyday medical practice that the quality of life of the patient depends on his state of health, in the sense of the impact of the disease and its treatment on its functioning in the physical, mental and social spheres (Szyguła-Jurkiewicz et al., 15.06.2020).

I. Romaniuk defines the quality of life as a complex subject and object characteristic of living conditions of an individual and society as a whole and believes that the individual's perception of the category "quality of life" is due to the interrelated influence of four main psychological factors: motivation, perception, attitudes and beliefs (Romaniuk, 2014, pp. 95-96).

Meanwhile, the discussion on the content and structure of the category "quality of life" is not over. As a subject of sociological research, the quality of life of the population is considered by scientists because its indicators are not only statistical, but also self-assessment and assessment of the population of their lives, which is possible only during sociological research.

The world's best-known integrated indicator of quality of life is the Human Development Index (HDI), which can be used to assess and compare poverty, literacy, education, product life expectancy and other indicators in different countries. The index was developed in 1990 by Pakistani economist Mahbub ul Haq and has been used by the United Nations since 1993 in its annual report on human development. Three types of indicators are taken into account while calculating the HDI: product life expectancy at birth – estimates longevity; education index: literacy level of the adult population of the country (2/3 of the index) and the total percentage of pupils and students (1/3 of the index); standard of living, estimated in terms of GDP per capita at purchasing power parity (PPS) in USD. The Poverty Index is an alternative index (also developed by the United Nations to assess the quality of life in any country) (Romaniuk, 2014, pp. 95-96).

Thus, quality of life as a scientific category describes a multifaceted and quite complex for research and assessment social, economic, law, cultural and psychological phenomenon, which is inherent in each individual and community, society as a whole, as it characterizes the level of living standards implementation (economic, law, social, environmental, cultural, medical, psychological and others), their degree of satisfaction with social and economic conditions created in the state to satisfy diverse requirements (economic, educational, material, psychological, social, cultural, sports, permits, etc.) and social support and protection by government agencies and institutions in terms of health loss or disability.

In Ukraine, scientists from the Ptoukha Institute for Demography and Social Studies of the National Academy of Sciences of Ukraine developed a system of indicators for assessing the quality of life of the Ukrainian population for comprehensive monitoring, including comparison with other countries, based on the national matrix. It includes the following three blocks of indicators:

- quantitative indicators of the external environment in which human life and the assessment of quality of life take place;
- characteristics of the current state of quality of life, which is formed as a result of the joint influence of the state and the population;
- subjective assessment of the quality of life of each individual (social strata, groups) in terms of their perception of the availability of different resources and the possibility of their use (Libanova et al., 2013).

On the basis of this matrix it is possible to make a configuration of those subsystems of life which are subject to an assessment when it is a question of measurement of quality of life:

- economic, natural, social, political environment as social spheres of society that provide living conditions for the individual;
- social, labor, family, personal life – subsystems that determine the subjective standard of living and meeting the individual needs.

According to the results of the Numbeo service research, in the quality of life ranking over 2018 (latest data) Ukraine was ranked 62nd among 71 countries on the list. A step higher in the ranking was Thailand, below was Hong Kong. In all 3 countries, the quality of life index barely exceeds 100 (in Ukraine, for example, 102.34). On the other hand, the leader of the Danish list has a score twice as high – 198.57. The researchers separately assessed countries' purchasing power, security, health care, cost of living, real estate affordability, transportation, pollution and the environment. There is the worst situation in Ukraine with purchasing power (32.72 points), cost of living (27.94) and transport (14.35) (Chomu v Ukraini nyzkyi riven yakosti zhyttia, 16.06.2020). Commenting on this situation, economist L. Cherenko noted that Ukraine has such a low rate due to the following reasons: the war reduces the country's security, as well as significant impact of the hryvnia's collapse in 2014-2015. According to the other indicators, everything is stable: "Since 2017, the situation with purchasing power has begun to improve, although the ranking has different data for the above reasons. The same situation happened with transport. The low score may be due to comparative characteristics with other countries. This is not the first problem for us. People are more concerned about the availability of health services, purchasing power and other social issues"(Chomu v Ukraini nyzkyi riven yakosti zhyttia, 16.06.2020).

Describing Ukrainians' state and quality of life, Director of Ptoukha Institute for Demography and Social Studies of the National Academy of Sciences of Ukraine, Academician E. Libanova noted that Ukraine's independence, formation of new international contacts, joining the new globalized world caused a deep economic crisis of transition, which found

glaring inequality in society, that may even lead to its division into castes. Moreover, in the last few years, a completely new concept of "sudden poverty" has emerged in Ukraine. Reasons of its appearing were as follows: the annexation of Crimea, the fighting in the east, and almost 2 million forced migrants (Iakist zhyttia v Ukraini, 4.07.2020). Surely, the state and quality of life of Ukrainians at the beginning of 2020 were affected not only by these phenomena, but also by the global COVID-19 pandemic, which forced the government to apply strict quarantine measures, that deprived many people of jobs and stable earnings. The difficult environmental situation also has a negative impact on people's well-being and health.

The consequence of all these challenges is the extremely low life expectancy of Ukrainians compared to residents of other countries. Thus, the average life expectancy in Ukraine of both sexes averages 71.1 years now. This is lower than the world average index, which is 71.7. In the Czech Republic it is 78.8, in Poland – 77.6, in Hungary – 75.3. The average life expectancy of women in Ukraine is 76 years, of men is 66.2 years. In the Czech Republic, women live on average 81.6 years, men – 75.9, in Slovakia women live 80, and men – 77.2 years, in Poland women live 5.5 years longer (81.5) than in Ukraine , and men – for 7.5 years (73.5) (Iakist zhyttia v Ukraini, 4. 07. 2020). Ukraine has an extremely low level of national income per capita in USD (purchasing power). If in 1990 it reached $10.8 thousand per person per year, now it has dropped to $7.4 thousand. In the Czech Republic, it is $29.8 thousand, in Slovakia – $27.4, in Romania – $19.9 thousand. Thus, United Nations experts stated that more than 60% of the population of Ukraine is below the poverty line now. In other words, they live on less than $8 a day per person. It is no coincidence that the general index of Ukrainians' satisfaction of their own lives (it includes satisfaction of education – 50%, health care – 22%, standard of living – 17%, work – 39%, security – 44%, freedom of choice – 63.5%) is much lower than in adjoining European countries and is 4.0. In Poland this index is 6.0, in the Czech Republic – 6.6 points, and satisfaction of public life (local labor market – 8%, leisure opportunities – 16%, local government – 76%, law system – 4%, environmental protection – 13%, central government – 8%) is 8 points, while in Poland this index amount to 21 points, and in the Czech Republic – 44 points (Iakist zhyttia v Ukraini, 4.07.2020).

Pensioners are a particularly vulnerable group of the population, which is acutely aware of changes in the quality of life level, as their state of life remains a major social problem in modern conditions.

At the beginning of 2020, the number of pensioners in Ukraine was 11.3 million people, and the average amount of pension payments was 3082.98 UAH or 130.19 USD (the dollar exchange rate on January 1, 2020 was 23.68) (Kurs NBU, 01 01.2020).

Ukrainian pensioners receive 4.5 times less pension, in comparison to Poland, where the average pension benefit in the first half of 2019 was 2,236.84 Zloty (Dani pro serednii rozmir pensii stanom, 29.06.2020; Ile wynosi średnia emerytura w Polsce, 29.06.2020).

Extremely low level of pensions of Ukrainian pensioners becomes obvious with the comparison with pensioners of European countries, and thus impoverishment and inability to provide for their own needs without additional assistance from children become obvious too, if they do not exist (see Table 1).

Table 1.
The minimum old-age pension in Ukraine, compared to Poland in 2014-2021

Minimum pension	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Changes in pension in 2021 compared to 2014**
Ukraine Dollar/ hryvnya	111.91/ 894.00	60.22/ 949.00	47.01/ 1130.00	58.86/ 1247.00	48.92/ 1373.00	54.03/ 1497.00	69.13/ 1638.00	62.54/ 1769.00	-49.46 USD/ +875.00 UA
Poland Dollar/ zloty	266.39/ 831.15	227.00/ 844,45	216.32/ 880.45	218.45/ 882.56	293.25/ 1000.00	273.88/ 1029,80	282.77/ 1100.00	323.45/ 1200,00	+57.06 USD/ +368.85 ZL

This table shows that the minimum level of pension in Ukraine from 2014 to 01.01.2021increased in hryvnya in 2 times (1769 UAH vs. 894 UAH), and in Poland in zlotys – 4.5 times (1200 zl vs. 266 zl). At the same time, the dollar equivalent in Ukraine decreased by 49.46 dollars, and in Poland - increased by 368.85 dollars. Moreover, as of January 1, 2021, the minimum pension of Polish pensioners is 5 times higher than that of Ukrainian pensioners ($323.45 vs. $62.54). (Minimum old-age pension, 2021; Minimum and maximum old-age pension, 2021; NBU exchange rate, 2021; Emerytura minimalna, 2021; Kursy walut, 2021).

Certainly, the low amount of the pension does not improve the living standards of pensioners, so they need a special state system of social support. One of the most important components of the system of social protection of the elderly people and improving the quality of their lives is pension insurance, which significantly affects social and economic status of retirees and their valuable and normative attitude to life.

4. Discussions

The current pension system of Ukraine was established on July 9, 2003, when the Verkhovna Rada (Supreme Council of Ukraine) passed two acts on pension reform: “On Compulsory State Pension Insurance” and “On Non-State Pension Provision” (Yatsenko, 29.06.2020). It is a set of law, economic and organizational institutions and norms, the purpose of which is to provide citizens with material support in the form of a pension. Regardless of the type of pension system, pensionary payments, as USAID Financial Sector Transformation Project Consultant V. Yatsenko noted, are “requirements for future output”, as to live a decent

life on a pension, elderly people "do not need paper money on their own or paper "accrued assets" (shares and bonds), but available goods (food, medicine, clothing) and services (medical, housing and communal services) produced by the working population" (Yatsenko , 29.06.2020). In other words, the pension level determines material, social and cultural standard of living of the elderly people. The lower the pension is, the less opportunities they have to meet their physiological, social and cultural needs.

The pension system of Ukraine has three levels: the first level is the solidarity system of compulsory state pension insurance; the second level – the accumulative system of compulsory state pension insurance; and the third level is private pension funds (PPFs) with voluntary contributions, which were established in 2005.

How effectively do these three levels of the pension system work? According to experts, only the first and the third levels of the pension system operate in Ukraine. However, the third level (voluntary non-state pension provision) is bare of credit of Ukrainian citizens. The second level of the pension system (the accumulative system of compulsory state pension insurance) would work from 2012 and provide for the deduction of up to 7% of the employee's salary to his personal account. And these funds were to "work", in other words, to invest into the Ukrainian economy, and the income from this investment in the future would increase the amount of pension benefits.

However, as practice shows, this level does not work at all. According to experts, in Ukraine private pension funds have assets of only $97 million or 0.1% of GDP and cover only 5% of employees. Almost 40% of them are members of one professional non-state pension fund "Magistral" of "Ukrzaliznytsia" (Ukrainian Railways) employees, who have accumulated an average of UAH 115 ($4.1). While, for example, in Denmark, which ranks first in the world in terms of the value of private pension assets, they will amount to $722 billion, which is 208% of GDP (2017), the Netherlands – $1.628 trillion (184% to GDP). About 94% of employees in the Netherlands and 90% in Denmark cover about by private pension plans (Yatsenko, 29.06.2020).

Nowadays the issue of decent pension provision for Ukrainian citizens is extremely important. It requires the study of foreign experience of the world"s leading countries and urgent reform of the pension system.

It should be noted that most European countries have experienced or are experiencing similar problems in the pension system. The main reasons are: demographic problems that lead to a reduction in the labor force and an aging population, as well as economic ones. Ensuring social justice, economic and financial stability requires the introduction of a multi-level pension system, which has been successfully tested for many years in the world's leading countries.

The Melbourne Mercer Global Pension Index assesses the adequacy, sustainability and integrity of the pension systems of 34 countries using more than 40 indicators from zero to 100 points. It shows which countries are best and worst prepared for the aging population. According to V. Yatsenko, due to falling birth rates, which has led to a reduction in the number

of children in almost half of the world, increasing life expectancy and reducing mortality, population aging is becoming one of the biggest challenges for governments around the world. There are more pensioners in Ukraine than their grandchildren. Over the past 60 years, the share of the population aged 60 and over has more than doubled – from 10% according to the 1959 census to 23% in 2018 according to the State Statistics Service. At the same time, the share of the population under 19 decreased from 34% to 20%. The median age of the country's population has increased one and a half times for 60 years: from 27.6 years to 40.8 years (Yatsenko, 29.06.2020). The last census in Ukraine was conducted in 2001. Therefore, the exact number of able-bodied citizens who have to pay taxes is unknown. After all, in the field of informal employment (taxes are not paid) in the country, according to various estimates, about a third of able-bodied citizens work. The annexation of Crimea, the war in Donbass and large-scale labor migration to the European Union, in particular Poland, also had a significant impact on the demographic situation of the population. Therefore, the Government of Ukraine is looking for ways to improve the pensions of its citizens.

A new stage of pension reform took place on October, 2017. Its main purpose is to equalize the expenditure and income parts of the Pension Fund of Ukraine (PFU). The reduction of the PFC deficit, which gradually took place from 2016 to 2018 (from 85.6 billion UAH to 32.1 billion UAH), indicates that positive changes in pension provision have begun to take place (Defytsyt Pensyonnoho fonda, 26.06.20). However, this does not solve the general problem that exists in Ukraine regarding the standard of living and well-being of pensioners.

Today Ukraine urgently needs effective steps to reform the pension system not on paper, but in real life. We agree that the main changes in the reform are linked to length of service, not age; annual indexation and increase of the minimum pension.

Determination of old-age pension in Ukraine in 2019 is carried out in accordance with the Law of Ukraine "On Compulsory State Pension Insurance" and observing two conditions:

1) reaching retirement age,
2) availability of sufficient insurance experience.

The increase of the retirement age and amount of minimum insurance experience required for a pension occurred on October 1, 2011. In addition, a new pension reform was carried out. According to this pension reform there is a gradual increase in retirement age starting from January 1, 2018. The retirement age in Ukraine for both men and women is set at the same level – 60 years. However, women will retire at age 60 only from 2021 (Law of Ukraine "On Compulsory State Insurance") (Vidomosti Verkhovnoi Rady Ukrainy, 25.06.2020).

That is, Ukrainians acquire the right to receive a pension after reaching the age of 60 and having at least 27 years of insurance experience. Every next year, the number of insurance experience increases by 1 year and, starting from January 1, 2028, it must be at least 35 years. The minimum amount of pensions in Ukraine as of January 1, 2020 is 1,638 UAH ($60.7), and by the end of 2020 it will increase by approximately to 8% 1,769 UAH ($65.5). The maximum

pension in 2020 will increase from 15,640 UAH ($579.2) to 16,380 UAH ($606.6) (Pensiina reforma, 01.06.2020).

That is, the largest increase in the amount of pension will be for those who receive the maximum amount of pension.

Thus, the low level of pension implementation for Ukrainian pensioners, definitely, affects the material level of their lives. Most retirees are unable to buy the necessary food and to rest. Therefore, they do not meet the social needs for leisure and recreation. As a result, the measurement of life values is significantly reduced, limiting to the intention to meet the basic needs of life: food, medicine and clothing. Subsidies provided by the government to pay utility bills to families with extremely low pensions barely cover the costs of water, gas and electricity. Without doubt, the unsatisfactory material level affects the social and psychological well-being of Ukrainian pensioners, reducing their social immunity and trust in public authorities.

Meanwhile, it should be noted that not only Ukrainian but also European pensioners have their own problems that affect their moral and psychological state. The 2018 sociological study "Health status, mental health and air quality: evidence from pensioners in Europe" found that environmental quality is an important factor in determining people's well-being and therefore one of the main problems of governments is the improvement of air and public health. This is especially true for vulnerable demographic groups, such as the elderly (Giovanis, and Ozdamar, 2018).

In order for the pension system to work effectively in Ukraine, the state needs law protection for the average Ukrainian who is his client, state control over the guarantee of pension payments (state and non-state funds) to its members and effective work of all spheres of social production in Ukraine.

The challenges that exist in Ukraine hinder the improvement of the general social and economic situation. E. Libanova, Ukrainian academician, outlined three most important challenges, given the difficult social and economic situation in terms of quality of life: (1) inequality, which really exists; it is significant and it is felt by each Ukrainian; (2) a crisis of trust, because in our country "everyone does not trust everyone", except close relatives (among the positive dynamics has recently appeared a certain level of trust in compatriots); (3) total nihilism and unwillingness to work legally: "people want to work because they have to live somehow, but most try in various ways to hide their income from the government and at the same time do not shy away from demanding social protection and benefits" (Iakist zhyttia v Ukraini, 04.07.2020).

Under such conditions, it is important to maintain the moral and psychological state of elderly people, since sociological research by foreign researchres shows that the higher is the psychological well-being, the higer is the quality of life. When a person can lead his own life, he seems happy and finds the meaning in life. Therefore, social workers and government organizations working for elderly should raise public awareness of the activization of their

personal lives, which in turn will help them to be happy and remain productive in society (Charles and Arockiam, 2020).

5. Conclusions

The problem of quality of life and improving its level is one of the main problems of our time in almost all countries of the world. There are many reasons that affect the condition and quality of life of people. These include political, economic, social, cultural, environmental and others. The low level of quality of life among the elderly people is particularly acute in those countries experiencing economic, political and environmental crises, including Ukraine.

However, in the scientific literature there is no ambiguous approach for understanding the category of "quality of life", so it is difficult to compare the phenomenon it describes in different countries. Therefore, in accordance with the purpose of this article, an analytical review of scientific approaches for understanding this category and clarifying its content was carried out. Also the state and quality of life of the population, including retirees in Ukraine, were analyzed.

It is emphasized that "quality of life" as a scientific category describes a multifaceted and quite difficult to study and evaluate social, economic, law, cultural and psychological phenomenon, which is inherent in each individual and community, society as a whole. As this category characterizes their living standards level implementation (economic, law, social, environmental, cultural, medical, psychological and others), their degree of satisfaction with the social and economic conditions created in the state to meet diverse (economic, educational, material, psychological, social, cultural, sports, leisure, etc.) needs and social support and protection by the government agencies and institutions in the event of loss of health or disability.

The main indicators for measuring the quality of life in Ukraine are the following: quantitative indicators of the external environment in which human life takes place and quality of life is assessed; characteristics of the current state of quality of life, which is formed as a result of the joint influence of the state and the population; subjective assessment of the quality of life of each individual (social strata, groups) in terms of their perception of the availability of different resources and the possibility of their use.

The analysis showed that almost majority of Ukrainians (up to 60%) live below the poverty line, including the majority of pensioners. Extremely low pensions, delayed pension reform, and the lack of a guaranteed adequate level of pension insurance reduce the life chances of the elderly people. Therefore, maintaining their health and survival by engaging their own abilities and helping children remains virtually the only life value for them. Limited pension insurance, including the real absence of private pension funds, definitely, limits the ability of Ukrainian

retirees to meet cultural needs, travel, buy healthy food, maintain communication with their friends.

Taking into account the experience of foreign countries such as Poland, Hungary, Estonia,Czech Republic in organizing national pension systems, it can be argued that private pension funds in all countries of the world are recognized as important social institutions. They contribute to the improvement of the financial situation of people of retirement age and have a high level of society members' trust in the pension savings system.

To guarantee a successful pension reform, Ukraine needs to act in three directions: create a competitive infrastructure (non-state pension funds, administrations, asset management companies), set adequate rates and protect the savings of depositors (Kuznecova, 2020).

In this regard, a promising area of further research on the problem considered in this work is the need to implement elements of the best standards of foreign pension systems, and develop the necessary measures to improve the second (mandatory funded system) and third levels (voluntary private pension provision) of the pension system. The third level of the pension system should guarantee the preservation and growth of accumulated pension benefits. This is possible under the condition of sustainable economic development of the country, the stock market of Ukraine, due to which non-state pension funds could increase the savings of pensioners or invest pension savings in other highly liquid assets. Public authorities must monitor this, because one of their top priorities is to ensure a decent standard of living for the elderly people, who have created tangible and intangible benefits for future generations.

References

1. Adamchuk, V.V. (1999). *Ekonomika truda*. Moskva: ZAO «Finstatinform».
2. Charles, S., Arockiam, K. (2020). *Psychological well being and quality of life of Pensioners*. ResearchGate. Available online https://www.researchgate.net/publication/339783826_PSYCHOLOGICAL_WELL_BEING_AND_QUALITY_OF_LIFE_OF_PENSIONERS, 2021.01.12.
3. *Chomu v Ukraïni niz'kij riven' yakosti zhittya. Povidmlennya pres-sluzhbi*. Nacional'na Akademiya nauk Ukraïni. Available online http://www.nas.gov.ua/UA/Messages/Pages/View.aspx?MessageID=5010, 2020.06.16.
4. *Dani pro serednij rozmir pensiï stanom na 01.01.2020*. Available online https://www.pfu.gov.ua/2119090-dani-pro-serednij-rozmir-pensiyi-stanom-na-01-01-2020/, 2020.06.26.
5. *Deficit Pensionnogo fonda v 2014-2019 godah. Finansy*. Available online https://ru.slovoidilo.ua/2019/09/26/infografika/finansy/deficit-pensionnogo-fonda-2014-2019-godax, 2020.06.26.

6. *Doslidzhennya tin'ovoï ekonomiki v Ukraïni: majzhe chvert' VVP – abo 846 mlrd griven' – perebuvaє v tini, 17.02.2020*. Available online https://bank.gov.ua/ua/news/all/doslidjennya-tinovoyi-ekonomiki-v-ukrayini--mayje-chvert-vvp--abo-846-mlrd-griven--perebuvaye-v-tini, 2020.05.25.
7. *Emerytura minimalna – wartości historyczne*. Pox. Pl. ZUS. Podatki. Finanse. Available online https://zus.pox.pl/zus/emerytura-minimalna-wartosci-historyczne.htm, 2021.01.13.
8. Giovanis, E., and Ozdamar, O. (2018). Health status, mental health and air quality: evidence from pensioners in Europe. *Studies in Indian Place Names (UGC Care Journal)*, 86483. Available online https://mpra.ub.uni-muenchen.de/86483/1/MPRA_paper_86483.pdf, 2021.01.12.
9. Gukalova, I.V. (2009). *YAkist' zhittya naselennya Ukraïni: suspil'no-geografichna konceptualizaciya.* Kiïv. Retrieved from https://igu.org.ua/sites/default/files/pdf-text/life-quality.pdf, 2020.06.22.
10. *Ile wynosi średnia emerytura w Polsce w 2020?* Zadłużenia.Com. Available online https://www.zadluzenia.com/srednia-emerytura-polska, aktualne notowania, https://www.fxmag.pl/artykul/kursy-walut-nbp-14-grudnia-2019-r-kurs-euro-funta-dolara-i-franka-szwajcarskiego-w-sobote-aktualne-notowania, 2020.06.29.
11. Kolot, A.M. (2003). *Social'no-trudovi vidnosini: teoriya i praktika: monografiya.* Kiïv: KNEU.
12. *Kurs NBU 1 yanvarya 2020*. Available online https://minfin.com.ua/currency/nbu/2020-01-01/, 2020.06.29.
13. *Kurs valyut NBU na 1 yanvarya*. Available online https://finance.i.ua/nbu/?d=1&m=1&y=2021, 2021.01.13.
14. *Kursy walut. NBP.* Available online https://www.nbp.pl/home.aspx?f=/kursy/arch_a.html, 2021.01.13.
15. Kuzior, A. (2006). Człowiek jako racjonalny podmiot działań w świetle założeń koncepcji zrównoważonego rozwoju. *Problemy Ekorozwoju, vol. 1, nr 2*, pp. 67-72.
16. Kuzior, A. (2008). *Paradygmat odpowiedzialności w perspektywie koncepcji sustainable developmen.* Preszów. Preš : Filozoficka Fakulta Presovskej Univerzity, pp. 88-96.
17. Kuzior, A. (2011). Fizjologia głodu. In: A. Kuzior (Ed.), *Globalne konteksty poszanowania praw i wolności człowieka. Prawa człowieka w społecznej praktyce* (pp. 43-53). Sosnowiec: Remar.
18. Kuzior, A. (2014). Aksjologia zrównoważonego rozwoju. Belianum: Banska Bystrzyca.
19. Kuznecova, Y.U. (10.12.2020). *Luchshie pensionnye sistemy Evropy i krah v CHili: na chto vazhno smotret' Ukraine.* Available online https://finance.liga.net/pension/article/luchshie-pensionnye-sistemy-evropy-i-krah-v-chili-na-chto-vajno-smotret-ukraine, 12.01.2021.
20. Libanova, E.M., Gladun, O.M., Lisogor, L.S. et al. (2013). *Vimiryuvannya yakosti zhittya v Ukraïni. Analitichna dopovid'.* Kiïv: In-t demografiï ta social'nih doslidzhen' imeni M.V. Ptuhi NAN Ukraïni. Programa Rozvitku OON, MEPT Ukraïni.

21. *Minimimal'nyj i maksimal'nyj razmer pensii po vozrastu v 2021.* Available online. https://www.profiwins.com.ua/ru/directories1/minpens.html, 2021.01.13.
22. *Minimal'na pensiya za vikom. Pensia.ua Pensijnij konsul'tant*. Available online https://pensia.ua/ua/baza-znan/statistichni-dani/item/914-minimalna-pensiia-po-viku, 2021.01.13.
23. *Pensijna reforma Uryadu Grojsmana*. Uryadovij portal. Available online https://www.kmu.gov.ua/gromadskosti/pensii, 2020.06.01.
24. Romanyuk, I. (2014). „Yakist' zhittya" yak social'no-ekonomichna kategoriya ta ob'ekt statistichnogo doslidzhennya. *Ekonomika, No. 4(157),* pp. 95-96.
25. Szyguła-Jurkiewicz, B., Kowalska, M., Mościński, M. *Jakość życia jako element oceny stanu zdrowia i efektywności leczenia chorych ze schorzeniami układu sercowo-naczyniowego.* Retrived from journals.viamedica.pl/folia_cardiologica/article/viewFile/23617/18803, 2020.06.15.
26. *Vidomosti Verhovnoï Radi Ukraïni (VVR), 2003, No. 49-51,* p. 376. Available online https://zakon.rada.gov.ua/laws/show/1058-15#Text, 2020.06.25.
27. WHOQOL Group. The World Health Organisation quality of life assessment (WHOQOL): Position paper from the world health organisation (1995). *Soc. Sci. Med., 41,* 1403-1409.
28. Yacenko, V. (2018). Pensionnyj populizm: novye vyzovy i obeshchaniya. Reforme pensionnoj sistemy Ukrainy – dva desyatka let. V chem prichina neudovletvoritel'nyh rezul'tatov? *Ekonomichna Pravda,* 18.09.2018. Available online https://www.epravda.com.ua/rus/columns/2018/09/18/640675/, 2020.06.29.
29. Yakist' zhittya v Ukraïni: ocinki ekspertiv. *Uryadovij kur'er,* 04.07.2020. Available online https://ukurier.gov.ua/uk/articles/yakist-zhittya-v-ukrayini-ocinki-ekspertiv/, 2020.06.29.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

LOCATION OF THE FURNITURE INDUSTRY IN VOIVODSHIPS IN POLAND

Katarzyna ŁUKIEWSKA[1]*, Katarzyna CHROBOCIŃSKA[2]

[1] University of Warmia and Mazury in Olsztyn, Faculty of Economic Sciences;
katarzyna.lukiewska@uwm.edu.pl, ORCID: 0000-0002-3175-5495
[2] University of Warmia and Mazury in Olsztyn, Faculty of Economic Sciences; kasiachr@uwm.edu.pl,
ORCID: 0000-0003-3189-9912
* Correspondence author

Purpose: The aim of the study was to assess the location of the furniture industry in voivodships in Poland in 2016-2018.
Design/methodology/approach: The study uses indicators of the share of business activity of the furniture industry (production value, employment, number of entities) of a given voivodship in the total activity (production value, employment, number of entities) of this sector in the whole country, CR concentration indicators, Herfindahl-Hirschman indexes, Lorenzo curve and location indicators.
Findings: The obtained results confirmed the tendency of the furniture industry to spatial concentration in the layout of Polish provinces. The furniture industry was concentrated mainly in Greater Poland, as well as Warmia and Mazury, Lower Silesia, Lesser Poland and Mazovian voivodship, and it was these regions that were most important in building the national furniture industry. From an intra-regional perspective, the furniture industry had by far the largest share in the economy of the Warmian-Masurian Voivodship.
Practical implications: The results obtained indicate which voivodeships are the most significant in creating the national furniture industry. The information may be used by the national authorities to create a policy of building competitiveness of the Polish furniture industry in the international arena. The information on the importance of the furniture industry in the economies of individual voivodships can be used by local authorities in building the competitiveness of the region.
Originality/value: The article concerns the furniture industry, which is relatively rarely studied in the literature. It includes a study of the location of the industry entities in a spatial arrangement in two dimensions: degree of concentration and structure and intensity of specialization.

Keywords: location, furniture industry, concentration, specialization.

Category of the paper: Research paper.

1. Introduction

The furniture industry has a long tradition in Poland and has been an important branch of the economy for many years (Dyba, Stryjakiewicz, 2014). It consists of over 18.28 thousand enterprises, i.e. about 8.83% of enterprises in the manufacturing sector in Poland. In 2018, the value of sold production was over 47.9 billion PLN, which accounted for 3.63% of industry production. The industry is also an important employer. In 2018, employment in enterprises producing furniture amounted to almost 145.5 thousand people, or 6.28% of all employed in industry in Poland (Statistical Yearbook..., 2019). Moreover, studies by Juchniewicz and Łukiewska (2014) show that the importance of the furniture industry in the Polish economy is relatively greater than in the entire European Union (EU).

The dynamic development of the furniture industry is also worth emphasising. The beginning of the development of the furniture industry in Poland was still in the period of the People's Republic of Poland, when in the block of states dependent on the USSR Poland was to specialise in furniture production (Adamowicz, Wiktorski, 2006). The experience gained during this period contributed to the development of the industry after the changes in 1989. Since that period, and especially after the accession to the European Union, there has been a systematic increase in the value of sold production of the furniture industry in Poland. The average annual growth rate of the sold value of this industry (in current prices) in the years 2005-2015 was 6.08%, and in the years 2015-2018 – 6.99%.

Moreover, research by other authors shows that Poland is among the top European and global manufacturers of furniture (Ulbrych, 2016). Better results in terms of export value are achieved only by companies from the industry from Germany and China. The most important export direction of furniture manufacturers from Poland was Germany, where almost 40% of the group's total exports were received, followed by the United Kingdom, France, the Czech Republic, the Netherlands and Sweden, and the United States outside the EU (Juchniewicz, Łukiewska, 2014). Industry reports show that the furniture industry on international markets is distinguished primarily by its many years of experience in trading furniture with Western European markets, high quality, active product development policy, continuous improvement of design and continuous work on building the image of corporate brands, openness to investment and optimal use of EU funds, relatively lower production costs (especially labour costs), as well as the proximity and abundance of raw material base (Furniture Market..., 2017).

The great importance of the furniture industry in Poland's economy, as well as its high competitive position on the international markets of the EU and the world, were important reasons for choosing this industry as a subject for consideration in the conducted research. Moreover, it was noted that in the literature on the subject, most empirical studies concern the total size of the furniture industry in Poland, as well as the distribution of this industry in the layout of EU countries and the world, especially in the context of international trade

(e.g. Sujova, Hlavackova, Marcinekova, 2015; Ciupiński, Łukiewska, 2015; Ulbrych, 2016, Kaczorowska, Staniec, Szczygieł, 2019; Huyen Vu et al., 2019), and the recognition of this issue in the regional aspect is definitely insufficient. Meanwhile, as Grzybowska (2012) points out, perceiving the development of the economy through the prism of global phenomena of international integration and increasing globalisation does not mean that other reference planes have lost their importance. The author emphasises that local or regional space is an integral whole of the 'global village'. Taking the above into account, the aim of the study was therefore to assess the location of the furniture industry in Polish voivodeships in 2016-2018. The results obtained will indicate the level of disparities in the furniture industry in Poland, as well as allow a discussion on its importance in the development and competitiveness of individual Polish regions.

The article consists of five parts. After the introduction, the second part presents the theoretical aspects of business location. The third part discusses the applied research methodology. The fourth part contains an empirical analysis of the inter- and intra-regional distribution of the furniture industry in Poland. The last part presents a summary.

2. Literature review

Inequality of location (spatial distribution) of manufacturing activities between countries and regions is a feature of economic development observed for centuries (Zielińska-Głębocka, 2003). This issue is the subject of theoretical and empirical considerations of various trends in economics and geography. In economic sciences, it mainly stems from classical and new trade theories, as well as the theory of specialisation, and in geographical sciences – from the classical theory of location and the so-called new economic geography (Zielińska-Głębocka, 2003). The concept of the location of economic activity is the location of the size and type of economic activity, facility or group of facilities, in a defined area (Budner, 1999). According to Budner (1999), a location can be considered in the functional aspect, as a procedure for selecting the type and place of investment, and in the resultant aspect, as a result of the procedure for a specific location. From the perspective of a company, the choice of an appropriate location for its activity is a decision of an economic nature influencing its functioning and success on the market. Kuciński (2001) indicates that the location of a company affects its competitiveness by influencing the level of costs, work efficiency, market expansion opportunities and economic effects of business activity. According to Skawina (2002), a company must gain a competitive advantage resulting from its location in a specific environment in order to successfully compete on the international market. Huczek (2012), on the other hand, indicates that a demanding local environment can be a stimulus to increase innovativeness and economic efficiency of business management, and thus to shape a better competitive position on the global market.

The process of selecting the optimal location usually requires analysis of many elements. In the literature, a number of different classifications of location factors can be found. Godlewska-Majkowska (2009) includes natural resources which have an impact on the development of investment outlays (during the construction of the facility) and the net profitability of industrial economic activity carried out in these locations. They include: surface shape, hydrographic relations, raw material base, labour resources, water resources, sales market, infrastructure development and existing business entities. Relatively often location factors are divided by object, i.e. (Wieloński, 2005):

1. Natural factors, e.g.: raw material base, energy base, water resources, communication barriers, ecological barriers.
2. Non-natural factors, including:
   - technical and economic factors, e.g. technical infrastructure, market, advantages of the agglomeration, labour force, scientific and technical facilities, the volume of demand and its concentration,
   - socio-political factors, e.g. state policy, social factors, strategic (military) factors.

Other classifications divide location factors by functions of economic activity (production, distribution, organisational factors) (Waldziński, 2005), history (traditional, modern) (Budner, 2007) or the possibility of their measurement (hard, i.e. easy to measure and soft, i.e. hard to measure) (Plawgo, Chylicka, 2008). Firlej (2009) also emphasises that an entrepreneur should bear in mind that the quality of the location of the same place may be different for entities differing in size, organisational structure or type of activity.

3. Methods

The location of business activity in a spatial arrangement can be defined and analysed in two dimensions: degree of concentration/aglomeration and structure and intensity of specialization (Zielińska-Głębocka, 2003). As Antonowicz (2014) emphasises, such phenomena should be analysed in relative terms. Concentration concerns the spatial distribution of a given industry between different regions within a country (or e.g. countries within the EU). The simplest measure used in this article was the share of the economic activity of the furniture industry (production value, employment, number of entities) of a given province in the total activity (production value, employment, number of entities) of this sector in the whole country, in the form of (Zielińska-Głębocka, 2003):

$$l_i = \frac{q_i}{q} \tag{1}$$

where:

q_i – average employment/value of production/number of entities in the furniture industry in a given province and in a given year,

q- average employment/value of production/number of entities in the furniture industry in Poland in a given year.

Then concentration ratios (CR) were applied, which are the sum of market shares in N of the largest entities (voivodeships), according to the following formula (Pavic, Galetic, Piplica, 2016):

$$CR(N) = \sum_{i=1}^{N} l_i \tag{2}$$

where:

l_i – is the share of the furniture industry of the voivodship and (production value, employment, number of entities) in the whole country.

This indicator shows the total market share N of the largest entities (voivodeships) in the whole market (country) (Kryzia, 2016).

In the next step, the Herfindahl-Hirschman index (HHI) was used, which was calculated as the sum of squares of market shares of all entities in the market according to the formula (Naldi, Flamini, 2014):

$$HHI = \sum_{i=1}^{N} l_i^2 \tag{3}$$

The index takes values from 1/N to 1. Due to its construction, the entities with the largest market share have the greatest influence on the size of this measure (Kryzia, 2016). The index would reach its highest value if one entity had a very high market share and the other entities had very small, marginal shares.

The level of concentration of the furniture industry is also graphically presented in the form of the so-called Lorenzo curve (Kleiber, 2005; Gastwirth, Modarres, Buar, 2005). On the curve, on the axis of ordinates, cumulative percentages of values of selected features (production value, employment, number of entities) were marked, and on the cut-off axis – cumulative percentages of the number of communities (voivodeships). The Lorenzo curve was created by merging points with appropriate coordinates. In the case of an even distribution of features, all points would lie on the diagonal of a square with a side equal to 100% called the line of even distribution. The more the Lorenzo curve deviates from the uniform distribution line, the greater the degree of concentration (Wysocki, Lira, 2003).

The location of the furniture industry in the context of specialisation was then examined. Specialisation shapes the structure of production and trade, leading to more intensive development of some areas in relation to others (Zielińska-Głębocka, 2003). The regional specialisation index was used for this purpose, otherwise the location quotient (LQ) (Hildebrand, Mace, 1950). It shows the importance of a specific branch of production in the

region compared to the whole country. It indicates the region's specialisation in the production of a branch in relation to the share of that branch in the total production of all examined regions. Therefore, it expresses the degree of similarity between the production structure of a given region and the country. The study adopted the following formula of the indicator (Wang, Hofe, 2007):

$$LQ = \frac{\frac{q_i}{q}}{\frac{q_{ir}}{q_r}} \tag{4}$$

where:

q_i – average employment/production sold/number of entities in the furniture industry in a given province in a given year,

q_b – average employment/sold production/number of total entities in industry in a given province in a given year,

q_{ir} – average employment/production sold/produced/number of operators in the furniture industry in the reference area (Poland) in the year,

q_r – average employment/production sold/number of total industry in the reference area (Poland) in the given year.

If the indicator takes values below 1, the share of branches in the economy of a given province is lower than in the whole reference area. If the indicator is close to 1 (deviations ±0.15 are allowed), it is assumed that the share of branches in the economy of a given province is similar to that of the reference area. If the LQ index is higher than 1, the importance of the branches in the voivodship is higher than in the whole studied area (Bergman, Feser, 2020).

4. Results and discussion

The assessment of the location of the furniture industry started with an analysis of the spatial distribution of this industry in individual provinces of Poland based on the number of entities, employment and production sold (Table 1). The level of the coefficients of variation and the range indicate a relatively high diversification of the sector's activity measured in this way by voivodship (especially in terms of sold production and employment). In Poland, in 2016-2018, there were on average 29.8 thousand enterprises engaged in furniture production. In individual provinces, the number of entities ranged from 634 (2.13%) to 4.3 thousand (14.57%). The largest number of entities were located in the Greater Poland Voivodship (14.57%), followed by the Masovian Voivodship (13.42%) and the Małopolska Voivodship (11.89%). In total, 39.88% of Polish furniture companies operated in these three provinces. The ranking was followed by Silesian, Łódź Voivodships, Pomeranian, Lower Silesia and Podkarpacie

Voivodships, where 5.55% to 8.49% of Polish furniture companies operated. By far the least numerous group of enterprises involved in furniture production (below 5%) were located in the following voivodships: Kuyawian-Pomeranian, Warmian-Masurian, West Pomeranian, Lublin, Podlasie, Opole, Świętokrzyskie and Lubuskie.

Table 1.
Share of voivodships in the furniture industry in Poland in 2016-2018

The voivodship	Number of entities		Employment		Production value	
	%	position	%	position	%	position
Lower Silesia	6,09	7	7,36	3	6,09	5
Kuyavian-Pomeranian	4,64	9	6,73	4	6,76	4
Lublin	3,61	12	4,49	8	3,78	11
ubuskie	2,13	16	4,21	10	3,8	10
Łódź Province	7,26	5	4,43	9	3,89	9
Lesser Poland	11,89	3	3,23	12	2,47	12
Masovian Voivodeship	13,42	2	6,57	5	7,89	3
Opole Province	2,76	14	2,14	13	1,61	14
Podkarpackie Province	5,52	8	5,98	6	4,98	6
Podlasie	3,25	13	1,88	14	1,69	13
Pomeranian	6,38	6	5,11	7	4,59	7
Silesian	8,49	4	4,19	11	3,96	8
Świętokrzyskie	2,2	15	-	-	-	-
Warmian-Masurian	4,15	10	11,82	2	10,64	2
Greater Poland	14,57	1	31,86	1	37,85	1
West Pomeranian	3,64	11	-	-	-	-
Descriptive statistics						
min	2,13	-	1,88	-	1,61	-
max	14,57	-	31,86	-	37,85	-
range	12,44	-	29,98	-	36,24	-
coefficient of variation (%)	63,25	-	105,53	-	128,40	-

Adopted from: own study based on GUS.

Another important category is the number of people employed in the industry, which has a direct impact not only on the scale of production, but also on labour productivity and the competitiveness of entities. In Poland, in 2016-2018, the furniture industry employed an average of 141.9 thousand people. The distribution of this feature was characterised by considerable dispersion. By far the highest number of employees, i.e. almost 1/3 of them, was concentrated in the Greater Poland Voivodeship (31.86%). None of the other voivodships reached a similar value. The second place was occupied by the Warmian-Masurian Voivodship, whose share in employment in the national furniture industry was much smaller at 11.82%. The share in engaging the labour resources of the remaining voivodships was even lower and did not exceed 10%. The percentage of employment between 5% and 10% was in the Lower Silesian, Kuyavian-Pomeranian, Lesser Poland, Podkarpackie and Pomeranian Voivodships. The lowest employment levels below 5% were recorded in the Lublin, Łódź, Lubuskie, Silesian, Lesser Poland, Opole and Podlaskie Voivodships.

In assessing the location of the industry's operations, it is also important to analyse the production effects, which in the study were measured by the value of sold production. In the whole country in 2016-2018, the value of furniture sold production was

35.09 billion PLN on average per year. In regional terms, this feature was the most diverse of all analysed. This is indicated by a high coefficient of variation of 128.40% and the highest range, which was 36.24%. The share of individual voivodships in generating the national value of sold production ranged from 1.61% to 37.85%. The Greater Poland Voivodship was the undisputed leader, which was also a leader in terms of the number of enterprises and employment. In this voivodship the value of sold production was PLN 13.28 billion. This was more than 20 times more than in the Opole Voivodship, which was in last place in this respect. The second place was taken by the Warmian-Masurian Voivodship, where the value of production was PLN 3.73 billion on average per year. The voivodship was also second in terms of employment and 10th in terms of the number of entities. This is related to the relatively large number of employees per one company. The third position was occupied by the Masovian Voivodship, whose share in generating domestic furniture production was 7.89%. The next rankings were occupied by the Kuyavian-Pomeranian and Lower Silesia Voivodships, whose shares ranged from 6.09% to 6.76%. The remaining provinces were relatively small (below 5%).

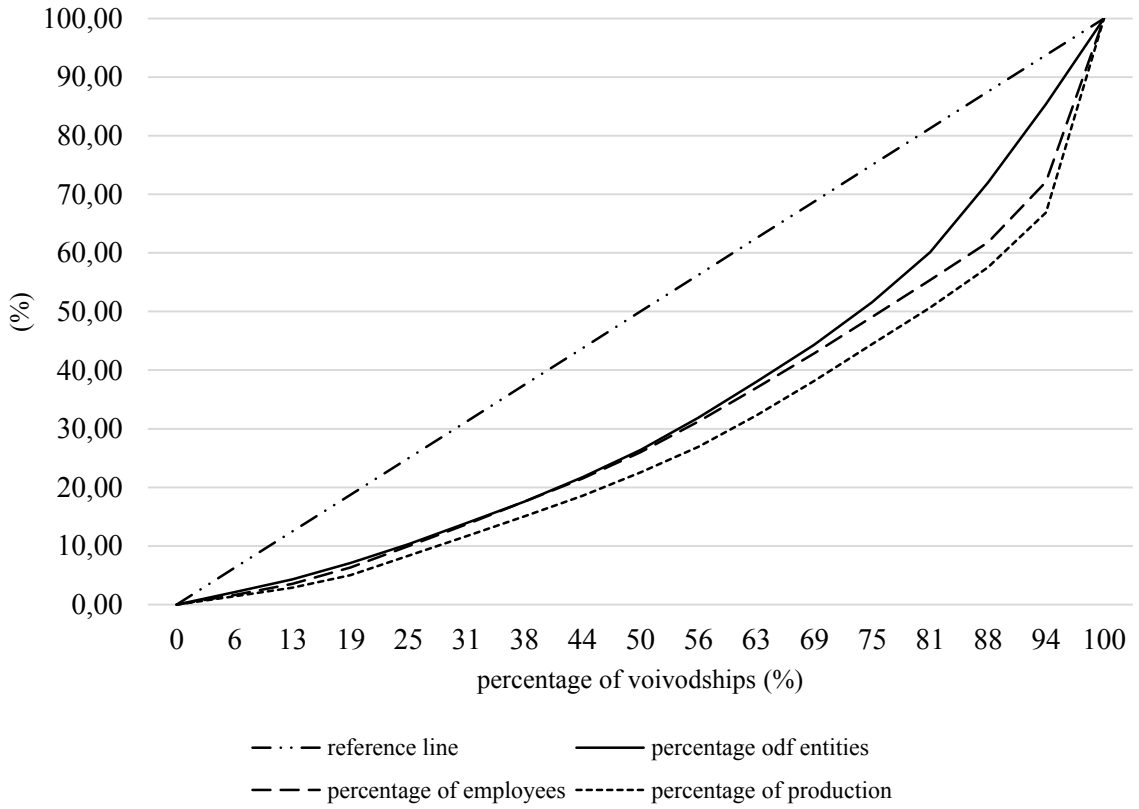


Figure 1. Lorenzo curve of employment, number of enterprises and value of production sold in the furniture industry in provinces in Poland in 2016-2018. Adopted from: own study based on GUS.

The degree of concentration of the furniture industry in Poland was determined using the CR (N) ratios. The concentration coefficients CR (2) indicate that the total share of the two largest voivodships in terms of the number of enterprises, employment and the value of production in industry in the years 2007-2015 was 27.00%, 43.67 and 48.49% respectively

(Table 2). In terms of employment and production value, they were: Greater Poland and Warmian-Masurian, and the number of entities was Greater Poland and Masovian. Considering the CR concentration index (5), it should be pointed out that the total share of five voivodships in terms of the number of enterprises was 55.64%, employment – 62.95%, production value – 68.12%. As regards the number of enterprises, these were: Greater Poland, Masovian, Małopolskie, Silesian and Łódź voivodship, and the employment and production value – Greater Poland, Warmian-Masurian, Lesser Poland, Lower Silesia and Kuyavian-Pomeranian. The HHI coefficients were relatively low, at 0.086-0.146. The occurrence of certain inequalities in the distribution of the number of enterprises, employment and production value in the EU countries is indicated by the Lorenzo curve presented in the graphs, which clearly deviates from the line of uniform distribution (Fig. 1). The analysis carried out indicates that the furniture industry in Poland tends to be concentrated (spatially focused).

Table 2.
Concentration and Herfindahl-Hirschman indicators in the furniture industry in voivodships in Poland in 2016-2018

Description	Number of entities	Employment	Production value
CR (2)	27,99	43,67	48,49
CR (3)	39,88	51,04	56,38
CR (5)	55,64	62,95	68,12
HHI	0,086	0,119	0,146

Adopted from: own study based on GUS.

Next, location indicators were calculated, which show the importance of the furniture industry in the industry of a given voivodship in comparison with a similar relation in all analysed regions (Table 3). They were also compared with the previously calculated structure indices (Fig. 2-4). In the figures, as reference lines for the location indicator, its limit values were assumed, i.e. 0.85 and 1.15, and in the case of structure indicators – 6.25%, i.e. assuming the same share of each voivodship in the analysed categories in Poland.

Table 3.
Indicators of location of the furniture industry in Polish voivodeships in 2016-2018

The voivodship	Number of entities		Employment		Production value	
	%	position	%	pozycja	%	position
Lower Silesia	0,85	11	0,82	8	0,69	9
Kuyavian-Pomeranian	0,99	7	1,1	5	1,38	4
Lublin	0,98	8	1,27	4	1,57	3
ubuskie	0,93	10	1,29	3	1,3	6
Łódź Province	0,98	8	0,62	11	0,68	10
Lesser Poland	1,24	5	0,39	13	0,35	13
Masovian	0,85	11	0,43	12	0,43	12
Opole Province	1,15	6	0,84	7	0,72	8
Podkarpackie Province	1,27	4	1,04	6	1,32	5
Podlasie	1,5	2	0,81	9	0,81	7
Pomeranian	0,79	14	0,78	10	0,63	11
Silesian	0,72	16	0,27	14	0,23	14
Świętokrzyskie	0,8	13	-	-	-	-

Cont. table 3.

Warmian-Masurian	1,54	1	3,10	1	3,84	1
Greater Poland	1,39	3	2,94	2	2,71	2
West Pomeranian	0,77	15	-	-	-	-
Descriptive statistics						
min	0,72	-	0,27	-	0,23	-
max	1,54	-	3,10	-	3,84	-
range	0,82	-	2,83	-	3,61	-
coefficient of variation (%)	25,60	-	76,84	-	83,83	-

Adopted from: own study based on GUS.

The location indicator calculated on the basis of the number of entities ranged from 0.72 to 1.54. In five voivodships, such as Warmian-Masurian, Podlasie, Greater Poland, Podkarpackie and Lesser Poland, it was higher than 1.15. This means that in these regions the importance of entities producing furniture in the economy was above average. When comparing these data with the structure of entities, it can be seen that Greater Poland and Wielkopolskie voivodships had a distinguishing importance in the national number of enterprises from the furniture industry, and the remaining voivodships from this group were relatively low (below 6.25%). In 7 voivodships the location indicator (calculated on the basis of the number of entities) oscillated around 1 (with the assumed deviation of ±0.15). These were the Opole, Kuyavian-Pomeranian, Lublin, Łódź, Lublin, Lower Silesia and Masovian Voivodships. The share of the furniture industry in industrial processing did not differ from the national average. Of this group of regions, the Mazovian region had a dominant share in the national number of enterprises. Relatively high importance was also noted in the case of the Łódź Province. In 4 voivodships the location indicator reached the level below 0.85 (Świętokrzyskie, Pomeranian, West Pomeranian, Silesian). This indicates a much lower share of the furniture industry, measured by the number of enterprises, in these regions than in the reference area. Only Silesian and Pomeranian were relatively high in the national industry.

Another variable that was analysed was the average employment in the furniture industry. The location index calculated on the basis of this category ranged from 0.27 to 3.10 and was characterised by relatively high variability. The level above 1.15 was observed in 4 voivodships: Greater Poland, Warmian-Masurian, Lublin and Lubuskie. Among the mentioned, Warmian-Masurian and Greater Poland stood out definitely, where the LQ index was by far the highest and amounted to 3.10 and 2.94 respectively. Considering the interregional comparison of the structure of employees, it should be stressed that the Greater PolandVoivodship is particularly important in the labour resources employed in Poland for furniture production. The Warmian-Masurian Voivodship also had a relatively large share in engaging labour resources in the furniture industry. In two voivodships, a location indicator close to unity was noted. These were Kuyavian-Pomeranian and Podkarpackie. Their share in the national employment of the industry can be described as average (close to 6.25%). A low location ratio was recorded in the remaining voivodships: Opole, Lower Silesia, Podlasie, Pomeranian, Łódź, Opole, Lesser Poland, Silesian and Masovian Voivodeship. Apart from the Lower Silesian and Mazsovian Voivodships, their significance was also low.

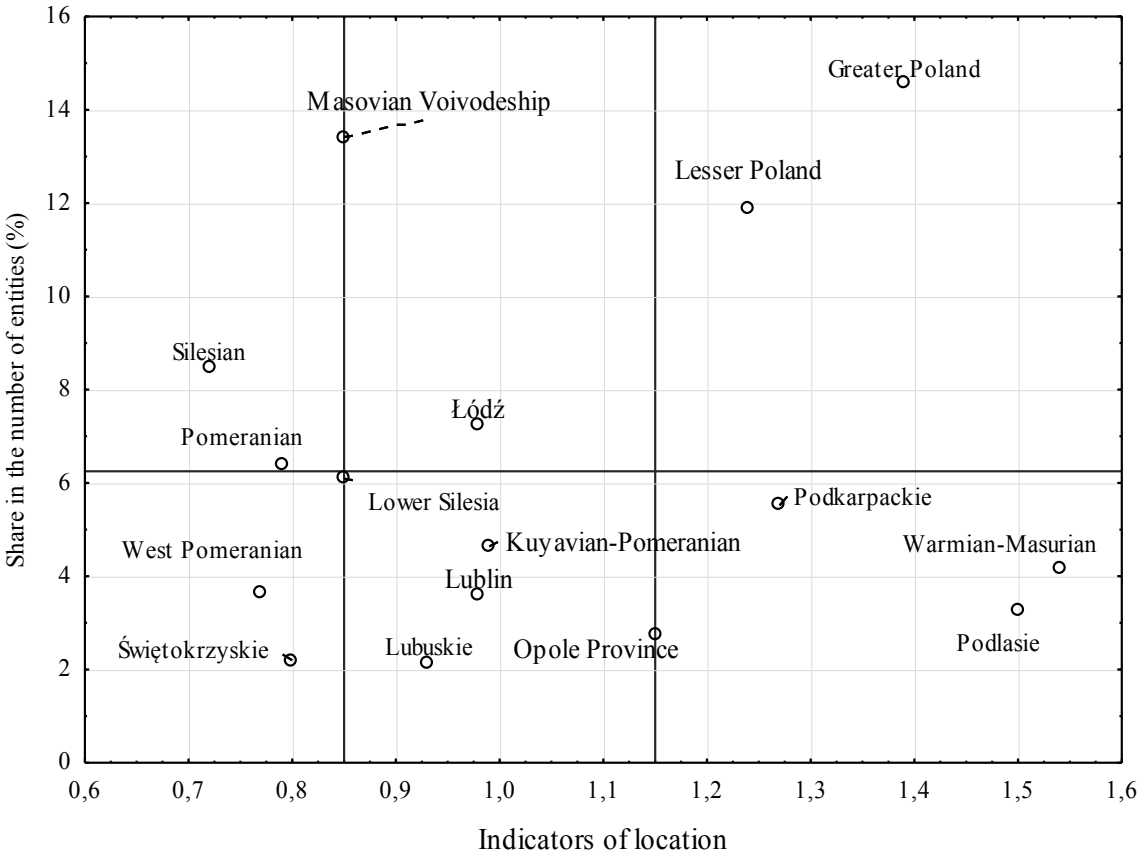


Figure 2. List of voivodships in terms of the level of the location indicator (variable - number of entities) and share in the national number of entities in the furniture industry in 2016-2018 (reference lines: median share in the number of entities, location indicator at 0.85 and 1.15). Adopted from: own study based on GUS.

The location of activities was also considered in terms of sold production. The LQ ratio measured in this way ranged from 0.23 to 3.84 and in the layout of voivodships it was characterised by the relatively highest disproportions. This is evidenced by the high coefficient of variation, as well as the biggest difference between the biggest and the smallest size, i.e. the range. Similarly to employment, the Warmian-Masurian and Greater Poland Voivodships were particularly distinct. The share of the furniture industry in generating the value of sold production of the industry in the Warmian-Masuria Voivodeship was 3.84 times higher, and in the Greater Poland Voivodeship 2.81 times higher than in all regions of the country. The indicator was much lower, but above 1.15, also in Lublin, Kuyavian-Pomeranian, Podkarpackie and Lubuskie voivodship. In the remaining regions, i.e. Podlasie, Łódź, Opole, Lower Silesia, Pomeranian, Masovian, Opole, Lesser Poland and Silesian, the location indicator was below 0.85. All the voivodships in this group, with the exception of Masovian, also had small, significantly lower employment in the national furniture industry.

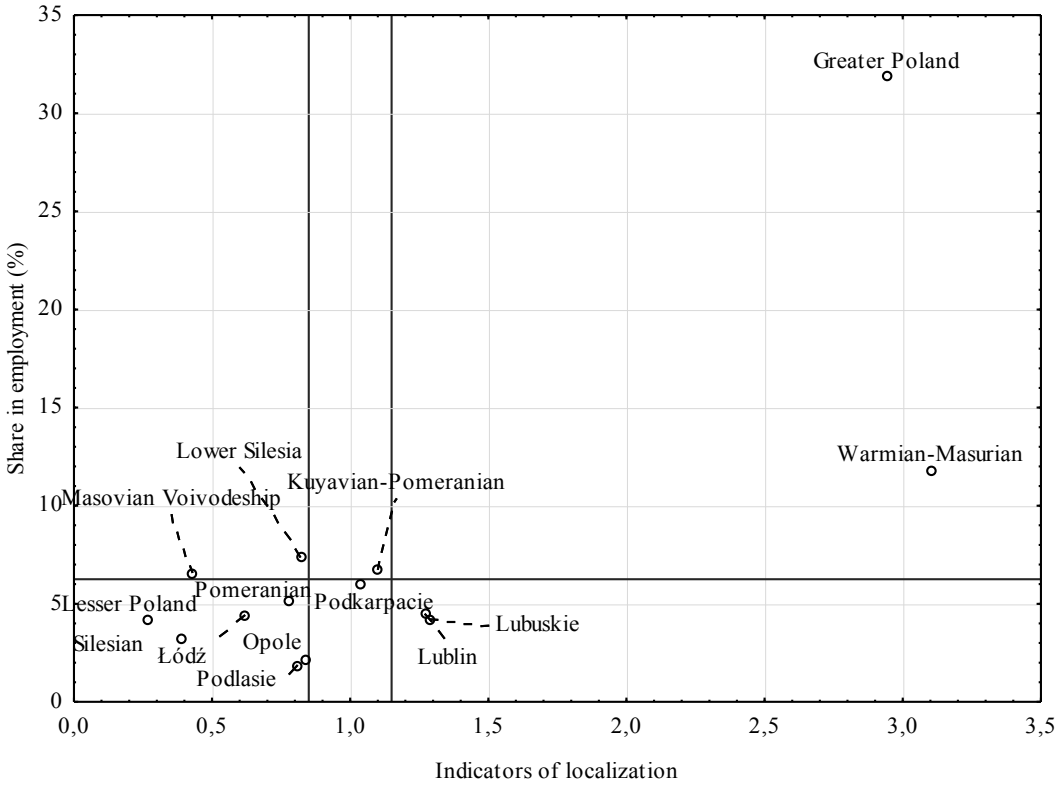


Figure 3. List of voivodships by the level of the location indicator (variable - employment) and share in the national employment of the furniture industry in 2016-2018. Adopted from: own study based on GUS.

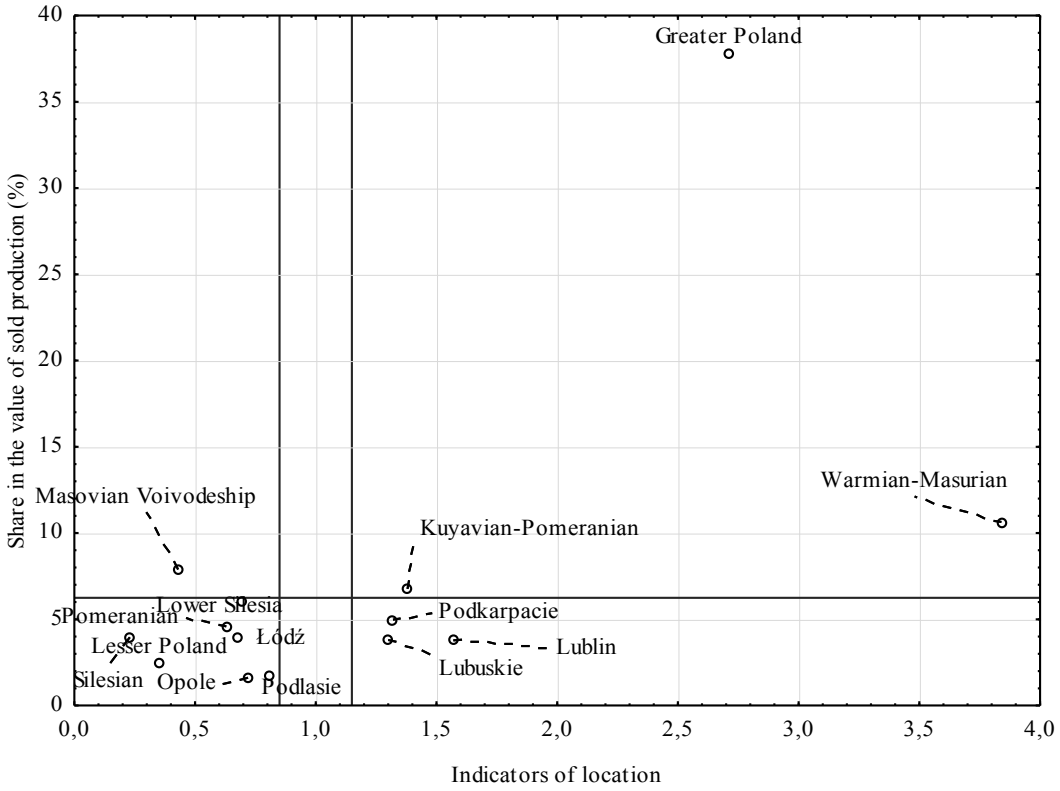


Figure 4. List of voivodships by the level of the location indicator (variable - sold production) and share in the national value of sold production of the furniture industry in 2016-2018. Adopted from: own study based on GUS.

5. Conclusion

The functioning and success of companies and industries depends to a significant extent on location, especially in the context of dynamic competitive processes. This also applies to the important furniture industry in the Polish economy, which achieves a high competitive position in the European and world arena. The study has confirmed the existence of disproportions in the distribution of the furniture industry in the layout of the country's provinces and a clear tendency to spatial concentration. Companies producing furniture are located in all provinces in Poland. However, in the analysed years, the furniture industry was concentrated mainly in several voivodships. The leader's position was held by the Greater Poland Voivodship, which had by far the largest share in the national number of entities, employment and the value of production sold. A large share of employment was also recorded in the case of the Warmian-Masurian and Lower Silesia Voivodships, in the number of entities – Małopolskie and Masovian, and in the number of sold production – Warmian-Masuria and Masovian. In total, 40% of companies from the domestic furniture sector were located in Wielkopolskie, Masovian and Małopolskie Voivodships. More than 51% of the employed industries were concentrated in Greater Poland, Warmian-Masuria and Lower Silesia. In turn, almost 49% of the value of furniture production in Poland was generated in two voivodships: Greater Poland and Warmian-Masurian. These voivodships therefore have the largest share in the construction of the domestic furniture industry.

The location considered interregionally was not fully consistent with the intraregional approach. By far the highest degree of regional specialisation, measured by the location indicator, was recorded in the Warmian-Masurian Voivodship. This means more intensive development of the industry in this region compared to the reference area, i.e. Poland. In the internal structure of the voivodship's economy, the furniture industry was also particularly important in Greater Poland Voivodship. A high localization rate calculated on the basis of the number of entities was recorded in Podlasie Voivodship, and on the basis of employment and production sold in Lublin and Lubuskie Voivodships. The prevalence of the indicated regions over other voivodships may contribute to the competitiveness of these regions.

References

1. Adamowicz, M., Wiktorski, T. (2006). Kondycja i perspektywy rozwoju polskiego przemysłu meblarskiego. *Foresty and Wood technology, nr 56,* pp.1-8.
2. Antonowicz, P. (2014). Zastosowanie współczynnika lokalizacji LQ i krzywej koncentracji w badaniach nad przestrzennym zróżnicowaniem upadłości przedsiębiorstw w gospodarce. *Zarządzanie i Finanse. Journal of Management and Finance, Vol. 12, No. 3/1/2014,* pp.53-63.
3. Bergman, E.M., Feser, E.J. (2020). Industrial and Regional Clusters: Concepts and Comparative Applications/. *2nd ed. Web Book of Regional Science.*
4. Budner, W. (1999). *Lokalizacja przedsiębiorstw*, *materiały dydaktyczne, nr. 55*. Poznań: Akademia Ekonomiczna.
5. Budner, W. (2007). Czynniki lokalizacji inwestycji a możliwości rozwoju ekonomicznego gmin w Polsce. *Acta Scientiarum Polonorum. Administratio Locorum, Nr 6(3)*, pp.43-58.
6. Ciupiński, D., Łukiewska, K. (2015). Konkurencyjność międzynarodowa przemysłu meblarskiego w Polsce na tle krajów UE. In: J. Olszewski (Eds.), *Gospodarka Światowa i Krajowa jej wyzwania we współczesnych czasach.* Szczecin: Wydawnictwo IVG.
7. Dyba, W. (2017). Klastry meblarskie na tle struktury przestrzennej przemysłu meblarskiego w Polsce. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego, 31(1),* pp. 38-51.
8. Dyba, W., Stryjakiewicz, T. (2014). Inicjatywy klastrowe jako szansa rozwoju przemysłu meblarskiego w Polsce w warunkach kryzysu – przykład Swarzędzkiego Klastra Producentów Mebli. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa Geograficznego, 27*, pp. 181-196.
9. Firlej, K. (2009). Lokalizacja przedsiębiorstw przemysłu spożywczego w fazie transformacji. *Roczniki Naukowe SERiA, T. XI, Z. 1,* pp. 84-89.
10. Gastwirth, J., Modarres, R., Buar, E. (2005). The use of the Lorenz curve, Gini index and related measures of relative inequality and uniformity in securities law. *International Journal of Statistics, vol. LXIII, n. 3,* pp. 451-469.
11. Godlewska-Majkowska, H. (2009). Lokalizacja jako uwarunkowanie strategii przedsiębiorstwa. In: K. Kuciński (Eds,), *Strategie przedsiębiorstw wobec wymogów zrównoważonego rozwoju*, Seria Wydawnicza: Przedsiębiorstwo Współczesne. Warszawa: KNoP SGH.
12. Grzybowska, B. (2012). *Innowacyjność przemysłu spożywczego w Polsce – ujęcie regionalne.* Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego.
13. Hildebrand, G., Mace, M. (1950), The Employment Multiplier in an Expanding Industrial Market. *Review of Economics and Statistics, No. 32.*

14. Huczek, M. (2012). Środowisko innowacyjne źródłem rozwoju regionu. *Zeszyty Naukowe Wyższej Szkoły Humanitas. Zarządzanie, nr 2,* pp. 19-35.
15. Huyen, Vu, Tian, G., Khan, N., Zada, M., Zhang, B., Nguyen, T. (2019). Evaluating the International Competitiveness of Vietnam Wood Processing Industry by Combining the Variation Coefficient and the Entropy Method. *Forest Management Strategies for an Ecologically, Economically and Socially Sustainable Future, 10(8) 703,* pp. 1-17.
16. Juchniewicz, M., Łukiewska, K. (2014). *Konkurencyjność wybranych branż polskiego gospodarki na rynku Unii Europejskiej*. Olsztyn: Polskie Towarzystwo Ekonomiczne Oddział w Olsztynie.
17. Kaczorowska, Z., Staniec, I., Szczygieł, N. (2019). Analiza rynku meblarskiego. *Zeszyty Naukowe Politechniki Łódzkiej, Organizacja i Zarządznie, Nr 1225, z. 72,* pp. 95-111.
18. Kardas, M. (2011). Inteligentna specjalizacja – (nowa) koncepcja polityki innowacyjnej. *Optimum. Studia Ekonomiczne, nr 2(50).*
19. Kleiber, Ch. (2005). The Lorenz curve in economics and econometrics, *Technical ReportsTechnische Universität Dortmund, No. 30*, pp. 1-20.
20. Kryzia, D. (2016). Poziom konkurencji na światowym rynku gazu ziemnego. *Polityka energetyczna – Energency Policy Journal, nr 19(2)*, pp. 47-64.
21. Kuciński, K. (2001). Lokalizacja jako element kształtowania pozycji rynkowej firmy (na przykładzie fabryki samochodów Opel). In: I. Fierla, K. Kuciński (Eds.), *Lokalizacja przedsiębiorstw a konkurencyjność, Materiały i Prace IFGN, t. LXXVI.* Warszawa: SGH.
22. Naldi, M., Flamini, M. (2014). *The CR4 index and the interval estimation of the Herfindahl Hirschman Index: an empirical comparison*. Retrieved from https://ssrn.com/ abstract=2448656.
23. Pavic, I., Galetic, F., Piplica, D. (2016). Similarities and Differences between the CR and HHI as an Indicator of Market Concentration and Market Power. *British Journal of Economics, Management & Trade, vol. 13(1),* pp. 1-8.
24. Plawgo, B., Chilicka, E. (2008). Lokalizacyjne uwarunkowania konkurencyjności przedsiębiorstw sektora rolno-spożywczego w województwie podlaskim. In: A.F. Bocian (Eds.), *Rozwój regionalny a rozwój zrównoważony.* Białystok: Wydawnictwo Uniwersytetu w Białymstoku.
25. *Rocznik Statystyczny Przemysłu* (2019). Urząd Statystyczny w Katowicach.
26. *Rocznik Statystyczny Województwa Dolnośląskiego* (2019). Urząd Statystyczny we Wrocławiu.
27. *Rocznik Statystyczny Województwa Kujawsko-Pomorskiego* (2019). Urząd Statystyczny w Bydgoszczy.
28. *Rocznik Statystyczny Województwa Lubelskiego* (2019). Urząd Statystyczny w Lublinie.
29. *Rocznik Statystyczny Województwa Lubuskiego* (2019). Urząd Statystyczny w Gorzowie Wielkopolskim.
30. *Rocznik Statystyczny Województwa Łódzkiego* (2019). Urząd Statystyczny w Łodzi.

31. *Rocznik Statystyczny Województwa Małopolskiego* (2019). Urząd Statystyczny w Krakowie.
32. *Rocznik Statystyczny Województwa Mazowieckiego* (2019). Urząd Statystyczny w Warszawie.
33. *Rocznik Statystyczny Województwa Opolskiego* (2019). Urząd Statystyczny w Opolu.
34. *Rocznik Statystyczny Województwa Podkarpackiego* (2019). Urząd Statystyczny w Rzeszowie.
35. *Rocznik Statystyczny Województwa Podlaskiego* (2019). Urząd Statystyczny w Białymstoku.
36. *Rocznik Statystyczny Województwa Pomorskiego* (2019). Urząd Statystyczny w Gdańsku.
37. *Rocznik Statystyczny Województwa Śląskiego* (2019). Urząd Statystyczny w Katowicach.
38. *Rocznik Statystyczny Województwa Świętokrzyskiego* (2019). Urząd Statystyczny w Rzeszowie.
39. *Rocznik Statystyczny Województwa Warmińsko-Mazurskiego* (2019). Urząd Statystyczny w Olsztynie.
40. *Rocznik Statystyczny Województwa Wielkopolskiego* (2019). Urząd Statystyczny w Poznaniu.
41. *Rocznik Statystyczny Województwa Zachodniopomorskiego* (2019). Urząd Statystyczny w Szczecinie.
42. *Rynek meblarski w Polsce*. (2017). KPMG. Retrieved from; https://assets.kpmg/content/dam/kpmg/pl/pdf/2017/06/pl-Raport-KPMG-Rynek-meblarski-w-Polsce-2017.pdf.
43. Skawińska, E. (2002). *Konkurencyjność przedsiębiorstw – nowe podejście.* Warszawa-Poznań: PWN.
44. Sujova, A., Hlavackova, P., Marcinekovam, L. (2015). The trade competitiveness of furniture products. *Drewno, Vol. 58, No. 195*, pp. 101-115.
45. Ulbrych, M. (2016). Przemysł meblarski w Polsce i jego międzynarodowa pozycja konkurencyjna. *Ekonomia Międzynarodowa, 13,* pp. 38-52.
46. Waldziński, D. (2005). *Polityka regionalna w Polsce w procesie przemian kulturowocywilizacyjnych.* Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie
47. Wang, X., Hofe, R. (2007). *Research Methods in Urban and Regional Planning*. New York: Springer.
48. Wieloński, A. (2005). *Geografia przemysłu.* Wydawnictwo Uniwersytetu Warszawskiego.
49. Wysocki, F., Lira, J. (2003). *Statystyka opisowa*. Wydawnictwo Akademii Rolniczej im. Augusta Cieszkowskiego w Poznaniu.
50. Zielińska-Głębocka, A. (2003). *Potencjał konkurencyjny polskiego przemysłu w warunkach integracji europejskiej.* Wydawnictwo Uniwersytetu Gdańskiego.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE POTENTIALS OF CRM APPLICATION IN THE PUBLIC SECTOR

Thao Phuong MAI[1*], Regina Zsuzsánna REICHER[2]

[1] University of Danang, Vietnam; thao.mai@vnuk.edu.vn: ORCID: 0000-0003-3184-0590
[2] Óbuda University, Hungary: reicher.regina@kgk.uni-obuda.hu, ORCID: 0000-0003-3929-6331
* Correspondence author

Purpose: The interest in the possibility of CRM application in the public sector has begun to emerge again recently with the development of e-government. In this paper, we show the optimistic support to the application of the CRM implementation in the public sector.
Design/methodology/approach: In this study, we attempted to explore the potentials of CRM application in public sectors by reviewing the existing literature on the traditional CRM concepts as well as in the context of government over the last decades.
Findings: CRM has not been utilised commonly by governments due to the number of complexities that needed to be more investigated and fixed by resolutions. A number of researchers have figured out the big gaps between private and public sectors which lead to difficulties in apply CRM in public services.
Social implications: This paper would be the initial foundation for our coming empirical research to get more insights into this area as we do believe that the implementation of CRM in the public sector is an emerging research potential that is valuable and significantly beneficial to the scientific innovation relating to government operation.
Originality/value: The paper reviewed existing findings to provide a better understanding of the field and figured out the main potentials of CRM in promoting government reputation, engaging citizens to the operating system, and improving the quality of service delivery in the public services system.

Keywords: Customer relationship management, CRM application, public sector, government.

Category of the paper: Conceptual paper, Literature review.

1. Introduction

In the constant development of society and community, good governance is recently recognised by the residents of a country through their satisfaction with the quality of life as well as their interaction with the government, especially in public administration works. In the traditional definition, the term "satisfaction" refers to the evaluation of customers about

how good a product or a service meet their expectations (Soudagar et al., 2011), which is commonly used in private sectors (business, service industries). Regarding specialised definition, satisfaction is defined as "the number of customers, or percentage of total customers, whose reported experience with a firm, its products, or its services ratings exceeds specified satisfaction goals" (Farris et al., 2010). Consumer satisfaction based on the habits of the innovation development in companies and in public services too. This habit is an expectation in the industry 4.0. (Eisingerné et al., 2019). Public services have become one of the most important concerns of governments across the world. According to Al-Khouri (2012), governments constantly effort to find themselves obliged more than ever to get closer to their residents by developing their governing systems that meet the resident's expectations. With the more modernised society and the highest quality of life than ever, people are having higher demands in any aspects of their life. More particularly, people tend to expect the service in the public sector to be as convenient and good as the way that, for the most part, they have enjoyed in the private sectors. Tembo (2012) stated that with today's international vision, a progressive government is the one that always sticks to its citizens on the path of progress harmonising their needs and requirements, together with providing a willing ear to hear their voices. The most important thing to do for good governance is to put a strong focus on enhancing the role of civil society as well as improving daily citizen demand. In order to achieve this goal in good governance, governments need to not only place their residents at the heart of government's work but also fundamentally change the governance system to the way of citizen centric. In other words, it is necessary for governments to push themselves to deliver high quality services; simultaneously, integrate governmental services with the key strategy of citizen-centric service. This strictly demands an efficient government working system that is concentrated on managing the relationship between the residents/ citizens and the government (Al-Khouri, 2012).

Over the past decades, Customer Relationship Management (CRM) has been increasingly become an interest in both practice and research and developed into an area of major significance. With the central focus on building a strategically long-term and mutually beneficial relationship between the organisation and customers (Siragher, 2001), the CRM has been regarded as a powerful and a holistic strategic approach and successfully applied by private/ business sectors to optimize customer relationships as well as to create shareholder value. By adopting the CRM model, the decision makers in the companies are able to improve an customer based marketing strategy. Eisingerné et al (2014) examined the decision making process in a special consumer behaviour group, in stepfamilies. But she realised, neither the small and middle size companies nor the public sector use CRM methods to understand this special consumer behaviour group. (Eisingerné et al., 2014). It could not be denied the significance of the CRM recently in its contribution to the more efficient operation in business sector around the world. This has led to a fact that CRM has grabbed more attention for further research on its extended application in recent years, not only within in private sector, but also

in the public sector domain. As mentioned by Schellong (2005), the rising interest about the possibility of CRM's application in public sector began to be emerged a decade ago with another used relevant term Citizen Relationship Management. Since then, many CRM research and publication mainly driven by the private industry have shown the opportunities for the CRM to work well in the public sector. In this paper, we would like to show the optimistic support to the implementation of the CRM in the public sector, particularly in the governmental system of operation. With this goal, the paper reviews existing literature to provide a better understanding of the field for relevant future research.

2. A Review on the Customer Relationship Management (CRM)

According to Dowling (2002), CRM had derived from the two distinctive origins: One is from the United States which was stimulated by technology development associated with customer-based technology solutions; And another is from Scandinavia and Northern Europe where to aim to strengthen the marketing strategies in connection with the Industrial Marketing and Purchasing (IMP) Group. The later one was established for developing knowledge of the nature and impacts of building trust-based and long-term relationships between businesses and customers. This scholar explained the reasons for the constant evolvement of CRM over the decades is because it is built fundamentally based on understanding customer demands and solve the problems or deliver benefits that bring about apparent costumers' value. At the same time, it could not be denied the vital role of information technology in the concept of CRM since it is regarded as the most important instrument designed for supporting customer relationships, rather than to drive this. Dowling (2002) emphasised that this help develop the deep and meaningful relationships between business-to-business or business-to-customer where all of the firm' actors and involving people are well engaged.

As analysed through academic works of literature regarding CRM's origin, there are two main streams of research for forming the theoretical foundation of a CRM concept which are the strategic stream in the connection with relationship marketing and the technological stream associated with the information systems (Agrebi, 2006; Triki, and Zouaoui, 2011). The term of CRM is basically clarified by leaning main these two terms: relationship marketing and customer management. Accordingly, Relationship marketing (RM) is a more strategic design for stimulating the long-term interaction and engagement of customers as well as customer loyalty. This is created to stimulate deep and strong connections between business and customers through the open communication approach in order to provide customer with really useful information that directly meets their demands and interests. Frow and Payne (2009) stated that this approach has advanced the word-of-mouth activity in business and resulted in

the willingness from the customer's side to support the organisation by giving their information and that is the reason why most of the organisations utilise and practice aspects of the RM. On the other hand, according to Al-Khouri (2012), whilst CRM is known as the integration of processes including different functions in customer relationship, customer management is more focused on tactical aspects of CRM implementation only relating to managing customer interaction; for example, sales force automation, sale campaign and call centre management (see more details at the figure 1 proposed by Frow, and Payne, 2009).

In fact, the definitions and descriptions of the term CRM are defined by varying authors and therefore used varied greatly amongst organizations. In general meaning, the focal concept of CRM is to establish a long-term and value-added relationship between businesses and customers. As viewed from a business strategy perspective, CRM is concentrated to deal with how an organisation can increase the shareholder value thanks to building superior customer relationships by the combination between information technology and marketing strategies (Glazer, 1997; Payne, 2005). From a business perspective, CRM is determined as a business strategy in which the use of technology is multiplied and applied in every single process in business in order to build up the retention and customer loyalty overtime (Crosby, and Johnson, 2001; Smith, 2001). Furthermore, CRM also represents for methodologies, technologies, and e-commerce capabilities used by companies to manage customer relationships (Stone, and Woodcock, 2001).

Figure 1. Relationship marketing, CRM and customer management Source: Frow and Payne (2009).

From these different perspectives of CRM definitions, it could be seen clearly that there are main three key dimensions in the term of CRM. The initial dimension is business strategy concentrated on the customer in which CRM is established basically based on managing customers such as acquiring information on different aspects of customers with the aim to build beneficial relationships. However, Al-Khouri (2012) claimed that this dimension might overlook a comprehensive commitment of the organisation's staff and the management that is

also essential for the best service to customers as well as satisfying their needs, then directly impacting on the effectiveness of CRM. The second dimension associated with CRM definition is the business process which enables the interaction between a business and customers. According to Mendoza et al (2007), any direct and indirect interaction between a business and its customers should be assessed and analysed as the business processing. Thirdly, the factors of technology and management are mainly involved in the CRM. With this dimension, one part is focused on technology capabilities that help organisations strengthen efficiency in communicating with customers, understanding customer behaviour as well as responding to customers with more accurate information (Chen. and Popovich, 2003). In addition, with the assumption that CRM has always changed to comprehend the organisation and people, the other part of this dimension cannot deny the continuous corporate change in culture and processes in CRM. Apart from the main three dimensions in defining CRM, the strategy has played the critical role and cannot be missed in any terms of CRM (Newell. 2003; Starkey, and Woodcock, 2002; Crosby, 2002; Yu, 2001). Accordingly, Roberts-Witt (2000) emphasised that the CRM strategy must determine the "what" and "how" elements in a businesses' aim for building a "single integrated view of customers" and maintaining the ‘customer-centric approach’ to satisfy their customers’ needs. Furthermore, the CRM strategy needs to consider the needs and behaviours of customers to the business so that the stronger relationship between business and customers is built together with public value is created (Coltman et al., 2003).

Competitive environment and competitors definitely make necessary efficiency and strategy or the so-called management whose goal is not merely to control. (Gyenge, Buresch, and Kozma, 2013). Nowadays it is not enough to think in corporate level, because of the organization and planning of supply chains have become a strategic area, the companies’ presence in the supply chain play an important role in their growth and expansions. Supply chain management provides many advantages to companies connected to the chain. Due to organizational techniques and a high degree of coordination, work sharing and capacity utilization improve (Kozma, 2017).

3. The complexity in Customer Relationships Management in Government

Improving the relationship between governments and their residents has become a priority of governments. Furthermore, administrative capabilities and practices have been often proposed for debates and discussions about governmental obligations to the citizens. Yet, the public administration, which is regarded as one of the most important roles in how a government exerts the power within its society, is often overlooked in the classical references to this vital relationship (Schellong, 2005). As argued by Blanchard, Hinnant and Wong (1998) that the philosophical foundations of the administrative component of the public sector are

uncommonly discussed, with some exceptions. In the meanwhile, residents of a government have experienced the direct impacts of public policies and governance structure of their government through daily interaction with the public administration, specifically in the health care sector, taxation and other public services bodies. Therefore, improving public services is not a new idea when the term of New Public Management emerged in the late 1970s as a normative model that was focused on the role of public administrators, public services and their goals (Denhardt, and Denhardt, 2003). Accordingly, the "customer driven" government was caught the attention of public servants as well as researchers. However, the New Public Management somehow was restricted one-side understood and only emphasised on the possibilities of economic controlling, at the same time, disregarded the service processes and their target group – the citizens (Lenk, and Traunmüller, 2002). In the 1990s, the customer approach in public services was increasingly raised by the government's attention (Swiss, 1992; Kaboolian, and Kelman, 1993; Barnes, 1995). According to the notion of customer approach, the citizen's role in public services is deconstructed as a consumer and this led to emerging more concerns by many academia at that time (Carroll, 1995; Hood, 1996; Box, 1999). Regarding the concerns, Box (1999) figured out that with repositioning citizens as customers, the relationship between government and citizen is therefore redefined from an interactive political engagement to a passive commercial transaction. Furthermore, Barnes (1995) also argued that offering the citizens more options in experiencing the public services would be beneficial; Yet, the main objective should be focused on gaining mechanisms that help improve citizen's voice options in public services. Once again, reconsidering the role of the citizen in public services has been transformed into a newer term called citizen-centric approach since the 2000s. Since then, this approach was suggested to be the focal foundation for government work. Al-Khouri (2012) emphasised that in order to conscientiously manage the relationship of citizens with the government, the paramount thing needed to be done by the government is managing the ever-changing roles of the citizens.

In the private sector, the management of customer relationships is generally relatively simpler. To be more specific, by focusing on a business objective of higher revenue generation driven by higher customer satisfaction, the customer and their demand of a private firm to some extent is more obviously defined; And hence, the products or services are processed for customer delivery. The nature of the customer relationship between government and citizen is much more complex with the engagement of a government in which the citizen is regarded as part of the government, at the same time, as a customer. As claimed by Tembo (2012), the term of citizen itself is dynamic since one citizen can simultaneously play multiple roles in a society like a resident, an employee and a service provider that in themselves include a complex network of formal and informal interactions. This complexity in nature would be not only difficult to disentangle, but also more challenging for taking the specific citizen relations into account when it is surrounded by other multiple external relations, interests, and influences (Tembo, 2012). In public services, delivering services by government across the various roles

and relationships with the citizen are intensively demanding in the combination with the high expectations by the citizen. As a result, meeting these high demands and expectation, along with ensuring the citizens' satisfaction to public services have become more challenging to the government. In other words, identifying clearly the customer role of citizens within their multiple interactions with the government is the real problematic issue that should be taken into account in customer relationship management in the public sector. Moreover, the public services system has been known as a structure including high standards, strict regulations and policy and the presence of multiple legacy systems which lead to the long procedure of response to customers. This results in the consequence that the simple process of widespread data collection becomes more complicated and more challenging to approach. In addition, the customer channels in public services need to be approachable and actively responsive to the public at any time that still goes beyond the original CRM system. It is also concerned that any governmental work itself has always stuck to a plethora of rules, policies, regulations as well as standards which makes the functions of CRM implementation all the more challenging.

4. Why should CRM be applied by Governments?

4.1. Boosting government reputation through CRM

Although the majority of research in reputation focused on private sectors, especially in the fields of business/enterprise, it does not mean that the concept of reputation is restricted to them. As stated by Fombrun (1996) and Davies et al. (2003), reputation could be relevant across many different types of organisations and even to countries and individuals. Having the same perspective, Passow et al. (2005) identified the similarities between private and public sectors in which a public sector also has staff, a vision and a strategic concept, and depends on resources and supportive behaviour. Furthermore, social responsibility in public organisations are more significant than in private organisations. In general, the function of public sectors, to a large extent, can be similarly compared with the management system of private sectors (Passow et al., 2005). Regarding the concepts discussed, the government reputation is assumed as the aggregate of stakeholders' images of government. Furthermore, Fombrun (1996) claimed that the reputation of an organisation represents the healthy relationships established with its stakeholders. To be more specific, the researcher explained that the quality of the relationship between an organisation and its customers shapes the image of the organisation, which is developed by the engagement of customers, at the end, the image contributes to building the reputation of the organisation. This assertion therefore enables the consideration of CRM application in the aspect of reputation.

The application of CRM systems in the public sector is regarded as a strong initiative for strengthening the proximity between government and citizens (Neff, and Kvandal, 2001). Heek (2001) also supported this statement by arguing that the relationship between government and citizen goes beyond the needs of public service and this relationship should be promoted by the implementation of new technologies and strategies along with the constant development of society. There is a fact that public sectors have also put their efforts to establish customer-focused strategies in order to improve the reputation of the government and eliminate the traditional view that governmental services are inefficient, bureaucratic, and waste taxpayers' money (Bannister, Remenyi, and Batista, 2003). The previous section has determined that improving the relationship between government and citizen requires a stronger customer-focused orientation, better strategic day-to-day management and operating activities together with the more effective communication with citizens, especially more focusing on the recognition of customers' needs and preferences. Once the relationship is enhanced, the reputation of the government is certainly promoted. This part again emphasises the importance of the meaning of "customer" embraces different stakeholders in CRM which are considerably addressed on Corporate Reputation theory: employees and consumers (Bannister, Remenyi, and Batista, 2003). There have been many studies on the impact of the direct interaction between the customer and the employees of an organisation on the perceptionof customers to the organisation as well as on the external image of the organisation. Accordingly, a study conducted by Davies et al. (2003) claimed that a positive image can be built when employees of an organisation who directly faced and deal with customers are empowered to respond to customer needs and when they feel trusted to run the business. In the meanwhile, as mentioned by Johnson (2000) that organisations in the information age could not only concentrate on efficiency, but only on other aspects involving employee relationship management. Specifically, an innovative business paradigm would include business initiatives towards their employees such as establishing trustiness and openness, enhancing participatory management and team building, and importantly empowering individuals.

It is a fact that in order to develop the reputation of a business or a government, there is one mutual thing that all fields of business need to do is focusing the development strategies. In the area of business, Corporate Reputation Management and Customer Relationship Management are the two elements that any business must not miss when running a business. Although there are differences in origins and business approaches, these two elements have a main common significant aspect which is the development of customer-focused strategies (Bannister, Remenyi, and Batista, 2003). Accordingly, these strategies are oriented for improving not only customers' satisfaction and loyalty, raise financial performance, but also organisational operating performance and from that building a positive organisational image. A number of previous studies figured out some typical aspects relating to building a reputation from both Corporate Reputation theory and CRM aspects and linked them to government context. It could not deny some strong arguments claimed by Davies et al. (2003)

that multiple stakeholders need to be considered as the main tenets of CRM. The system of CRM consists of all interaction channels of customers and combines all this data for analysing and resulting in a single customer view as well as creating a consistent level of service across channels. It was emphasised that CRM is not only about "electronic" service delivery or online interactions since one of its premises is the improvement of organisational capability for delivering seamless services to customers regardless of the point or meaning of interaction. From this clarification, studies conducted by Davies et al. (2003) focused on the multiple interactions and employee engagement for building the reputation of an organisation, especially regarding the government context. They strongly stated that CRM solutions can support governments to improve the reputation through allowing them to track a customer through a number of interactions among is the channels of contact and also enabling the development of joined up services. As the same as the business system, CRM can provide seamless coordination between all customer-facing functions in the public sector.

4.2. Citizen Engagement Becomes Easier and More Accessible

As claimed by Andreassen (1994) that public services are homogeneous in which the difference in market segments is not reflected. Consequently, it would be beneficial to governments when their system can understand the segments with regard to factors influencing customer satisfaction level and the technology of CRM certainly can help governments deal with this. Specifically, CRM's solutions regarding segmentation tools can group customers according to established common patterns. By doing this, public departments are able to interact with a greater number of citizens aiming to different groups or segments needs and preferences. In addition, Berman (1997) proved his excellent argument that the reputation of a government could be improved through clarifying to its residents to understand what the government does and how it serves the interests of the public; At the same time, engaging customers into decision-making processes and more concentrating on public satisfaction by the improvement of organisational performance. Specifically, Berman explained that by applying the CRM approach, the initiative regarding public services such as public information channels, inputting channels for listening to citizens could be comprehended and the quality of public services are improved through the received inputs by citizens. This operating system would bring about a more responsive and proactive public organisation in pursuing community wide goals and enable the citizen's involvement in public policy making. Kell (1993) also addressed these aspects by focusing on obtaining citizen's feedbacks, taking actions upon the feedback to make improvements, sending the improvements back to the public through direct communication, and receiving citizen feedbacks again (see Figure 2). For adding to this argument, Moore (2003) showed that the focal point of public engagement is based on unrecognized assets, gifts, and capacities of citizens in order to discover their motivation to act, simultaneously, capture the government's resources for supporting citizen's activities. Furthermore, the development of trust needs to be also based on considering the sense of belonging that serves the emotional needs of individuals (Berman, 1997).

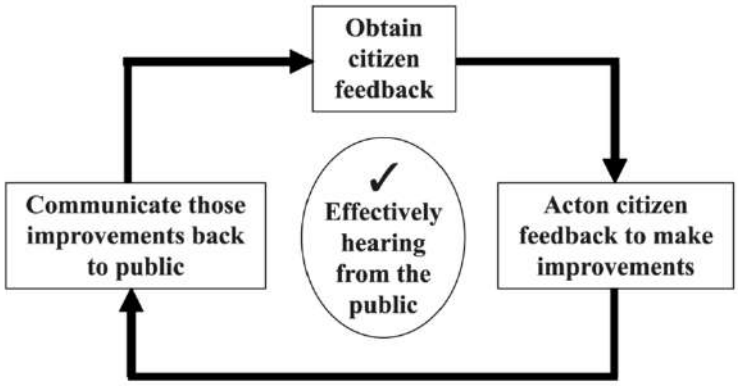


Figure 2. Effectively hearing from the public Kell (1993).

4.3. Improve the efficiency and the processing time of public service delivery

Services in public sectors have become more sensitive in terms of requirements, preferences and expectations of the citizens which are considered as the prioritised target of governments in comprehending and reforming their policies. Phala (2007) mentioned that citizens are now more engaged with the government in showing their points of view or the manner of choice which has shown a profound transformation in the service structure of the governments. In this sense significant elements in management such as access, speed of response and delivery, service quality, consultation, privacy, being treated with dignity and respect have become the vital foundation of managing the relationship between the government and citizens; In other words, managing the customer relationship in the public sector. According to Silva and Batista (2007), the strategic and practical aspects of CRM can strongly drive the organisational change towards customers. Practically, organisations can adjust or comprehend their operational procedures in order to improve the quality of their services to customers through a broader and integrated manner. The general concept of CRM function in public services is that CRM rearranges systems in a place in which all channels of interaction with customers are combined to provide a consistent level of service across channels as well as a single customer view (Dean, 2001). It is no doubt that CRM has recently become popular in the public sector in a number of countries around the world, especially in developed countries such as Singapore, United Kingdom, United Arab Emirates and other European countries where the application of CRM is somehow presented as the key element of the e-government system. One of the most important measurements for the effectiveness of CRM implementation in the public sector must be the practical efficiency of public services delivery when CRM is applied and its real impact on citizen quality of life. Silva and Batista (2007: 601) emphasised that "As a matter of practice, CRM implementation enables a series of different organizational capabilities".

There was an inspiring example of service quality improvement with applying CRM in Italy reported by the European Commission (2017). Specifically, the City Council of Milan launched a new project named "Complaint Front Office for Service Quality" which used the CRM integrated with other operation channels in April 2015. This project was regarded as

a breakthrough of reorganising the back offices and rationalising in the number of civil servants engaged in the service. According to the results of the project, after more than 1 year of project running (from April 2015 to August 2016), all 33,000 information requests submitted to the system by citizens were responded with shorter processing time. The Integrated CRM provided access to the Planning and Control Department to the citizens' requests in which staff were able to analyse and categorise the requests then continued to deliver the requests to the departments receiving the complaints to consider improving the services they are responsible for. By doing that, the Communication Department, the CEO office, the IT Department and the Planning and Control Department have involved and contributed to determining the specific framework for claim lodging (European Commission, 2017). This implementation was evaluated as an impressive track record and quick response to the citizens regarding the improvement of public services' quality.

One of the most typical areas that CRM implementation has proven its effectiveness and significant contribution to the improvement of service delivery is the educational sector, especially in higher education institutions around the world. Nowadays, higher education institutions could be regarded as human-oriented companies that produce highly educated people (EspoCRM, 2020). In other words, higher education institutions are complex organisations including diverse stakeholders such as students, academic and non-academic staff, regulatory bodies, government and other universities as the partners; and the goods that higher education institutions provide to their customers are not tangible products or services, but knowledge (Seeman, and O'Hara, 2006). However, a study on CRM adoption in higher education institutions conducted by Rigo, Pedron, Caldeire and Araujo (2016) claimed that the most important stakeholders of the institutions are definitely students. In this line, the success of a higher education institution is tightly bound to the students' satisfaction in which maintaining the strong relationship between the institution and students is the key to enhancing the efficiency and performance in education as well as improving the education quality of the institution. Therefore, CRM strategy has continued to have a huge potential for implementation in the education area of public services with the specific strategy for CRM solution created by the requirements of all stakeholders including the professionals, academic and non-academic staff, higher management level apart from the IT solution.

In recent years, a large number of universities or higher education institutes around the world have been implementing CRM systems as an effective initiative for their service delivery quality. As studied by Seeman and O'Hara (2006), the development and implementation of CRM were examined in a higher education institution and the findings showed by implementing CRM in a state community college. Accordingly, the research findings showed that the higher education institution significantly enhanced their quality of the university service, increased student loyalty, retention and satisfaction with the college's programs through the student-centric focus to improve customer data and process management. In reality, several feedback on the effectiveness of utilising CRM system in higher education institutions has been provided by the institutions adopting it. Feedback claimed by a representative of the Stockholm School

of Economics showed that one of the greatest advantages of the CRM system is helping the University to focus on the right recruitment activities and enhancing communications with both prospective and current students. Hence, utilising a CRM system has been considered as a great improvement for our recruitment and admissions processes (Knasys, 2015). Westminster University has also applied the CRM system for a long time and the representative of the University mentioned that our CRM service has been successful with the effectiveness of the digital event management system. The CRM allows them to maximise the productive online data/information process provided by students in any events. At the same time, the University is able to offer improved user experience while also harnessing better quality data for the university's marketing efforts (Knasys, 2015).

Conclusion

In this study, we attempted to explore the potentials of CRM application in public sectors by reviewing the existing literature on the traditional CRM concepts as well as in the context of government over the last decades. It is no doubt that there have been many studies conducted to explore the high potentials of CRM function in the government, and in public services in particular. However, CRM has not been utilised commonly by governments due to the number of complexities that needed to be more investigated and fixed by resolutions. A number of researchers have figured out the big gaps between private and public sectors which lead to difficulties in apply CRM in public services. However, It could not also deny a fact that along with the emergence of e-government, CRM solution has recently become popular in the public sector in a number of countries in the world, especially in developed countries where e-government have been applied commonly and CRM is somehow presented as the key element of the e-government system. There has been a number of shreds of evidence showing that CRM implementation has contributed to promoting government reputations through improving the vital link or relationship between government and citizen. Furthermore, the CRM system also helps directly engage citizens in the operating system as well as in the process of policy decision making of the government, and certainly improve the quality of service delivery in the public services system. The implementation of CRM in the public sector would be still regarded as big concerns to many governments due to the complex concept government as well as the big difference in structure between the private and public sectors. Therefore, the efficiency of CRM implementation in governments needs to be supported by empirical evidence by future research aimed at studying CRM and its application in the government context. In this line, this paper would be the initial foundation for our coming empirical research to get more insights into this area as we do believe that the implementation of CRM in the public sector is an emerging research potential that is valuable and significantly beneficial to the scientific innovation relating to government operation.

References

1. Al-Khouri, A.M. (2012). Customer Relationship Management: Proposed Framework from a Government Perspective. *Journal of Management and Strategy, 3(4),* 34-54.
2. Andreassen, T. (1994). Satisfaction, Loyalty and Reputation as Indicators of Customer Orientation in the Public Sector. *International Journal of Public Sector Management*, *7(2),* 16.
3. Bannister, F., Remenyi, D., and Batista, L. (2020). *Potentialities of customer relationship management in the building of government reputation*.
4. Barnes, M., and Prior, D. (1995) "Spoilt for Choice? How Consumerism can Disempower Public Service Users". *Public Money & Management,* 53-58.
5. Berman, E. (1997). Dealing with Cynical Citizens. *Public Administration Review*, *57(2)*.
6. Blanchard, L.A., Hinnant, C.C., and Wong, W. (1998). Market-Based Reforms in Government – Toward a Social Subcontract? *Administration & Society*, *30(5),* 483-511.
7. Box, R. (1999). Running Government like Business: Implications for Public Administration Theory and Practice. *American Review of Public Administration*, *29(1),*19-43.
8. Carroll, J. (1995). The Rhetoric of Reform and Political Reality in the National Performance Review. *Public Administration Review*, *55(3),* 302-312.
9. Chen, I.J., and Popovich, K. (2003). Understanding customer relationship management (CRM): People, process and technology. *Business Process Management Journal*, *9(5),* 672-688.
10. Coltman, T., Devinney, T.M., and Midgley, D. (2003). *Strategic Drivers and Organizational Impediments to eBusiness Performance: A Latent Class Assessment*. AGSM Working Paper Series.
11. Crosby, L. (2002). *Exploding some myths about customer relationship management*. Managing Service Quality.
12. Cutler, M., and Sterne, J. (2000). *E-Metrics: Business Metrics for the New Economy*. NetGenesis and Target Marketing.
13. Davies, G., Chun, R., da Silva, R. and Roper, S. (2003) *Corporate Reputation and Competitiveness*. London: Routledge.
14. Dowling, G. (2002). Customer Relationship Management in B2C Markets, Often Less is More. *California Management Review, 44(3),* 87-104.
15. Eisingerné, B.B., Józsa, L. (2014). Does blood count? Buying decision-making processes in stepfamilies. *Science Journal of Business and Management, 6,* 163-169.
16. Eisingerné, B.B., Rámháp, S. (2019). Innovation development methods for small- and medium-sized enterprises based on the trends/requirement of industry 4.0, In: M. Bezpartochnyi (Ed.), *Przeworsk* (pp. 251-274). Poland: WSSG.

17. EspoCRM (2020). CRM for Education, available at: https://www.espocrm.com/industries/education/, 20 May 2020.
18. European Commission (2017). *Quality of Public Administration A Toolbox for Practitioners.* Luxembourg: Publications Office of the European Union.
19. Farris, P.W., Bendle, N.T., Pfeifer, P.E., and Reibstein, D.J. (2010). *Marketing metrics*: *The definitive guide to measuring marketing performance.* Upper Saddle River, NJ: Pearson.
20. Fombrun, C. (1996). *Reputation, Realising Value from the Corporate Image.* Cambridge, MA: Harvard Business School.
21. Fox, C. (1996). Reinventing Government as Postmodern Symbolic Politics. *Public Administration Review*, *56(3),* 256-62.
22. Frow, P., and Payne, A. (2009). Customer Relationship Management: A Strategic Perspective. *Journal of Business Market Management, 3(1),* 7-27.
23. Glazer, R. (1997). Strategy and Structure in Information-intensive Markets: the Relationship between Marketing and IT. *Journal of Market Focused Management,* 65-81.
24. Gyenge, B., Buresch, J., Kozma, T. (2013). How to Measure the Efficiency of Management Strategy in Organisational Structure. In: F. Bylok, L. Cichobłaziński (Eds.), *Human Capital and Corporate Responsibility* (pp. 60-72). Poland, Czestochowa: Politechnika Czestochowska.
25. Heeks, R. (2001). Understanding e-Governance for Development, i-Government. *Working Paper Series, Paper No. 11.* Manchester: Institute for Development Policy and Management.
26. Hobby, J. (1999). Looking After the One Who Matters. *Accountancy Age, 28,* 28-30.
27. Hood, C., and Peters, G. (2004). The middle Aging of New Public Management: Into the Age of Paradox? *Journal of Public Administration Research and Theory*, *14(3),* 267-282.
28. Johnson, W. (2002). *New Behaviors, Executive Excellence*, *17(9),* 16.
29. Kell, T. (1993). Negative views undermine public enterprise. *The Public Manager: The New Bureaucrat*, *22(1).*
30. King, S.F. (2007). Citizens as customers: Exploring the future of CRM in UK local government. *Government Information Quarterly*, *24(1),* 47-63.
31. Knasys, M. (2015). *The importance of CRM systems in Higher Education*, available at: https://studyportals.com/blog/the-importance-of-customer-relationship-management-crm-systems-in-higher-education/, 20 May 2020.
32. Kozma, T. (2017). Cooperation in The Supply Chain Network. *Forum Scientiae Economia, 5(3),* 45-58.
33. Mendoza, L.E., Marius, A., Perez, M., and Griman, A.C. (2007). Critical success Factors for a Customer Strategy. *Information Software Technology*, *49*, 913-945.
34. Moore, H. (2003). Building communities: a bottom-up approach. *Public Management*, *Vol. 85(1),* 30.

35. Neff, D., and Kvandal, S. (2001). Connecting Citizens to Government Online. *San Diego Business Journal*, *22(23),* 14.
36. Newell, F. (2003). *Why CRM Doesn't Work.* Princeton, New Jersey: Bloomberg Press.
37. Pan, S.L., Tan, C.W., and Lim, E.T.K. (2006). Customer relationship management (CRM) in e-government: a relational perspective. *Decision Support Systems*, *42(1),* 237-250.
38. Passow, T., Fehlmann, R., and Grahlow, H. (2005). Country reputation – from measurement to management: the case of Liechtenstein. *Corporate Reputation Review*, *7(4),* 309-26.
39. Payne, A. (2005). *Handbook of CRM: Achieving Excellence in Customer Management*. Great Britain: Butterworth-Heinemann.
40. Rigo, G., Pedron, C.D., Caldeira, M., and Araújo, C.C.S. (2016). CRM Adoption In A Higher Education Institution. *Journal of Information Systems and Technology Management*, *13(1),* 45-60.
41. Roberts-Witt, S.L. (2000). It's the Customer, Stupid! *PC Magazine*, *June 27*, IBIZ, 6-22.
42. Schellong, A. (2005). *CRM in the Public Sector: Towards a Conceptual Research Framework,* 326-332.
43. Seeman, D.E., and O'Hara, M. (2006). Customer relationship management in higher education: Using information systems to improve the student-school relationship. *Campus Wide Information Systems*, *23(1),* 24-34.
44. Silva, R., and Batista, L. (2007). Boosting government reputation through CRM. *International Journal of Public Sector Management*, *20(7),* 588-607.
45. Siragher, N. (2001). *Carving Jelly: A Managers Reference to Implementing CRM*. High Wycombe, Bucks: Chiltern Publishing International Ltd.
46. Soudagar, R., Iyer, V., and Hildebrand, V. (2011). *The Customer Experience Edge: Technology and Techniques for Delivering an Enduring.* Profitable and Positive Experience to Your Customers, McGraw-Hill.
47. Starkey, M., and Woodcock, N. (2002). CRM Systems: Necessary, but not Sufficient. Reap the Benefits of Customer Management. *Journal of Database Marketing*, *9(3),* 267-275.
48. Stone, M., and Woodcock, N. (2001). Defining CRM and Assessing Its Quality. In: B. Foss, M. Stone (eds.), *Successful Customer Relationship Marketing* (pp. 3-20). London: Kogan Page.
49. Subban, M., Pillay, P., Bhowan, K., and Raga, K. (2007). Towards Effective Service Delivery via Customer Relationship Management. *Journal of the Centre for the Study of Southern African Literature and Languages, 14(1),* 34-58.
50. Swiss, J. (1992). Adapting Total Quality Management (TQM) to Government. *Public Administration Review*, *52,* 356-362.
51. Tembo, F. (2012). *Citizen voice and state accountability: Towards theories of change that embrace contextual dynamics.* UK: Overseas Development Institute.

52. Triki, A., and Zouaoui, F. (2011). Customer Knowledge Management Competencies Role in the CRM Implementation Project. *Journal of Organizational Knowledge Management,* 1-11.
53. Yu, L. (2001). Successful Customer-Relationship Management. *MIT Sloan Management Review, 42(4),* 81-87.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

MOBILE SIGHTSEEING APPLICATIONS: THE EXAMPLE OF *MAZOWIECKIE REZERWATY PRZYRODY*

Iryna MANCZAK[1*], Maria BAJAK[2]

[1] Cracow University of Economics; manczaki@uek.krakow.pl, ORCID: 0000-0002-9661-9945
[2] Cracow University of Economics; bajakm@uek.krakow.pl, ORCID: 0000-0003-4769-7696
* Correspondence author

Purpose: The aim of this article is to assess the functionalities offered by the selected mobile sightseeing guide application. The subject of the consideration is the Mazowieckie Rezerwaty Przyrody application.
Design/methodology/approach: The article uses the case study method. The evaluation of the functionalities of the *Mazowieckie Rezerwaty Przyrody (Mazovian Nature Reserves)* application was made on the basis of the point method. This method has been modified for the needs of this research.
Findings: (mandatory) Based on the results of the analysis it was found that the functionalities of the *Mazowieckie Rezerwaty Przyrody* application are mainly information tools useful for people interested in learning about protected areas located in the Mazowieckie Voivodeship. The researched mobile application can also meet various expectations of tourism participants, and it has been designed with the realization of educational tasks through entertainment in mind.
Research limitations/implications: (if applicable) The article contains a preliminary study. In the future it is planned to conduct additional quantitative and qualitative research. The study will help to perform a comprehensive analysis of the application being discussed.
Practical implications: (if applicable) Conclusions from the discussion can be an inspiration for creating a strategy of promotion of the analyzed mobile application, as well as activities related to improving its functionalities.
Social implications: The research conclusions may encourage institutions managing touristic areas to create more complex mobile solutions supporting sightseeing tourism. This solution should offer visitors access to additional information that will enable them to improve their knowledge of tourism and sightseeing.
Originality/value: The article uses the example from business practice. This is one of the earliest studies investigating the *Mazowieckie Rezerwaty Przyrody* application.

Keywords: mobile technology, mobile applications in tourism, innovation in tourism, *Mazowieckie Rezerwaty Przyrody*.

Category of the paper: The article uses the case study method.

Introduction

Mobile applications are eagerly used around the world by institutions and companies operating in various sectors of the economy (Lee, Rangu, 2014). First of all, they provide an example of a key tool of mobile marketing (Broeckelmann, 2010; Holl, Elberzhager, 2019). Recently, they have also been used in sightseeing tourism. Implementation of mobile applications for this form of tourism can contribute to the increase of the attractiveness of the area and its competitiveness, and consequently to the development of tourist traffic (Panasiuk, 2015). However, the activation of these socio-economic phenomena requires coordinated actions to support tourism and sightseeing, including the implementation of innovative solutions (Divisekera, Nguyen, 2018). It is worth noting that at the same time it is necessary to create a coherent offer that will distinguish a given region from other competitive areas (Manczak, 2014). Creating and sharing mobile sightseeing applications is an example of the assumptions indicated. Such mobile products are often designed and implemented on behalf of public entities (Ganatapi, 2015). They recognize the need to create websites and mobile programs in order to share free multimedia with a wide audience (Papińska-Kacperek, 2016). At the same time the dynamic realities of today's market make it seem necessary to indicate the need for the creation of personalized communication solutions for the consumer (Manczak et al., 2019). One should also expect to see increasing customer expectations in terms of sophistication and complexity of the mobile tools offered by enterprises (Sanak et al., 2018; Fard, Marvi, 2019).

The aim of this article is to assess the functionalities offered by the selected mobile sightseeing application. The subject of the consideration is the *Mazowieckie Rezerwaty Przyrody* (*Mazovian Nature Reserves)* application. This program is part of a project of the same name, which since 2018 has been implemented by the Regional Directorate for Environmental Protection in Warsaw with the support of the Regional Fund for Environmental Protection and Water Management in Warsaw. During the research, case study method was used. The evaluation of the functionalities of the *Mazowieckie Rezerwaty Przyrody* application was made on the basis of the point method.

Mobile sightseeing applications

Mobile technologies have become an inseparable part of life, both for individual users and various businesses (Martin, Ertzberger, 2013). The popularity of this type of solutions is evidenced by the fact that at the end of 2018 it was noted that the number of mobile device (smartphone, tablet etc.) users was higher than that of those using desktop computers

(Dąbrowski, 2019). More and more institutions are deciding to use solutions addressed to mobile recipients (Sanak et al., 2018). The reason for it is that mobile technologies allow carrying out basic market communication tasks (Sznajder, 2014). One of the tools addressed to the consumer are mobile applications, which can be considered as a consequence of implementing ICT in business practice (Czajkowski, Nowakowski, 2015). They perform social, informational, educational and entertainment functions (Kubiak, 2015). The functionalities of mobile applications are also widely used in tourism and sightseeing (Da Silva, Da Rocha, 2012; Liang et al., 2017, Pawłowska-Legwand, 2019).

Mobile applications are examples of software that are used on mobile devices with embedded operating systems, such as smart phones, mobile phones, tablets or PDAs (Jasiulewicz, Wiaderny, 2015). They can have a variety of purposes. For example, we can distinguish between social networking applications, information applications, business software, educational applications, banking and financial applications, travel applications, health applications, games, entertainment software, music and film software, sport applications, commercial applications and others. The general trend shows that very often mobile software has a layered formula, while offering functionalities from many areas (Gadziński, 2018). They can also have hybrid purposes.

There is no doubt that mobile applications have successfully supported tourism for many years (Buhalis, Law, 2008). In addition, it should be noted that tourism has a significant role in the development of mobile technology (Kim, Kim, 2017). In this industry, the analyzed applications have been widely used, and at the same time new solutions from this area are being implemented (Nunes, Mayer, 2014; Law et. al., 2018). Research conducted by Pawłowska-Legwand (2019) shows that tourists are keen to use information and communication technologies before and during a trip. Smartphone users access information and advice related to travel via mobile programs and websites. This applies to, among others, recommended routes, reviews of various attractions, information on beauty spots, transport, accommodation, events or other activities (Chang et al., 2016; Hew et al., 2016). At the same time, the implementation of mobile applications may contribute to a better adaptation of the tourist product to the needs of the recipients, following their greater interaction with a given tourist destination (Piechota, 2014).

In parallel with the development of ICT in tourism, the idea of a SMART tourist emerged (Koo et al., 2016). Such a tourist uses a variety of digital tools that support the planning and implementation of the trip both prior and after it. User support technologies in this area include already mentioned applications, as well as Wi-Fi, Big Data, various sensors and others (Gretzel et al., 2015). The SMART tourist is characterized by a range of behaviors such as (Molz, 2012):

- keeping online connectivity through applications with access to the device location,
- enrichment of sightseeing experiences from the use of new technologies (e.g. virtual reality),
- creating and sharing content related to the visited areas independently,

- digital interaction with local communities and other stakeholders of tourism,
- commitment to sustainable development of the community and environment.

The SMART tourist willingly combines conventional and technological experience, which they treat as a factor increasing the attractiveness of visited places (Buonincontri, Micera, 2016; Brennan, 2020). In this area several levels of digital support for the participant of tourism can be distinguished. These are, respectively, the following experiences (Neuhofer et al., 2014):

- conventional experience,
- experience aided by technology,
- experience enriched by technology,
- experience stimulated by technology.

Mobile touristic applications, especially those using new technologies, such as the Internet of Things, virtual reality or artificial intelligence, are part of the SMART tourism trend. Such solutions gain supporters as a result of various phenomena taking place on the modern tourism market. Recipients are looking for more and more flexible, dynamic and intelligent solutions that will actively be useful from the point of their needs and expectations (Perez Pulido, 2016). At the same time, participants in tourism expect personalized offers, characterized by a close fit to their individual preferences (Manchak, Sanak-Kosmowska, 2018).

It is worth noting that consumers show attachment to the digital tools used so far. However, they are constantly looking for new solutions that will work better when optimizing the planning of the sightseeing experience (Xiang et al., 2015). Importantly, there is often a disproportion between the number of application users expected by the publisher and those who actually use them. As a result, even the most useful mobile application must be supported by suitable promotional activities (Ziernicka-Wojtaszek et al., 2020).

The national offer of sightseeing mobile applications is constantly being expanded and enriched with other interesting proposals. Users are provided with practical tools that are able to meet their expectations, including making their travels more attractive. The available sightseeing applications help one navigate tourist trails as well as offer access to a rich database of information about places and attractions in their vicinity. For example, the application *Szwajcaria Kaszubska* provides information about the highest rising part of the Kashubian Lake Area. The *Szlaki Małopolski* application, in turn, presents the routes of tourist trails in the Małopolska province, including the related tourist attractions. The *Bieszczady* and *MRB Karpaty Wschodnie* application can be a mobile guide to the International East Carpathian Biosphere Reserve.

Aim of research and applied research method

The key objective of the discussion is to assess the functionalities available within the mobile application *Mazowieckie Rezerwaty Przyrody*. It was decided to analyze the possibilities, including the usefulness of the software. The following specific questions were prepared:

- what tasks the software performs,
- who the target audience of the application are,
- how the application contributes to the development of tourism in the Mazowieckie Voivodeship,
- what new technologies support the software,
- how the application promotes the Mazovian nature reserves.

As part of the considerations the case study method was used (Yin, 1981; Eisenhardt, 1989). The applied research method is discussed in the works of representatives of various scientific fields (Dąbrowski, 2017). This qualitative method assumes a comprehensive description of the studied phenomenon, concerning the selected scientific discipline (Grzegorczyk, 2015), as well as identification of appropriate concepts in economic practice (Manchak, Sanak-Kosmowska, 2018). For the purpose of the considerations, it was assumed that the discussion presented is based on considerations that meet the assumptions of case study. The article attempts to approximate an example of the use of a mobile application in a selected tourist region. This objective was achieved on the basis of a literature analysis and the materials available on the project, including the research approach used. It was decided to make a point evaluation of the functionalities available in the application from the point of view of different target groups. In the literature it is accepted that the point method allows the evaluation of any object according to a set of adopted criteria (Szyran-Resiak, 2016; Gierszewska, Romanowska, 2017). The gist of the method is to create a list of criteria (factors) that will allow one to describe and differentiate the analyzed object (Thompson, Strickland, 1997). The subsequent criteria are assigned appropriate weights (because not all of them have the same meaning) and a number of points (marks) from the selected numerical range (Szyran-Resiak, 2016).

For the purposes of the research, it was decided to make a slight modification of the above-mentioned point method. First of all, it was recognized that the needs of each user are equally important and therefore different weights were not given to them. Scales of 1 to 5 points were adopted, assuming that:

- 5 points implies a very useful functionality,
- 4 points implies a useful functionality,
- 3 points implies a functionality that can be useful,
- 2 points implies a hardly useful functionality,
- 1 point implies a useless functionality.

The points received by each one of the functionalities of the application were awarded by the authors of the article and then they were summed up to rate their usefulness.

Mazowieckie Rezerwaty Przyrody mobile application – project assumptions

The *Mazowieckie Rezerwaty Przyrody* application was made available in 2020 as part of the project of the same name carried out by the Regional Directorate of Environmental Protection in Warsaw. It was co-financed by the Regional Fund for Environmental Protection and Water Management in Warsaw. The main objectives of the project included bringing closer the knowledge of the value of nature reserves in the Mazowieckie Voivodeship, emphasizing the necessity of their protection and encouraging users to take care of the natural environment (Mazowieckie Rezerwaty Przyrody, 2020). The project was divided into several stages, two of which have already been completed – presented in Table 1.

The *Mazowieckie Rezerwaty Przyrody* mobile application can be classified as a sightseeing application, performing mainly informative and navigation tasks. This software is addressed both to the residents of the Mazovia region, and to domestic and foreign tourists. In its current form, the application is available only in Polish. It is intended to find access routes to the individual reserves located in the area of the Mazowieckie Voivodeship. What is more, during the visit to the protected areas, the tourists will be shown the trails and the most interesting places (Mazowieckie Rezerwaty Przyrody, 2020).

Table 1.
Stages of the project Mazowieckie Rezerwaty Przyrody

Specification	Completed tasks
1st stage of the project (2018-2019)	• printing 10,000 brochures and maps presenting fifteen of the nature reserves located in Warsaw and its surroundings • issue of 2000 memory games educating about flora and fauna in Mazovian nature reserves • creation of two educational videos about the natural values of the reserves and selected threats to them • placement of 40 information boards in twelve nature reserves • sharing the hashtag #MazowieckieRezerwatyPrzyrody on Facebook • organization of two educational meetings and three nature walks in the reserves • organization of the Explore the Mazovian Nature Reserves competitions • organization of conference on the Mazovian nature reserves
2nd stage of the project (2020)	• making the mobile application available presenting twenty of the protected areas in the Mazowieckie Voivodeship; the software is intended to provide information on all reserves in the region (189) • installation of 120 plates with QR codes to enable downloading of the application and providing information about the natural, cultural and historical values of the sites; by the end of the year, about 30 more are to be installed • placing 10 information boards in five nature reserves • organization of the Explore the Mazovian Nature Reserves competitions

Source: Generalna Dyrekcja Ochrony Środowiska, 2019; Generalna Dyrekcja Ochrony Środowiska 2020; Mazowieckie Rezerwaty Przyrody, 2020.

An important element of the mobile software are its educational functionalities, including informational elements with descriptions of the natural values of the reserves, on top of entertainment in the form of quizzes and games (Generalna Dyrekcja Ochrony Środowiska, 2020). The software works with the functionalities of the device on which it is installed and uses external information carriers, using new technology solutions such as augmented reality and QR codes. The first of these technologies is a kind of visual system, which, through the IT environment, applies information and images to the external environment. As a result, it allows connecting the virtual world and reality through content, simulations, illustrations and projects (Peddie, 2017). In the analyzed application, the user can access graphic overlays on the camera of their mobile device, showing characteristic species of animals and plants from the area of the visited protected areas (Generalna Dyrekcja Ochrony Środowiska, 2020). QR codes, on the other hand, enable the graphical presentation of information using a two-dimensional symbol (Soon, 2008). After scanning the code, the user is shown text or graphic information stored in the code or is redirected to an indicated URL. The *Mazowieckie Rezerwaty Przyrody* application allows the user to scan the QR codes that have been placed on the information boards in selected nature reserves. Users are given access to additional information about the natural, historical and cultural values of a given place. In the case of people who do not have this application on their mobile device, scanning the code with a smartphone camera will direct them to the application download page (Mazowieckie Rezerwaty Przyrody, 2020).

Evaluation of the functionalities available in the *Mazowieckie Rezerwaty Przyrody* mobile application

Various criteria are used in the research on the quality of mobile applications. One of them might be functionality. For the purposes of the considerations, it was assumed that functionality means the accessibility of certain functions of the mobile application. It can be measured by the features from the area of functional requirements defined by the organization (Zborowski, Łuczak, 2016).

The creation of the application was prompted by various motivations to present the protected areas in the Mazowieckie Voivodeship. The most important objectives pursued by the creators of the software were (Mazowieckie Rezerwaty Przyrody, 2020):

- presenting the value of nature reserves in Mazovia province,
- the need to emphasize the importance of their protection,
- encouraging care for the environment.

Their implementation is supported by various mobile application functionalities. Figure 1 presents the basic functionality of the application available in the Start-up screen and the side menu in the applications.

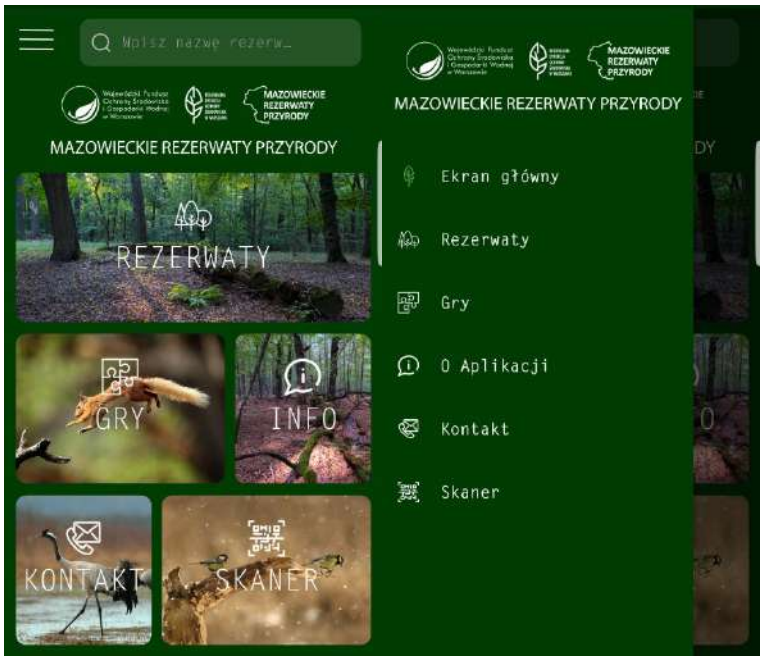


Figure 1. Start-up screen and side menu in the applications *Mazowieckie Rezerwaty Przyrody* application. Source: own research.

Using the functionalities of the software requires that the GPS location is activated on the mobile device. In addition, the augmented reality function also uses a smartphone or tablet camera. As a result, the application user can benefit from the full spectrum of its functionalities. Evaluation of the functionalities available in the *Mazowieckie Rezerwaty Przyrody* mobile application was presented in the Table 2. It should be stressed, however, that in accordance with the project assumptions, the software will be further developed in the coming years. Therefore, it can be assumed that the content available within the application will be expanded, as will the offer of new functionalities (Mazowieckie Rezerwaty Przyrody, 2020).

The functionalities available within the application can be grouped into four categories (according to their purpose). They are the following: informative, navigational, entertainment and application-related.

In the information category there is a functionality called “Nature Reserves”, which allows the user to select a reserve by pointing on it on the map, selecting from a list, or searching by name. This selection displays pictures of the protected area, data on the date of its creation, its area, protection goals, characteristic plants and animals, forms of accessing the area and who manages it. In addition, one can enable the “Flora” and “Fauna” tabs for each of the reserves. The available content is complemented by pictures with descriptions, which are often followed by additional information about the species.

Table 2.
Evaluation of the functionalities available in the Mazowieckie Rezerwaty Przyrody mobile application

Feature	Specification
Nature Reserves	information on individual protected areas in the Mazowieckie Voivodeship
Navigate to Natural Reserve	a tool for mapping the route to the reserve from the current location
Map	map of the nature reserve with sightseeing trails
Games	educational quiz and memory game to systematize the knowledge of protected areas
AR Items	virtual overlays on the camera of a mobile device showing the local protected species
QR Scanner	tool for scanning QR codes placed in the nature reserves presenting additional information about the area.
About the App	basic information about the application and access to its settings
Contact	contact information of the Regional Directorate of Environmental Protection in Warsaw

Source: own research.

Another functionality in the category of information is called "QR Scanner". This functionality can scan the respective boards with QR codes, which are arranged in selected protected areas. As a result, the user gains access to additional information about the natural, historical and cultural values of their current location.

In the navigation category there is a "Navigate to Nature Reserve" functionality. This option gives a possibility to set a route to the selected protected are from the current location. Its use requires running the GPS location on the recipient's smartphone, as well as granting the application access to use this functionality. In this category there is also a functionality called "Map", which contains hiking, biking, walking and cycling trails in selected protected areas, as well as in their vicinity. The map is equipped with a compass for easy orientation in the area and it displays information about the nature reserve.

In the "Entertainment" category, there are "Games" which allow users to check knowledge gained during a trip or from the content of the application. The user can choose from educational games, such as:

- a quiz with questions about the nature reserves and flora and fauna occurring in their area; after indicating the answer, the user receives a response message not only regarding its correctness, but also containing supplemental information on issues raised in the question,
- memory game where the task is to find pairs of the same photos; they depict the species of plants and animals living in the protected areas described in the application (the game has three difficulty levels).

In the entertainment category also "AR Items" are found. These are camera overlays showing protected species of plants and animals, which the user can also superimpose on photos they take.

As part of the research, an attempt was made to evaluate individual functionalities available in the *Mazowieckie Rezerwaty Przyrody* application. The results are being shown in Table 3. The following separated categories have been assigned points:

- **information** – transmission of knowledge about the values of landscape parks,
- **tourism** – supporting people during trips to Mazovian protected areas,
- **entertainment** – level of solutions' focus on learning through play.

Each functionality could obtain from 1 (not useful at all) to 5 (very useful) points in this category.

Table 3.
Evaluation of the functionalities available in the Mazowieckie Rezerwaty Przyrody mobile application

Feature	Information	Tourism	Entertainment	TOTAL
Nature Reserves	5	4	2	**11**
QR Scanner	5	4	5	**14**
Navigate to the Reserve	3	5	1	**9**
Map	3	5	1	**9**
Games	4	1	5	**10**
AR Items	2	3	5	**10**
About the App	2	1	1	**4**
Contact	2	2	1	**5**
TOTAL	**26**	**24**	**21**	**71**

Source: own research.

On the basis of the conducted considerations, it was found that the functionalities of the application *Mazowieckie Rezerwaty Przyrody* will be useful, first and foremost, as information tools for people interested in protected areas in the Mazowieckie Voivodeship (26 points). They will be almost equally useful for tourists visiting protected areas (24 points). The designers of the analyzed application also took into account trends in education through entertainment, which complements the basic tasks of the program (21 points). The function that best meets the assumptions of each of these criteria is the "QR Scanner" (14 points). Other functionalities integrate up to two of the identified areas. For example, the "Reserves" functionality combines the categories of information and tourism, while the "Games" category fits into and tourism and information.

On the basis of the assessment, it was noticed that the *Mazowieckie Rezerwaty Przyrody* application can aid a sightseeing tourist during visits to nature reserves. The program presents individual protected areas in an attractive way. It gives the opportunity to learn interesting facts about the flora, fauna and history of visited places and supports the tourist in planning the trip. Based on the evaluation performed, it was found that the *Mazowieckie Rezerwaty Przyrody* application can be considered in three ways:

- as a guide to the protected areas in the Mazowieckie Voivodeship,
- as a support tool for planning travel,
- as an educational platform.

It is worth emphasizing that the application in question is part of a project that will be further developed in the future, which may transfer into further expansion of the program's functionality and an increase in its complexity.

Conclusions

The increase in the number of mobile device users is conducive to creating and sharing mobile touristic applications. The wireless communication provided by smartphones allows users to stay connected at almost any time and anywhere. Therefore, mobile programming offers tool that continuously support the user during sightseeing trips. For this reason, more and more regions offer dedicated platforms for different segments of tourist traffic. One such region is the Mazowieckie Voivodeship.

In the discussion, an attempt was made to evaluate the functionalities of the *Mazowieckie Rezerwaty Przyrody* mobile application. Based on the results of the analysis it was found that the functionalities of the *Mazowieckie Rezerwaty Przyrody* application are mainly information tools useful for people interested in learning about protected areas located in the Mazowieckie Voivodeship. Importantly, they can also meet the various expectations of the participants of tourism. The *Mazowieckie Rezerwaty Przyrody* application was also been designed to carry out the tasks of education through entertainment. Based on the results of the evaluation, it was found that the functionality that meets the assumptions of each of the adopted criteria for the purpose of the research is the "QR Scanner". The functionality may be considered the most useful by potential users of the application. This solution is capable of getting to know the needs of people who are interested in improving their knowledge of tourism and sightseeing. The *Mazowieckie Rezerwaty Przyrody* application is an example of programs which presents the ways of organizing tourist travel in the protected areas in an attractive way.

Finally, it should be emphasized that the point method has a number of limitations, the greatest of which is the subjectivity of the assessment. However, it should be stressed that the deliberations undertaken in the article are preliminary in nature. The study will help to perform a extensive analysis of the application being discussed. In the future it is planned to conduct additional quantitative and qualitative studies. This research will allow to make a comprehensive examination of the application of *Mazowieckie Rezerwaty Przyrody*, as well as to indicate new thematic areas related to the topic of the discussion. It is also planned to combine the discussed mobile program with other similar technological solutions.

References

1. Brennan, B. (2020). A convergence of mobile device application use and smart tourism: a comparison of Korean and Non-Korean smart tourists. *The Journal of Internet Electronic Commerce Research*, *20*(4), 145-160.
2. Broeckelmann, P. (2010). Exploring consumers' reactions towards innovative mobile services. *Qualitative Market Re-search: An International Journal*, *13*(4), 414-429, DOI: https://doi.org/10.1108/13522751011078827.
3. Buhalis, D., Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet-the state of eTourism research. *Tourism Management*, *29*(4), 609-623, DOI: 10.1016/j.tourman.2008.01.0.
4. Buonincontri, P., Micera, R. (2016). The experience co-creation in smart tourism destinations: a multiplecase analysis of European destinations. *Information Technology and Tourism*, *16*(3), 285-315, DOI: 10.1007/s40558-016-0060-5.
5. Chang, S.E., Shen, W.-C., Jang, Y.-T., and Lee, P.-F. (2016). Building smartphone apps by using free cloud services from Facebook, Dropbox and Google, *Frontiers in Artificial Intelligence and Applications*, *282*, 183-196, DOI: 10.3233/978-1-61499-637-8-183.
6. Czajkowski, R., Nowakowski, W. (2015). iBeacons – mobilne usługi lokalizacyjne. *Elektronika: konstrukcje, technologie, zastosowania*, *4*, 47-50, DOI: http://dx.doi.org/10.15199/13.2015.4.9.
7. Da Silva, A.,. Da Rocha, H.V. (2012). M-traveling: mobile applications in tourism. *International Journal for Infonomics*, *5*(3/4), 618-630, DOI: 10.20533/iji.1742.4712.2012.00.
8. Dąbrowski, A. (2017). Metoda studium przypadku krok po kroki. *Studia Socjologiczne*, *4*(227), 249-262.
9. Dąbrowski, G. (2019). Dostęp do internetu w Polsce. In: *Internet 2018/2019*. Available online https://www.iab.org.pl/wp-content/uploads/2019/06/HBRP-raport-IAB-05-191-1.pdf, 22.10.2020.
10. Divisekera, S., Nguyen, V.K. (2018). Determinants of innovation in tourism evidence from Australia. *Tourism Management*, *67*, 157-167, DOI: https://doi.org/10.1016/j.tourman.2018.01.010.
11. Eisenhardt, K.M. (1989). Building case theories from case study research. *Academic od Management Review*, *14*(4), 532-550.
12. Fard, M.H., Marvi, R. (2019). Viral marketing and purchase intentions of mobile applications users. *International Journal of Emerging Markets*, *15*(2), 287-301. DOI: https://doi.org/10.1108/IJOEM-06-2018-0291.

13. Gadziński, J. (2018). Perspectives of the use of smartphones in travel behaviour studies: Findings from a literature review and a pilot study. *Transportation Research. Part C: Emerging Technologies, 88,* 74-86, DOI: https://doi.org/10.1016/j.trc.2018.01.011.
14. Ganatapi, S. (2015). *Using mobile apps in government*. Available online: http://www.businessofgovernment.org/sites/default/files/Using%20Mobile%20Apps%20in%20Government.pdf, 23.11.2020.
15. Generalna Dyrekcja Ochrony Środowiska (2019). *Konferencja Mazowieckie rezerwaty przyrody*. Available online: http://www.gdos.gov.pl/konferencja-mazowieckie-rezerwaty-przyrody-2, 25.10.2020.
16. Generalna Dyrekcja Ochrony Środowiska (2020). *Aplikacja mobilna Mazowieckie rezerwaty przyrody*. Available online: http://warszawa.rdos.gov.pl/aplikacja-mobilna-mazowieckie-rezerwaty-przyrody, 25.10.2020.
17. Gierszewska, G., Romanowska, M. (2017). *Analiza strategiczna przedsiębiorstwa*. Warszawa: PWE.
18. Gretzel, U., Sigala, M., Xiang, Z., Koo, C. (2015). Smart tourism: foundations and developments. *Electronic Markets*, *25*(3), 179-188, DOI: 10.1007/s12525-015-0196.
19. Grzegorczyk, W. (2015). Studium przypadku jako metoda badawcza i dydaktyczna w naukach o zarządzaniu. In: W. Grzegorczyk (ed.), *Wybrane problemy zarządzania i finansów. Studia przypadków* (pp. 9-16). Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
20. Hew, J.J., Lee, V.H., Leong, L.Y., and Ooi, K.B. (2016).The dawning of mobile tourism: what contributes to its system success? *International Journal of Mobile Communications*, 14(2), 170-201, DOI: 10.1504/IJMC.2016.075023.
21. Holl, K., Elzberzhager, F. (2019). Mobile application quality assurance. *Advances in Computers*, *112*, 1-77, DOI: http://dx.doi.org/10.1016/bs.adcom.2017.12.001.
22. Jasiulewicz, A., Wiaderny, M. (2015). Aplikacje mobilne jako innowacyjne narzędzie promocji marki w opinii konsumentów. *Logistyka, 2*, 1229-1236.
23. Kim, D., Kim, S. (2017). The role of mobile technology in tourism: patents, articles, news, and mobile tour app reviews. *Sustainability*, *9*(11), 2082, DOI: https://doi.org/10.3390/su9112082.
24. Koo, C., Shin, S., Gretzel, U., Cannon, W., and Chung, N. (2016). Conceptualization of smart tourism destination competitiveness. *Asia Pacific Journal of Information Systems*, *26(4), 561*-576, DOI: 10.14329/apjis.2016.26.4.561.
25. Kubiak, K. (2015). Ocena wybranych aplikacji mobilnych w opinii użytkowników. *Zeszyty Naukowe Uniwersytetu Szczecińskiego, 875. Problemy Zarządzania, Finansów i Marketingu*, *41*(2), 83-93.
26. Law, R., Cheng Chu Chan, I., Wang, L. (2018). A comprehensive review of mobile technology use inhospitality and tourism. *Journal of Hospitality & Management*, *27*(2), 626-648, DOI: DOI: 10.1080/19368623.2018.142.

27. Lee, G.W., Raghu T.S. (2014). Determinants of mobile apps' success: evidence from the app store market. *Journal of Management Information Systems*, *31*(2), 133-170, DOI: 10.2753/MIS0742-1222310206.
28. Liang, S., Schuckert, M., Law, R., Masiero, L. (2017). The relevance of mobile tourism and information technology: an analysis of recent trends and future research directions. *Journal of Travel and Tourism Marketing*, *34*(6), 732-748, DOI: https://doi.org/10.1080/10548408.2016.1218403.
29. Manchak, I., Sanak-Kosmowska, K. (2018). Personalizacja usług jako trend rozwojowy na rynku usług turystycznych. *Ekonomiczne Problemy Turystyki*, *2*(42), 29-35, DOI: 10.18276/ept.2018.2.42-03.
30. Manczak, I. (2014). Kształtowanie relacji partnerskich w turystyce. *Przegląd Organizacji*, *12*, 21-26.
31. Manczak, I., Sanak-Kosmowska, K., Bajak, M. (2019). Reasons to use beacon technology as a tool to study audience behaviour in museums. *Cultural Management: Science and Education*, *3(2),* 83-94, DOI: 10.30819/cmse.3-2.05.
32. Martin, F., Ertzberger, J. (2013). Here and now mobile learning: an experimental study on the use of mobile technology. *Computers&Education, 68*, 76-85, DOI: https://doi.org/10.1016/j.compedu.2013.04.021.
33. Mazowieckie Rezerwaty Przyrody (2020). *Mazowieckie Rezerwaty Przyrody | Facebook.* Available online: https://www.facebook.com/MazowieckieRezerwatyPrzyrody, 25.10.2020.
34. Molz, J.G. (2012), *Travel connections: tourism, technology, and togetherness in a mobile world.* Abingdon: Routledge.
35. Neuhofer, B., Buhalis, D., Ladkin, A. (2014). A typology of technology-enhanced tourism experiences. *International Journal of Tourism Research*, *16*(4), 340-350, DOI: 10.1002/jtr.1958.
36. Nunes, M., Mayer, V. (2014). Mobile technology, games and nature areas: the tourist perspective. *Tourism & Management Studies*, *10*(1), 53-58.
37. Panasiuk, A. (2015). Nowoczesne technologie informacyjne w kształtowaniu innowacji na rynku turystycznym. *Rozprawy Naukowe Akademii Wychowania Fizycznego we Wrocławiu*, *49*, 99-106.
38. Papińska-Kacperek, J. (2016). Miejskie aplikacje mobilne w turystyce kulturowej w Polsce. *Turystyka Kulturowa*, *2*. Available online: http://turystykakulturowa.org/ojs/index.php/tk/article/view/720/646, 67-85, 22.10.2020.
39. Pawłowska-Legwand, A. (2019). Wykorzystanie technologii informacyjno-komunikacyjnych w dostępie do informacji i usług turystycznych w świetle wyników badań przeprowadzonych wśród polskich turystów w województwie małopolskim. *Turyzm, 29*(2), 109-117, DOI: https://doi.org/10.18778/0867-5856.29.2.22.

40. Peddie, J. (2017). *Augmented reality: where we will all live*. Cham: Springer International Publishing.
41. Perez Pulido, A. (2016). *Mobile app for tourist services using artificial intelligence methodologies.* Conference on artificial intelligence with applications.
42. Piechota, N. (2014). Lokalizacyjna aplikacja mobilna jako narzędzie badań ruchu turystycznego miasta w długim okresie. *Studia Oeconomica Posnaniensia*, *2*(1), 121-135.
43. Sanak-Kosmowska, K., Bajak, M., Filip, J., Kargula, N. (2018). Uwarunkowania i przesłanki wykorzystania beaconów w mobilnej komunikacji marketingowej. *Marketing i Rynek, 10*, 17-23.
44. Soon, T.J. (2008). QR Code. *Synthesis journal: Section three*, 60-78.
45. Sznajder, A. (2014). *Technologie mobilne w marketingu*. Warszawa: Oficyna Wolters Kluwer business.
46. Szyran-Resiak, A. (2016). Systematyka metod pokrewnych możliwych do zastosowania w ocenie jakości działalności marketingowej organizacji. *Zeszyty Naukowe PWSZ w Płocku. Nauki Ekonomiczne*, *XXIII,* 87-98.
47. Thompson, A., Strickland, A. (1997). *Strategic management. concepts and cases*. Boston: Irwin Professional Publishing.
48. Xiang, Z., Magnini, V.P., Fesenmaier, D.R. (2015). Information technology and consumer behavior in travel and tourism: Insights from travel planning using the internet. *Journal of Retailing and Consumer Services*, *22*, 244-249, DOI: https://doi.org/10.1016/ j.jretconser.2014.08.005.
49. Yin, R.K. (1981). The case study as a serious research strategy. *Knowledge: creation, diffusion, utilization*, *3*(1), 97-114.
50. Zborowski, M., Łuczak, K. (2016). Propozycja doboru składowych struktury kryteriów oceny jakości aplikacji mobilnych na przykładzie wybranych bankowych aplikacji mobilnych w Polsce. *Annales Univesitas Marie Curie-Skłodowska Lublin–Polonia. Sectio H*, *L* (2), 183-202, DOI:10.17951/h.2016.50.2.183.
51. Ziernicka-Wojtaszek, A., Król K., Zdonek, D. (2020). Assessment of the attractiveness of the tourist and recreation area of Bielsko county. *Zeszyty Naukowe. Organizacja i Zarządzanie. Politechnika Śląska, 144*, 299-314, DOI: http://dx.doi.org/10.29119/1641-3466.2020.144.2.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

ETHICALITY OF CONSUMERIST RELATIONS. TISCHNER'S AND BAUMAN'S LOOK AT THE EXISTENCE OF CONTEMPORARY MAN

Izabela MARSZAŁEK-KOTZUR

Politechnika Śląska Wydział Organizacji i Zarządzania, Katedra Stosowanych Nauk Społecznych;
izabela.marszalek-kotzur@polsl.pl, ORCID: 0000-0002-8426-0170

Purpose: The purpose of the research is to determine the condition of a contemporary man immersed in the realities of consumerism based on the texts of Sigmund Bauman and Józef Tischner.
Design/methodology/approach: The objective has been achieved by using critical textual analysis and the phenomenological method, together with hermeneutic interpretation both in relation to the phenomena of the surrounding world, as well as the texts of Sigismund Bauman and Józef Tischner.
Findings: During the course of work, a convergence of the views of the above thinkers was found.
Research limitations/implications: The research process has been limited to the texts of Bauman and Tischner.
Social implications: The article can be an inspiration to change the way people live in the society and restore forgotten values.
Originality/value: This article is addressed both to the human being in society and to those responsible for creating human behavior.

Keywords: relations, consumption, ethics, freedom, responsibility.

Category of the paper: viewpoint.

1. Introduction

Technological advances and rapid economic development have increased people's wealth. The possibility of purchasing more and more goods and using a number of services has today become a criterion determining the social status of a man. Increasingly intersecting economic, consumer and private spheres have created a specific culture called consumer culture. The consequence is not only over-exploiting the environment, but also the progressive objectification of human relationships, and the social exclusion of people who cannot or

consciously do not want to identify with it. One of the "diagnosticians" of the socio-political reality of the early 21st century is Zygmunt Bauman, who refers to it using the term "liquid modernity". This fluidity involves "melting everything fixed", that is, the gradual release of the economy from traditional, cultural and interpersonal bonds. Living in that reality entailed the need for a man to adapt to the new rules of social life. The result of this process is the emergence of a society known as a "consumer society", characterised by the tendency to tie-up human relationships based on market principles. Bauman's in-depth analysis of the structures of this society provided an insight into the state of the modern man. In the field of understanding the complex interdependence of human relationships, it is impossible to ignore Józef Tischner's ethical considerations. This paper is an encouragement to reflect on the condition of modern man immersed in consumerist realities and to find common or complementary threads in the views of Bauman and Tischner, which could inspire reflection on the attempt to change the way of human life and restore forgotten values that are important to human existence.

2. Consumer society

The concept of consumer society, although it operates in general use, has not yet been given a clear and unambiguous definition. It is generally accepted that this is a modern society which, as a result of the improvement in quality of life, treats consumption as an overriding priority, assigning to it other areas of life, such as morality, customs, politics. According to Zygmunt Bauman, consumer society is "a set of living conditions in which the probability of adopting consumerist culture and acting in most cases according to its orders is high. In other words, 'consumer society' is a society that promotes the choice of a consumerist lifestyle and life strategies, encourages or coerces people to it, plunging all its cultural alternatives into dismay" (Bauman, 2009, pp. 61-62). Its main feature is to bring all elements of reality to the level of consumer goods, that is, merchandise. The consumer must live in the belief that the recipe for solving any problems that life is facing will always be found on the market, it is enough to pay the right amount of money (Marszałek-Kotzur, 2019a).

Bauman distinguishes the concept of consumption, defining the act of consuming, which is a characteristic of a single individual, from the concept of consumerism, understood as an attribute of society as a whole. The two concepts are closely interlocked, as the consumer society is formed as the result of the transformation of individuals with ever greater and stronger desires into "collective consumers" (Marszałek-Kotzur, 2019a).

In the lives of previous generations, consumption served as a meeting of the human needs of everyday life. But, Bauman says, due to the collapse of ethical norms and the new phenomenon of plasticity of "needs", it got released from the chains of functionality and changed the meaning of the term "need". Traditional psychology defines "need" as a state of

tension that discharges and fades away. However, today's need is expected to constantly build and sustain this tension. As Bauman notes, "consumer society preaches inability to satisfy the needs and its progress is measured in terms of the ever-increasing desire" (Bauman, 2007, pp. 212). Tischner calls such a condition uncritical consumption, and when: "'benefit' passes into the delight of 'use' for the very use; we don't ask about the goal, we keep playing with the means to reach this goal" (Tischner, 2005, p. 277). Today's needs are the desires awakened by so-called occasions. Ads inform potential consumers about new products they could not have desired before, without knowing their existence (Bauman, 2004; 2007).

Tischner calls the current world a marketplace that offers us countless "things, objects, ideas, even people" (Tischner, 2008, p. 63). In this market, some people promise happiness, while others threaten us with an inevitable misfortune. Markets attract our attention, forcing us to constantly look at the goods on display and listen to what is, as Tischner writes, "shouted". According to Tischner "The marketplace does not allow you to cross its space, it still forces you to return, to watch the same things many times. Above all, however, the marketplace imposes its own language on us. Who has stayed at the market for some time, cannot speak the language different from the language of the market. Nor can such a person think differently – they become part of the marketplace" (Tischner, 2008, p. 63). The marketplace, or as Bauman would put it – the market, systematically drags us into its space, brutally and noisily seizing us and not allowing us to escape from its influence.

Bauman believes that the most common experience today, intensive and absorbing, in which the consumer participates, is the experience of life as a series of consumer choices, made in response to attractions, increasingly shaped, perceived and "justified" according to the imposed pattern (Bauman, 2007). In the social space, this means imposing patterns of behaviour and limiting the ability of individuals to make choices.

The logic of a consumer-oriented economy adjusted to the requirements of consumerism also includes a shift from having things to being able to get rid of them and throw them away. (Bauman, 2011) Acquired items need to quickly come out of use, you need to quickly part with them without regret, so that you can replace them with products "newer and better" (Bauman, 2009c).

3. Consumption and human relations

According to Bauman, in a consumer society, not only material things must be subject to a process of continuous exchange. This also applies to interpersonal relationships, which should also mimic the buyer's relationship with the items purchased. When they begin to disturb, they need to be removed. As Bauman points out, consumer-type relationships are by definition focused on continuing until further notice. Nowadays, long-term investment, both in material

goods and in the life partner, is not an option. “Pleasure” life is lived as a series of pleasant moments that do not even have to add up, or create anything specific (Bauman, 2007). Long-term commitments and lasting bonds are perceived limiting to human beings and today they are seen to be the antithesis of a happy life (Bauman, 2007). Entering a lifelong contract fills people with fear because, as Bauman points out, it’s like signing a blank cheque. (Bauman, 2009c). There are problems, difficulties, unforeseen situations out of which there may not be a way to escape. Therefore, it is better to start a new relationship without over-involvement. It will last as long as it brings mutual satisfaction (Marszałek, 2019a).

Bauman points out that the relationship of the consumer type concerns not only individual relationships, but entire human communities (Bauman, 2008; 2012b). There has been a disintegration of traditional forms of community and great formal social structures, and in their place there came a new kind of social relations organization, like virtual communities, online communities. They are characterized by their intensity but are both flexible and temporary. They are based on the interest in specific resources of the individual, the individual’s access to information and contacts, which allows to achieve their own goals (Marszałek-Kotzur, 2019b). The ease of breaking and banning them extracts a new variation of interpersonal relationships. Face-to-face direct contacts are subordinate to electronically mediated.

Consumerism has also entered the space of human work, destroying relationships between co-workers. Employees are subject to merciless pressure to be creative. The work has been instrumentalised and its value is assessed according to the standards of consumer experience (Bauman. 2007). Tischner states that there has been a new concept in the area of work, the so-called “demand”. The introduction of the demand criterion in the working space led, according to Tischner, to a profound social upheaval. Unprofitable workplaces have been closed, many jobs have been lost, resulting in unemployment and the exclusion of entire crowds (Tischner. 2005). Tischner also points to the change that has taken place in the very concept of work. Today, every activity that creates utility values that someone is willing to pay for on the market (Tischner. 2005) is defined as work. The market, with its competitiveness principle and demand criterion, can foster the development of many forms of work, but on the other hand it can lead to their destruction. That’s why Tischner, when making a diagnosis of the modern state of human work, states that: “The nature of work is decided by the market. The market breeds jobs but the market can also kill them” (Tischner. 2005, p. 275). According to Tischner, the market has also an impact on modern axiology: “after an era of struggle for absolute values, the time has come for utilitarian values” (Tischner. 2005, p. 275), the usefulness of which is determined by the free market.

According to Bauman, the consumer market has also influenced the family relationships. It offers us its paid services in order to make up for the time spent making money. Because there is not enough time to talk together, show interest to our loved ones, we buy expensive gifts. The more we pay, the better we feel, having the sense of rewarding our absence (Bauman, 2009c). We have learned to compensate for our time with material gifts. In this way, shopping

becomes something like a moral deed (Bauman, 2012c). Consumer markets help us silence moral scrupulous, which is an clear signal of the dangers to human ties. They could have been subjected to deeper reflection had they not been drowned out by market-supplied products (Bauman, 2009a; 2012c)

In the consumer society, Bauman notes, the world should be orderly and clean. When the measure of purity becomes the ability to participate in, as Bauman writes, consumer fun, people who do not participate in it are a problem. They are called impurity. It's about people suffering from deprivation, homeless, begging. They should be removed because they are unnecessary. Hence, against such "consumers with a glitch" (Bauman, 2000, p. 29), guards are hired in shopping malls, or the cameras are installed. Similarly, residents of luxury settlements follow, treating their houses as fortresses to which so-called strangers do not have access. Strangers are tolerated as much as they are useful. They can sometimes be providers of pleasure when the customer pays, requires, evaluates and decides at which point the contact will end (Bauman, 2000). People who hide from others are called by Tischner "people from hiding places". In their hideout, the man protects himself from the world and from others. To all who approach this hideout, He is guided by the suspicion that all who approach this hideout are approaching it only to rob and destroy it. In order to keep the other man safely away from the wall of the hideout, you need to conduct a kind of struggle to capture him (Tischner, 2002). According to Tischner, people from hiding places suffer from a disease of hope. The future does not promise such a man anything interesting, and the memory of the past gives insults to failure. In the hideout you can safely survive (Marszałek, 2014).

A similar condition experienced by people from hideouts is melancholy, which seems to be the share of a large number of people today. Tischner's description of melancholy shows the position of a man who succumbs to moods, regrets a lost opportunity, is overwhelmed by a sense of defeat (Tischner, 2008). Man cannot find himself in the world, because he seems to find himself in the wrong place and at the wrong time. Melancholy, as Tischner states, is constantly looking for entertainment to escape from one another, from one's love, from despair, from sacrifice, from some choice. There are so many possibilities for the man to choose that he is not able to pick any of them. As Tischner writes, "Because the man is allowed too much, he doesn't do anything. He stands suspended between possibilities, unable to take a step further" (Tischner, 2008, p. 60). Man is trapped by grief and powerlessness, unseen desire for self-assertiveness and self-esteem, adds Bauman (Bauman, 2007).

4. Ethical imagination in the space of freedom

By producing a countless number of different products, extending the range of possibilities for a man, we disrupt the world order and push further the boundaries in the search for something (Delsol, 2002). Bauman agrees with Hannah Arendt that today's human autonomy has evolved into a tyranny of opportunity (Bauman, 2000). According to Tischner, the contradiction between what is possible for man and what should become the limit of opportunity shows us in a new light the need to use the acquis of ethics, because the role of ethics is not only to set limits on increasing possibilities of technology, but also to show the differences between what is necessary, what is essential and what is crucial (Tischner, 2000).

The effects of human action on a global scale are so radical today that we can hardly predict the results. They demand many answers to ethical issues. Unfortunately, the increase in awareness of human moral responsibility does not go hand in hand with technological development and increased consumption, pessimistically states Bauman (Bauman, 2000). Great ethical problems, such as human rights, justice, the coordination of the interests of the individual and the common weal have not lost their relevance, it is crucial, however, to deal with them in a new way (Bauman, 2012a). The thought of Tischner seems to be similar, as he tries again to reach the sources of human ethical sensitivity (Tischner, 2002).

Both Bauman and Tischner are not in favour of constructing new and complex ethical standards. Both are convinced that the mankind must confront the consequences of their own actions by themselves. According to Tischner, ethics can only be developed by awakening creative imagination and intuition, which dictate what to do at any given moment. Moral principles cannot be memorized or disseminated (Tischner, 2002). The result of imposing universal norms, as Bauman notes, is merely silencing moral impulses and directing moral qualifications to imposed actions (Bauman, 2012a). Tischner, when studying ethical issues in terms of history, believes that "(...) true moral progress made throughout history is made not by those who wash their hands of problems, but by those who are not afraid to accept responsibility and guilt" (Tischner, 2008, p. 39).

The concept of responsibility in terms of ethics is crucial (Kuzior, 2006). As Tischner argues, "the truth of man is expressed in the purest way in the sense of responsibility. This is it that distinguishes and binds man to the world, it testifies to his freedom and towards values, and in it expresses the fullest of man's special trust in his own existence (...)" (Tischner, 2002, pp. 43-44). It can be said that a sense of responsibility is what builds humanity (Bauman, 2009b). However, a precondition for responsibility to develop is freedom. The consequence of freedom are the decisions that change the course of human life. Freedom is not only a lack of external obstacles and coercion, but above all it is a dynamic factor that shapes the world and the man. Freedom releases hope for the fulfillment of the deepest desires and highest aspirations of the man (Zuziak, 2002).

According to Tischner, freedom is a dramatic category. It appears between people who are free from each other (Tischner, 2001). The presence of the other in that space of relations requires recognition in terms of their dignity and freedom. The idea is to find yourself and your place with others and others in a meaningful space of the world (Tischner, 2001). Only a free man can make a responsible choice between good and evil. But what is the essence of the choice? To choose means to assimilate something, make it "mine", make it "part of yourself", says Tischner (Tischner, 2001, p. 305).

Freedom is a unique ethical value as its realisation determines realization of all other personal values. You cannot improve yourself without freely accepting the proposed values (Tischner, 2000). As Tischner points out, thanks to freedom, a man can rise above his small world and look at himself from the outside. By comparing the inner and outer image of himself, the man can get closer to the truth about himself and about the world (Tischner, 2008).

The realization of values is conditioned not only by human freedom, but requires effort of thinking. Tischner believes that thinking is a kind of spiritual force by which man frees himself from illusions, illusions of apparent knowledge, and false certainty. According to Tischner, thinking "clears the dustbin that everyday life makes of our heads" (Tischner, 2008, p. 11). The lost and lonely man sees the world in fragments, is tossed by someone's decisions, exposed to an excess of objects and information, succumbs to illusions and delusions that are the result of human finiteness, experienced on the level of human cognition. The incomplete knowledge in this field promotes the emergence of various appearances. In the consumerist world, man was deprived of the spiritual dimension and became a follower of simple social, physical and economic forces (Giddens, 2010). Trying to think allows the man, at least to some extent, to sort out the chaos that surrounds them. Thinking, however, involves risks, Tischner warns. People attach themselves to their own illusions. It is safer for them to perpetuate illusions than to disperse them.

A man who has decided to undertake the risk of freeing himself from illusion and false self-confidence enters the deep self and is prepared for the call of goodness, says Tischner (Tischner, 2008). As Tischner writes, thinking allows you to hear the voice of good penetrating through the noises of the world to summon man to something absolute (Tischner, 1990). For Tischner, The Good is the axiom of human drama. Tischner, is convinced that good demands existence. How do we know it? Tischner thinks we know this from our own experience. We want the good, not bad. We have a hunch that in the present world there is a lack of good that should exist. So our intuition tells us that the source of man's experience is good. Even when man does evil, he really wants good. How can we understand good? We can try penetrating into the various dramatic threads it establishes between people. At the bottom of all the threads lies one thing, says Tischner, the seed of good awakened in man by goodness (Tischner, 1990).

5. Conclusion

Living in a world where the logic of consumption dominates, we actually move in the space of influence of various illusions and delusions that appeal to all our senses and try to take over our power of judgement. We are enslaved by the constant anticipation of new trends that are coming in various fields: in automotive, in fashion, in nutrition, in ways of behavior, in leisure, and many more. Without a shadow of doubt we accept everything that is imposed on us, we no longer even wonder by whom. Many of us do not even realize that, in fact, day after day, we allow ourselves to take away our freedom and independence. The enslavement we experience does not allow us to decide for ourselves. Its consequence is a sense of insecurity, uncertainty and anxiety, melancholy, and above all, the changes taking place on the horizon of interpersonal relationships. Bonds with another person in the social sphere, at work, in the family, in partnerships, in social relationships are broken or disturbed. There is a systematic objectification of another person, who becomes, on the one hand, a threat and, on the other hand, a tool for satisfying our daily desires. The distorted experience of another person blunts our sensitivity to the world of ethical values.

Consumption has become a self-perpetuating machine that I think can no longer be stopped. However, in this situation, paradoxically, we are increasingly dependent on each other and both our actions and omissions have an impact on the fate of others. For this reason, as Bauman notes, "from an ethical point of view, we are all responsible for ourselves" (Bauman, 2007, p. 23). And because the world was "built by a man", so it can be rebuilt by the man as well. So the modern reality for Bauman is an invitation to be creative and to let our goodwill speak, through the effort of thinking, which can only take place in the space of human freedom, Tischner would say.

Both freedom and responsibility for Bauman and Tischner play a key role in human life. Freedom gives the man an opportunity for authenticity, allows us to participate in a world of values, and responsibility creates a sense of commitment and opens the door to the realization of good. The transition from incarceration to freedom entails a kind of transformation of experience. The conditions characteristic of enslavement disappear: anxiety, melancholy, sadness, hopelessness and despair. There is joy, certainty, hope and a sense of dignity. Freedom means that the man "can" and not "have to" (Tischner, 2001).

The above considerations do not claim the exhaustion of the issue raised. Only some of the selected questions from the texts of Sigismund Bauman and Józef Tischner concerning the ethical and existential problems of modern man have been reflected. They are intended to demonstrate in a sketchy way that the man, though at risk, is not in a completely lost position and, if they wish, they can change a lot by rereading the call to realize fundamental human values. The ethical and existential problems of modern man demand, especially today, re-examination and diagnosis. The Article may therefore provide a starting point for further research in this area.

References

1. Bauman, Z. (2007). *Społeczeństwo w stanie oblężenia*. Warszawa: Wydawnictwo Sic!
2. Bauman, Z. (2000). *Ponowoczesność jako źródło cierpień*. Warszawa: Wydawnictwo Sic!
3. Bauman, Z. (2008). *Wspólnota. W poszukiwaniu bezpieczeństwa w niepewnym świecie*. Kraków: Wydawnictwo Literackie.
4. Bauman, Z. (2009a). *Konsumowanie życia*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
5. Bauman, Z. (2009b). *Nowoczesność i zagłada*. Warszawa: Wydawnictwo Literackie.
6. Bauman, Z. (2009c). *Sztuka Życia*. Kraków: Wydawnictwo Literckie.
7. Bauman, Z. (2011). *Kultura w płynnej mnowoczesności*. Warszawa: Drukarnia Perfekt.
8. Bauman, Z. (2012a). *Etyka ponowoczesna*. Warszawa: Wydawnictwa Aletheia.
9. Bauman, Z. (2012b). *Kultura jako praxis*. Warszawa: PWN.
10. Bauman, Z. (2012c). *Straty uboczne. Nierówności społeczne w epoce globalizacji*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
11. Bauman, Z., May, T. (2004). *Socjologia*, Poznań: Zysk i S-ka Wydawnictwo.
12. Delsol, Ch. (2002). Przekraczanie, profanowanie, czyli granice jako problem ponowoczesności. In: W. Zuziak (ed.), *Pytając o człowieka. Myśl filozoficzna Józefa Tischnera* (pp. 61-64). Kraków: Wydawnictwo Znak.
13. Giddens, A. (2010). *Nowoczesność i tożsamość. "Ja" i społeczeństwo w epoce późnej nowoczesności*. Warszawa: PWN.
14. Kuzior, A. (2006). Człowiek jako racjonalny podmiot działań w świetle założeń koncepcji zrównoważonego rozwoju. *Problemy Ekorozwoju, nr 1(2)*. Polska Akademia Nauk, pp. 67-72.
15. Marszałek, I. (2014). *Józef Tischner I filozoficzne koncepcje zła. Czy zło jest w nas, czy między nami*? Kraków: Wydawnictwo WAM.
16. Marszałek-Kotzur, I. (2019b). Społeczeństwo konsumpcyjne. Cechy człowieka ponowoczesnego w ujęciu Zygmunta Baumana. In: L. Karczewski, H.A. Kretek (eds.), *Humanistyczne i społeczne aspekty biznesu i zarządzania* (pp. 59-67). Opole: Oficyna Wydawnicza Politechniki Opolskiej.
17. Marszałek-Kotzur, I. (2019a). Tischnerian land husbandry Ethical aspects of management of the environment. *Scientific Papers of Silesian University of Technology Organization and Management Series, no. 140*. Gliwice, pp. 197-205.
18. Tischner, J. (2001). *Spór o istnienie człowieka*. Kraków: Wydawnictwo Znak.
19. Tischner, J. (1990). *Filozofia dramatu*. Paryż.
20. Tischner, J. (2000). *Świat ludzkiej nadziei*. Kraków: Wydawnictwo Znak.
21. Tischner, J. (2002). *Myślenie według wartości*. Kraków: Wydawnictwo Znak.

22. Tischner, J. (2005). *Etyka solidarności oraz Homo Sovieticus*. Kraków: Wydawnictwo Znak.
23. Tischner, J. (2008). *Wędrówki w krainę filozofów*. Kraków: Wydawnictwo Znak.
24. Zuziak, W. (2002). W poszukiwaniu wolności – między J. Nabertem i J. Tischnerem. In: W. Zuziak (ed.), *Pytając o człowieka. Myśl filozoficzna Józefa Tischnera* (pp. 43-59). Kraków: Wydawnictwo Znak.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

DEVELOPMENT BACKGROUND OF HEALTH RESORTS IN THE DOLNOŚLĄSKIE VOIVODESHIP. SELECTED ECONOMIC ASPECTS

Ryszard MARSZOWSKI[1*], Tomasz SKOWRONEK[2]

[1] Central Mining Institute, Katowice; rmarszowski@gig.eu, ORCID: 0000-0002-2855-7121
[2] Central Mining Institute; Katowice; tskowronek@gig.eu, ORCID: 0000-0002-4947-8473
* Correspondence author

Purpose: the main purpose of the paper is to support the sustainable development of the health resort areas by protecting their unique resources.
Design/methodology/approach: the research is based on the descriptive and comparative statistical method and literature review, critical literature analysis, documentary research and comparative analysis.
Findings: on the basis of the conducted analyses and research it can be concluded that a systematic increase in the living standard of the residents of the researched health resort areas is clearly visible. The key factor that may determine further increase in the living standard of the residents of the areas appears to be the development of knowledge-based economies together with the development of innovative technologies and products as well as efficient management.
Originality/value: it should be assumed that the research into health resort area will be based to a large extent on its endogenous conditions and its strategic advantages. The key potential in this area is people and their knowledge, as well as skills, competencies and talents which shape social attitudes and influence behaviour towards the changes taking place, thus influencing acceptability or resistance to them.

Keywords: being, work, economy.

Category of the paper: research paper.

1. Introduction

The article is a result of research tasks assigned to the scope of project entitled "Enhancing environmental management capacities for sustainable use of the natural heritage of Central European SPA towns and regions as the driver for local and regional development",

implemented in Central Mining Institute[1]. The project is implemented within the Interreg CENTRAL EUROPE Programme funded under the European Regional Development Fund. It aims to build a sustainable development of the health resorts through the protection of their unique resources. The project will be implemented until 2022 in an international partnership of local and regional government units, development agencies and scientific units from Poland, Austria, Croatia, Czech Republic, Slovenia, Hungary and Italy. Thanks to the project, the partners will increase their knowledge and awareness of impact of various factors on underground thermal water deposits, building multi-level and territorial models of managing natural resources of health resorts. A key element of the project is to build a common, innovative and web-based tool for assessing risks and pressures on thermal water deposits.

An important part of the project work is social and economic analysis which makes possible to indicate development conditions in examined administrative areas of the Poviatries from which the project partners come. Therefore, the administrative area of the research – in the case of Poland it is 11 administrative units from the Dolnośląskie Voivodeship (Lower Silesian Voivodeship – further referred to as DLŚ), common methodology and subject matter of results presented in the article were determined by the project partnership – in the area of Poland, in particular by the Institute of Regional Development from Wrocław.

In the light of the project objectives focusing on economic research, it is now assumed that knowledge is determining factor for competitive advantages in a globalised world economy (Tusińska, 2014). In earlier periods this factor was labour, capital and land. The end of the twentieth century introduced a new term, previously unknown – knowledge-based economy. According to the definition of this term, economic development is assumed to be correlated with the appropriate use of knowledge (Mańkiewicz, 2016, pp. 130-140). This condition is increasingly determined by the disappearance of impact on development of economies of factors such as capital and labour resources in areas of productivity, competitiveness and efficiency in order to increase impact on these areas of knowledge in technical sciences, economics, organisation and management. As the literature review indicates, such relations enable the competitiveness of economies to increase, which are additionally determined by the following key factors: innovative technologies and products and efficient management. In conclusion, dynamics of changes taking place in globalised economies is determined by resource and modernity of people's knowledge, quality of work, education and training, ability to think quickly and innovatively and to implement new solutions to manufacturing, distribution and service processes (Kołodko, 2010).

In this context, from the point of view of investing in the development of human resources, it should be noted once again that process of globalisation, internationalisation and the knowledge-based economy is fully correlated with the level of human knowledge; and to a lesser extent with the material, natural and labour resources. The dominance of human

[1] The project is also co-financed by the Ministry of Science and Higher Education Republic of Poland.

capital results in its influence on the formation of all other factors and its recognition as a key factor of global development. Numerous literature sources stress that without investment in human capital economic development is impossible to achieve (Gołaszewska-Kaczan, 2016, pp. 91-104). It is this capital that will determine condition of the national economies of the European Union and the distance in their development. Therefore, it is assumed that a necessary and indispensable condition for the development of economies is the permanent development and strengthening of human capital, together with the recognition of this activity as an imperative of modern times (Becla, 2014, pp. 16-28). Along with the indicated economic benefits resulting from investing in the development of human capital, the quality of life, its level and numerous social benefits such as the decrease in crime, strengthening of social bonds, increase in tolerance behaviours, increase in ecological awareness or actions to protect natural environment also develop. An extremely positive role is played in these areas by educational system, on the basis of which development of human capital influences shape of social principles and norms and determines social cohesion. As a result, economic activities create benefits for society as a whole and fairer distribution and also clearer division of the economic sphere.

On the basis of above theses and megatrends in the analyses and research presented in the article, the authors focused – according to project guidelines – on the following key variables:

- number of persons employed by broad economic activity: agricultural, industrial and service sectors,
- average monthly gross remuneration,
- unemployment rate,
- education expenditure ratio,
- health expenditure ratio.

Table 1.
Variables introduced in economic analyses and studies

Item	Variable	Definition/Scope
1	Number of persons employed	Percentage of the active population working in agricultural sector (agriculture, forestry, hunting and fishing), industry and construction, service sector (trade, vehicle repair, transport, accommodation and catering, information and communication) and financial sector (financial and insurance activities, real estate).
2	Average monthly gross remuneration	The total value of recognition of remuneration, i.e. including personal income tax advances and, since 1999, compulsory social security contributions (pension, disability, sickness) paid by the insured employee.
3	Unemployment rate	Share of registered unemployed in civil professionally active population, i.e. without employees of budgetary units conducting activities in the field of national defence and public security.
4	Education, upbringing and care expenditure	Total expenditure by heading of the Budgetary Classification (Units: Territorial units; Budgetary classification headings) Heading 801
5	Health expenditure	As above Heading 851

Source: Statistics Poland – glossary of terms.

This article analyses of economic conditions – in compliance with assumptions adopted in the project – focus on selected 11 poviats (Poviaties) of Dolnośląskie Voivodeship. In the light of regularity of the matter, it should be noted that, taking into accunt Poviat territorial division of the analytical area according to NUTS 3 – on the basis of available statistical data from EUROSTAT and Statistics Poland describing variables – the analyses and surveys for the administrative units adopted in draft are only available by 5 Poviaties and the administrative division NUTS 3 presented in Table 2.

Table 2.
Division of the analytical area by administrative units on the basis of statistical data provided by EUROSTAT, Statistics Poland and NUTS 3

Item	Administrative unit	Administrative division	(Poviat)
1	Przerzeczyn Zdrój	village in the Niemcza Poviat	dzierżoniowski
2	Cieplice Śląskie-Zdrój	currently the district of Jelenia Góra	Jelenia Góra, city
3	Długopole-Zdrój	Village	kłodzki
4	Duszniki-Zdrój	urban commune	
5	Kudowa-Zdrój	urban commune	
6	Lądek-Zdrój	urban-rural commune	
7	Polanica-Zdrój	urban commune	
8	Czerniawa-Zdrój	currently the district of Świeradów Zdrój	lubański
9	Świeradów-Zdrój	urban commune	
10	Jedlina-Zdrój	urban commune	wałbrzyski
11	Szczawno-Zdrój	urban commune	

Source: Polska w liczbach 2019 [Poland in numbers], Local Data Bank Statistics Poland, European Union Statistical System EUROSTAT.

The analyses used statistical data from three sources: statistical portal Polska w liczbach [Poland in numbers], Statistics Poland and European Union Statistical System EUROSTAT. The research is based on the method of descriptive and comparative statistics and literature review, critical literature analysis, documentary research and comparative analysis.

2. Implementation of research – discussion

The data provided by Statistics Poland in the surveyed Poviaties of DLŚ in 2017 shows that the following number of people per 1000 inhabitants worked in given Poviaties: Dzierżoniów Poviat – 161, the Poviat of Jelenia Góra city – 258, Kłodzko Poviat – 162, Lubań Poviat – 159 and Wałbrzych Poviat – 102. Women constituted in these Poviaties the following percentage of employed persons, respectively: 52% – Dzierżoniów Poviat, 52.3% – Jelenia Góra city, 55.5% – Kłodzko Poviat, 56.2 – Lubań Poviat and 58% – Wałbrzych Poviat. Whereas the working men represented respectively: 48%, 47.7%, 44.5%, 43.8% and 42%. Among the professionally active inhabitants of Dzierżoniów Poviat – 6800 people were going to work in other towns or cities, and 5351 people were coming to work from outside the Poviat, therefore, the balance of arrivals and departures to work is – 1449. In the Poviat of Jelenia Góra city –

2058 people were going to work in other town or cities and 4400 people were coming from outside the Poviat, so the balance of arrivals and departures to work was – 2342. In Kłodzko Poviat – 14 087 people were going to work in other towns or cities, and 10 265 were coming to work from outside the Poviat, and the balance of arrivals and departures to work is – 3822. In Lubań Poviat – 4867 people were going to work in other towns or cities, and 3763 employees were coming from outside the Poviat, so the balance of arrivals and departures to work is – 1104.

In Wałbrzych Poviat – 7123 people were going to work to other towns or cities, and 2022 employees were coming to work from outside the Poviat, and the balance of arrivals and departures to work is – 5101.

This process was accompanied by a stable trend of predominance in the number of women in total employment. The highest median for the number of employees in the years from 2008 to 2018 in the population of women occurred in Lubań Poviat and amounted to 59.4%. Next, the following Poviaties were: 55.33% Wałbrzych, 55.2% Kłodzko, 54.4% Jelenia Góra city and 50.2% Dzierżoniów (Table 3).

Table 3.
Employed in selected Poviaties of Dolnośląskie voivodeship in 2008-2018 by gender

Poviat	Detailed list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Median
dzierżoniowski	males	51.4	50.7	50.2	50.9	49.8	49.7	49.4	48.8	48.4	48.8	49.1	**49.8**
	females	48.6	49.3	49.8	49.1	50.2	50.3	50.6	51.2	51.6	51.2	50.9	**50.2**
Jelenia Góra, city	males	45.4	45.7	45.6	45.6	44.0	44.8	44.6	45.6	46.4	47.7	48.5	**45.6**
	females	54.6	54.3	54.4	54.4	56.0	55.2	55.4	54.4	53.6	52.3	51.5	**54.4**
kłodzki	males	46.5	46.7	49.8	47.7	46.5	47.5	47.1	47.2	48.7	48.8	47.5	**51.2**
	females	53.5	52.5	55.4	54.5	53.1	55.0	54.9	55.9	56.7	57.2	57.0	**55.2**
lubański	males	48.4	42.4	49.9	50.6	49.6	48.7	48.3	48.7	50.7	50.4	51.5	**49.6**
	females	51.6	51.5	58.8	59.3	58.0	59.4	60.8	59.9	61.4	61.4	62.0	**59.5**
wałbrzyski	males	-	-	-	-	-	44.9	45.6	44.4	45.0	44.0	43.2	**50.0**
	females	-	-	-	-	-	55.1	54.4	55.6	55.0	56.0	56.8	**55.3**

The symbol '-' indicates a lack of information due to: a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables.

In the analysed period economic sector with the highest share of employees in the analysed Poviaties – excluding Dzierżoniów Poviat– were the remaining services. In this sector, the median for the number of employed persons – in decreasing order – was: 42.7% Jelenia Góra city, 38.5% Kłodzko Poviat, 34.6% Wałbrzych Poviat and 31.2% Lubań Poviat. In the Poviat of Dzierżoniów, the dominant sectors were industry and construction – 42.1%. The indicated sector was second in the order of the share of employed in the remaining Poviaties, characterised by the following percentage of employed persons: 32.1% Jelenia Góra city, 24.8% Kłodzko Poviat, 25.1% Wałbrzych Poviat and 27.7% Lubań Poviat. It is worth noting that in Jelena Góra city the following branches were characterised by a high percentage of workers: trade; repair of motor vehicles; transport and storage; accommodation and catering; information and communication – 20.9%. In Kłodzko Poviat these were agriculture, forestry,

hunting and fishing – 17.4%. In Lubań Poviat, similar to Kłodzko Poviat, these were agriculture, forestry, hunting and fishing – 23.9%. And finally, in Wałbrzych Poviat these were trade; repair of motor vehicles; transport and storage; accommodation and catering; information and communication – 18.7%.

The remaining sections, due to the median value, were not significant in the quantitative development of the working structure (Table 4).

Table 4.
Employed in selected Poviaties of Dolnośląskie voivodeship in 2008-2018 by economic sectors

Subregions	Detailed list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Median
dzierżoniowski	1	11.3	11.6	12.8	12.8	13.1	13.0	12.8	13.1	12.7	12.8	12.5	**12.8**
	2	45.5	42.6	40.5	41.8	41.1	41.7	43.4	42.1	41.5	43.8	44.0	**42.1**
	3	13.8	13.7	15.5	14.5	15.5	14.2	13.3	13.3	14.8	14.0	13.9	**14.0**
	4	3.0	3.2	3.1	3.1	2.9	3.0	2.9	2.9	2.8	2.6	2.5	**2.9**
	5	26.4	28.9	28.1	27.8	27.4	28.1	27.6	28.6	28.2	26.8	27.1	**27.8**
Jelenia Góra, city	1	0.8	0.7	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	**1.5**
	2	33.8	32.2	30.4	30.6	29.7	30.5	32.1	32.1	33.9	34.4	34.7	**32.1**
	3	21.2	20.9	21.9	19.3	18.7	18.3	17.0	20.0	22.4	20.9	21.0	**20.9**
	4	5.0	4.8	3.6	3.3	3.1	3.5	3.2	3.3	3.2	3.0	2.7	**3.3**
	5	39.3	41.4	42.7	45.4	46.9	46.2	46.2	43.1	39.0	40.2	40.0	**42.7**
kłodzki	1	12.8	12.6	17.2	17.7	18.1	17.8	18.0	17.6	17.2	17.3	17.4	**17.4**
	2	26.3	25.7	25.2	24.8	23.5	22.9	23.3	24.6	25.1	25.7	24.7	**24.8**
	3	15.6	16.1	15.1	15.1	15.6	16.6	17.0	16.6	16.8	16.5	16.7	**16.5**
	4	4.6	4.7	4.0	3.9	3.6	3.2	3.3	2.7	2.6	2.6	2.5	**3.3**
	5	40.7	40.9	38.4	38.5	39.1	39.4	38.5	38.5	38.3	38.0	38.6	**38.5**
lubański	1	13.4	14.1	24.0	23.8	24.1	24.3	24.3	24.3	23.6	23.9	23.6	**23.9**
	2	32.3	29.0	25.3	26.9	26.4	24.9	25.3	27.7	28.3	28.8	30.0	**27.7**
	3	17.1	16.6	16.3	15.7	15.2	16.0	16.6	15.5	16.5	16.5	15.9	**16.3**
	4	3.0	2.6	2.6	2.6	3.1	2.8	2.7	2.1	2.2	2.0	2.3	**2.6**
	5	34.2	37.7	31.8	31.1	31.3	32.0	31.2	30.4	29.3	28.7	28.1	**31.2**
wałbrzyski	1	-	-	-	-	-	17.9	16.7	18.0	18.6	18.7	17.8	**17.9**
	2	-	-	-	-	-	25.7	23.9	24.8	25.7	25.3	24.0	**25.1**
	3	-	-	-	-	-	18.8	24.2	19.5	17.6	18.6	18.4	**18.7**
	4	-	-	-	-	-	3.0	2.9	3.0	2.9	3.1	2.9	**2.9**
	5	-	-	-	-	-	34.6	32.3	34.7	35.2	34.4	37.0	**34.6**

Legend: 1. Agriculture, forestry, hunting and fishing, 2. Industry and construction, 3. Trade; repair of motor vehicles; transport and storage; accommodation and catering; information and communication, 4. Financial and insurance activities; real estate services, 5. other services[2].

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables.

In the whole period of 2008-2018 the number of employees in the surveyed Poviaties – excluding the city of Jelenia Góra – was stable and characterized by a slight increase. In a descending order, the shares of Poviaties are as follows: dzierżoniowski – 105.4% (median 101.3%), kłodzki – 104.6% (102.4%), lubański – 113.5% (108.7%) and wałbrzyski – 101.4% (100.4%). In the Poviat of Jelenia Góra city, as it has already been indicated, the total number

[2] Other services include: extraterritorial organisations and bodies, households as employers; other service activities of households as producers of goods and services for own use. Cf. Regulation of the Council of Ministers of 24 December 2007 on the Polish Classification of Activities (PKD) (Journal of Laws 251, item 1885, as amended).

of employees was decreasing. The fall was nearly 8% (5% median). In the analysed period, the growth dynamics of female employees prevailed in all surveyed Poviaties (Table 5).

Table 5.
Dynamics of growth/decrease in the number of employed persons in selected Poviaties of Dolnośląskie voivodeship in the years 2008-2018. Year 2008 = 100%

Sub-regions	Detailed list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Med.
dzierżo-nowski	Total	17973	17 370	18 261	18 161	17 825	17 810	18 253	17 965	18 277	18 620	18 945	**18207**
	%	100	96.6	101.6	101.0	99.2	99.1	101.6	100.0	101.7	103.6	105.4	**101.3**
	Males	9 246	8 798	9 174	9 252	8 879	8 851	9 026	8 758	8 855	9 085	9 306	**8952.5**
	%	100	95.2	99.2	100.1	96.0	95.7	97.6	94.7	95.8	98.3	100.6	**96.8**
	Females	8 727	8 572	9 087	8 909	8 946	8 959	9 227	9 207	9 422	9 535	9 639	**9147**
	%	100	98.2	104.1	102.1	102.5	102.7	105.7	105.5	108.0	109.3	110.5	**104.8**
Jelenia Góra, city	Total	25114	24 764	25 179	23 895	24 110	24 077	23 542	22 923	23 056	23 298	23 169	**23 895**
	%	100	98.6	100.3	95.1	96.0	95.9	93.7	91.3	91.8	92.8	92.3	95.1
	Males	11407	11 307	11 482	10 892	10 604	10 779	10 492	10 443	10 705	11 107	11 241	**10 892**
	%	100	99.1	100.7	95.5	93.0	94.5	92.0	91.5	93.8	97.4	98.5	95.5
	Females	13707	13 457	13 697	13 003	13 506	13 298	13 050	12 480	12 351	12 191	11 928	**13 050**
	%	100	98.2	99.9	94.9	98.5	97.0	95.2	91.0	90.1	88.9	87.0	95.2
kłodzki	Total	29261	29 031	30 783	29 894	29 153	29 971	29 850	30 174	30 833	31 022	30 596	**29 971**
	%	100	99.2	105.2	102.2	99.6	102.4	102.0	103.1	105.4	106.0	104.6	**102.4**
	Males	13609	13 670	14 581	13 954	13 618	13 885	13 785	13 816	14 249	14 275	13 905	**13 885**
	%	100	100.4	107.1	102.5	100.1	102.0	101.3	101.5	104.7	104.9	102.2	**102.0**
	Females	15652	15 361	16 202	15 940	15 535	16 086	16 065	16 358	16 584	16 747	16 691	**16 086**
	%	100	98.1	103.5	101.8	99.3	102.8	102.6	104.5	106.0	107.0	106.6	**102.8**
lubański	Total	10110	9 493	10 989	11 103	10 881	10 938	11 023	10 983	11 332	11 303	11 478	**10 989**
	%	100	93.9	108.7	109.8	107.6	108.2	109.0	108.6	112.1	111.8	113.5	**108.7**
	Males	4 890	4 285	5 045	5 111	5 016	4 928	4 881	4 927	5 124	5 096	5 211	**5 016**
	%	100	87.6	103.2	104.5	102.6	100.8	99.8	100.8	104.8	104.2	106.6	**102.6**
	Females	5 220	5 208	5 944	5 992	5 865	6 010	6 142	6 056	6 208	6 207	6 267	**6 010**
	%	100	99.8	113.9	114.8	112.4	115.1	117.7	116.0	118.9	118.9	120.1	**115.1**
wałbrzy-ski	Total	-	-	-	-	-	7 073	7 593	7 136	7 071	6 832	7 174	**7 105**
	%	-	-	-	-	-	100	107.3	100.9	100.0	96.6	101.4	**100.4**
	Males	-	-	-	-	-	3 179	3 462	3 168	3 184	3 006	3 100	**3 174**
	%	-	-	-	-	-	100	108.9	99.6	100.2	94.6	97.5	**99.8**
	Females	-	-	-	-	-	3 894	4 131	3 968	3 887	3 826	4 074	**3 931**
	%	-	-	-	-	-	100	106.1	101.9	99.8	98.2	104.6	**100.9**

The symbol '-' indicates a lack of information due to: a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables.

In the light of the regularities described above, it is worth pointing out that structure of economies is characterised, among others, by structure of economic entities operating there. Every developing economy is subject to structural changes, especially changes in the structure of entities. As a result of structural transformations, the share of particular parts of the economy in GDP creation changes, as well as the share of employment in particular sectors (Klamut, 1996). As Leszczewska notes, analyses of structural changes in economy in long term indicate the following several regularities: along with economic development, importance of agricultural sector is decreasing and its share in employment is decreasing, at a certain stage of economic development, the importance of the industrial sector is increasing, which manifests itself in increase of its share in total employment, at a further stage of development, importance

of industrial sector is stabilising and then decreasing, and at the same time employment in this sector is decreasing, along with economic development, share of services sector in the economy is increasing and the share of those working there is increasing at expense of employment in agricultural and industrial sector (Leszczewska, 2010, pp. 215-225).

Another variable describing socio-economic situation of the surveyed Poviaties is average monthly gross remuneration, which in 2018 in decreasing order was respectively (in PLN): Jelenia Góra city – 4546.1, Kłodzko Poviat – 4054.2, Dzierżoniów Poviat – 4024.94, Lubań Poviat – 3939.03 and Wałbrzych Poviat – 3835.44. The highest growth rate of the average monthly gross remuneration was observed in Lubań Poviat – 170.2%, followed by 162.6% in Jelenia Góra city, 161.7% in Dzierżoniów Poviat, 161.4% Kłodzko Poviat and the lowest growth dynamics were achieved by Wałbrzych Poviat – 121.9% (Table 6).

Table 6.
Dynamics of decrease/growth of average monthly gross salary in selected Poviaties of Dolnośląskie voivodeship in the years 2008-2018. Year 2008=100%

Sub-regions	Det. list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Med.
dzierżo-niowski	Total	2489.4	2645.1	2832.1	3024.1	3113.1	3156.1	3300.0	3406.2	3562.6	3825.2	4024.9	**3156.1**
	%	100	106.3	113.8	121.5	125.1	126.8	132.6	136.8	143.1	153.7	161.7	**126.8**
Jelenia Góra, city	Total	2795.9	2913.0	2969.8	3192.2	3291.1	3367.2	3577.0	3835.1	3979.8	4237.5	4546.1	**3367.2**
	%	100.0	104.2	106.2	114.2	117.7	120.4	127.9	137.2	142.3	151.6	162.6	**120.4**
kłodzki	Total	2511.4	2663.4	2803.2	2962.3	3063.4	3200.5	3333.4	3410.2	3526.7	3741.8	4 054.2	**3200.5**
	%	100.0	106.1	111.6	118.0	122.0	127.4	132.7	135.8	140.4	149.0	161.4	**127.4**
lubański	Total	2314.7	2464.4	2600.6	2810.0	2937.0	3034.9	3195.7	3314.0	431.3	3622.2	3939.0	**3034.9**
	%	100.0	106.5	112.4	121.4	126.9	131.1	138.1	143.2	148.2	156.5	170.18	**131.1**
wałbrzy-ski	Total	-	-	-	-	-	3138.1	3213.8	3293.5	3528.0	3638.6	3825.4	**3410.8**
	%	-	-	-	--	-	100.0	102.4	105.0	112.4	115.9	121.9	**108.7**

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables. Remuneration and social benefits.

In each of the analysed Poviaties, the average gross monthly remuneration in relation to national average was lower, and in the analysed period it was at the following levels: Jelenia Góra city – 94%, Kłodzko Poviat – 83.9%, Dzierżoniów Poviat – 83.3%, Lubań Poviat – 81.5% and Wałbrzych Poviat – 79.1%. In the years between 2008 and 2018, monthly gross remuneration expressed in median were as follows: 88.5% – Jelenia Góra city, 82.2% – Kłodzko Poviat, 82.4% – Dzierżoniów Poviat, 78.4% – Lubań Poviat and 80.3% – Wałbrzych Poviat (Table 7).

Table 7.
Average gross monthly remuneration in relation to the national average (Poland = 100%) in selected Poviaties of Dolnośląskie Voivodeship in the years 2008-2018

Subregions	Detailed list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Median
dzierżoniowski	Total	78.8	79.8	82.4	83.4	83.1	81.4	82.4	82.1	83.0	84.5	83.3	**82.4**
Jelenia Góra, city	Total	88.5	87.9	86.5	88.1	87.9	86.8	89.3	92.4	92.8	93.6	94.0	**88.5**
kłodzki	Total	79.5	80.3	81.6	81.7	81.8	82.0	83.3	82.2	82.2	82.6	83.9	**82.2**
lubański	total	73.3	74.3	75.7	77.5	78.4	78.3	79.8	79.8	80.0	80.0	81.5	**78.4**
wałbrzyski	total	-	-	-	-	-	80.9	80.3	79.3	82.2	80.4	79.1	**80.35**

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables. Remuneration and social benefits.

To conclude, in years between 2009 and 2018 a dynamic and high growth of gross monthly remuneration should be recorded in the analysed Poviaties. It is worth noting that this was also a linear increase in the average monthly gross remuneration in relation to national average, which in the analysed period ranged between 88.5% and 94% in Jelenia Góra city, between 79.5% and 83.9% in Kłodzko Poviat, between 78.8% and 83.3% in Dzieżoniów Poviat, 73.3% and 81.5% in Lubań Poviat and between 80.9% and 79.1% in Wałbrzych Poviat.

Given the above analysis, it is worth stressing that among various aspects of wage developments in a market economy, wage differentiation in Poland deserves special attention. It is also a result of various factors: demographic and social (including age, gender and education) and economic (economic development level, situation on labour market, economic attractiveness). On the other hand, knowledge about the level and diversity of remuneration for work can be used in the Polish economy (both on a micro- and macro-economic scale) for measures to increase work efficiency and improve the competitive position of enterprises and for more rational human resources management in the region and the Poviaty (Karaszewska, 2003).

On the basis of these theses, the above analyses focusing on the socio-demographic and economic area gain additional value, indicating the need to take them into ac Poviats in the process of conclusions resulting from the entirety of the research carried out in the design works.

The analysis of the rate of registered unemployment in the studied Poviaties in the years from 2008 to 2020 shows a systematic decrease: Dzierżoniów Poviat from 21.1% to 5.6%, Jelenia Góra city 6.5% to 3.4%, Kłodzko Poviat 21.6% to 11.5%, Lubań Poviat 22.2% to 7.1% and Wałbrzych Poviat from 29.8% to 12.9%. The highest rate of decrease in the unemployment rate in the analysed period was observed in Dzierżoniów Poviat – 26.5% (the year 2008 = 100%). Next, the following Poviaties: 52.3% Lubań, 32.0%, Wałbrzych 43.4%, Jelenia Góra 52.3% and Kłodzko 53.2% (Table 8).

Table 8.
Dynamics of decrease/growth in the registered unemployment rate in selected Poviaties of Dolnośląskie voivodeship in the years 2008-2020. Theyear 2008 = 100%

Sub-regions	Det. list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Med.
dzierżo-	Total	21.1	24.5	22.3	19.3	20.5	20.2	15.8	11.9	10.0	7.4	6.1	5.1	5.6	**19.3**
niowski	%	100	116.1	105.7	91.5	97.2	95.7	74.9	56.4	47.4	35.1	28.9	24.2	26.5	**74.5**
Jelenia	Total	6.5	9.6	10.9	9.9	10.1	9.3	7.5	5.7	4.6	3.6	3.6	3.2	3.4	**7.5**
Góra, city	%	100	147.7	167.7	152.3	155.4	143.1	115.4	87.7	70.8	55.4	55.5	49.2	52.3	**100**
kłodzki	Total	21.6	24.4	24.7	24.9	27.1	27.1	23.6	19.9	16.0	12.5	11.8	10.9	11.5	**23.6**
	%	100	113.0	114.3	115.3	125.5	125.5	109.3	92.1	74.1	57.9	54.6	50.5	53.2	**100**
lubański	Total	22.2	25.4	24.7	22.9	23.1	21.6	17.8	14.2	11.3	9.3	7.3	6.9	7.1	**17.8**
	%	100	114.4	111.3	103.1	104.0	97.3	80.2	64.0	50.9	41.9	32.9	31.1	32.0	**80.2**
wałbrzy-	Total	-	-	-	-	-	29.8	24.9	22.4	19.3	14.3	13.6	12.3	12.9	**20.8**
ski	%	-	-	-	--	-	100	83.6	75.2	64.8	48.0	45.6	41.3	43.4	**56.4**

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

The symbol '*' indicates the end of January 2020.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables. Remuneration and social benefits.

The same trend determines the size of the unemployment rate in relation to its national value and is in the range, according to the surveyed Poviaties: Dzierżoniów from 222.1% to 105.2%, Jelenia Góra city from 68.4% to 60.3%, Kłodzko from 227.4% to 200%, Lubań from 233.7% to 127.6% and Wałbrzych from 222.4% to 237.9% (Table 9).

Table 9.
*Registered unemployment rate (Poland = 100%) in selected Poviaties of Dolnośląskie voivodeship in the years between 2008 and 2020**

Sub-regions	Det. list	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Med.
dzierżonio-wski	Total	222.1	202.5	179.8	154.4	153.0	150.7	138.6	122.7	122.0	112.1	105.2	150.7
Jelenia Góra, city	Total	68.4	79.3	87.9	79.2	75.4	69.4	65.8	58.8	56.1	54.5	60.3	68.4
kłodzki	Total	227.4	201.7	199.2	199.2	202.2	202.2	207.0	205.2	195.1	189.4	200.0	201.7
lubański	Total	233.7	209.9	199.2	183.2	172.4	161.2	156.1	146.4	137.8	140.9	127.6	161.2
wałbrzyski	Total	-	-	-	-	-	222.4	218.4	230.9	235.4	216.7	237.9	226.7

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

The symbol '*' indicates the end of January 2020.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables. Remuneration and social benefits.

Despite the very low unemployment in 2020 in the Poviat of Jelenia Góra city and the dynamic decline of this phenomenon in the remaining examined Poviaties, it is worth noting that in the next few decades in the developing globalised economy in the phase of demographic change significant processes will be taking place on the demand and supply side of the labour market. The state of supply and demand that is not equivalent to the labour force is a structural mismatch that may be of a qualification, branch, industry, vocational and spatial nature.

Equally important in the process of shaping the relationship between labour supply and demand is the already mentioned demographic change. It will result in a process of a systematic decrease in labour supply and, above all, an increase in the demographic burden factor. According to forecasts, by 2060 the demographic burden will be significant. In turn, the old-age dependency ratio may increase by more than three times, according to forecasts (Kiełkowska, 2013, pp. 6). This process will have a huge impact on the quantitative and qualitative dimension of unemployment, which is also determined by changes in the structure of consumer demand or, for example, the collapse or development of economies. This is related, among other things, to the emergence of more and more innovative technologies – more and more determined by Revolution 4.0. in a globalised economy in the phase of demographic change.

Another analysed variable is expenditure on education, upbringing, and care. In the light of this analysis, the huge role of the education system – and thus of expenditure on education, upbringing and care – in shaping qualified staff and their position in the labour market is revealed. Numerous documents and studies stress that education is a key factor determining the increase of an individual's developmental changes on the labour market, in particular in the context of professional activation and chances related to gaining employment. In this light, it is worth stressing that the modern paradigm of the knowledge-based economy should take into acPoviat the fact that human needs are met in the production and service process. It is through education that knowledge "spreads" to all sectors of the economy. Economists and social politicians provide convincing tangible evidence of the benefits of education. The economic benefits illustrate the differences in income between people with different levels of education. In more than 2/3 of OECD Poviaties, people with higher education have 50% higher earnings than people with upper secondary and post-secondary education. Also, from a macroeconomic point of view, investment in education is profitable. In OECD Poviaties, a male with higher education during his working life brings the state budget an average income of about USD 100 000 more in taxes and insurance premiums than a person with secondary education. After deducting the public funds allocated to finance student education in higher education, the net benefit is over USD 91 000 (Educationat a Glance, 2011, pp. 161-165). The benefits of education are even greater if the social benefits expressed in indicators important for building up social capital resources are taken into acPoviat. According to the OECD report, in Poland also – according to the results of the "Social Diagnosis" study – people with higher education declare greater life satisfaction, better health, a higher degree of mutual trust, greater involvement in social life in the form of participation in elections or voluntary activities (Social Diagnosis 20090, 2009, pp. 271). In this context, as U. Sztanderska emphasizes, education matters not only when entering the labour market and matching employers' expectations. The effects of primary/initial education last practically throughout life because the knowledge and skills acquired at school are used for an exceedingly long time. These competencies are complemented over time by professional experience and training already undertaken during employment. Above all, under the influence of technological

developments and intensification of global ties, primary (school) education often needs to be modified and expanded if it is to provide work and satisfactory earnings (Sztanderska, 2008, p. 5).

In years between 2008 and 2018, the analysed variable grew dynamically in each of the analysed Poviaties. The highest growth rate of expenditure on education and upbringing was observed in Kłodzko and Lubań Poviaties. The dynamics measured by the median value in the years 2008-2018 was respectively 125.8% and 123.2%. The lowest dynamics occurred in Wałbrzych Poviat and amounted to 108.5% (Table 10). In 2018, the total expenditure in the areas under consideration was as follows (in PLN): Dzierżoniów Poviat – 108 265 132.8, Jelenia Góra Poviat – 144 633 211.0, Kłodzko Poviat – 195 889 476.3, Lubań Poviat – 79 149 929.3 and Wałbrzych Poviat – 52 764 222.7. The highest amount of expenditure on education, upbringing and care per capita was characteristic of Jelenia Góra Poviat. The amount of expenditure in 2018 amounted to PLN 2260.5. The lowest was in Wałbrzych Poviat, with the level of PLN 937.9 (Table 10).

Table 10.
Dynamics of growth/decrease in expenditure on education, upbringing and care in selected Poviaties of Dolnośląskie voivodeship in the years 2008-2018

Poviat	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Median	Expenditure per capita in PLN
dzierżoniowski	100	102.4	112.5	118.8	114.5	120.0	118.0	116.1	119.9	129.1	160.6	**118.1**	**1063.6**
Jelenia Góra, city	100	105.1	112.8	117.7	128.7	119.7	119.8	122.4	120.8	129.9	148.9	**119.8**	**2260.5**
kłodzki	100	110.6	120.2	122.6	122.1	126.4	125.8	131.3	136.2	156.1	169.1	**125.8**	**1225.5**
lubański	100	106.1	117.6	117.5	121.5	123.2	129.2	133.4	137.4	143.1	170.9	**123.2**	**1444.5**
wałbrzyski	-	-	-	-	-	100	108.5	114.2	100.8	103.8	111.2	**108.5**	**937.9**

The symbol '-' indicates a lack of information due to a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables.

Health care expenditure, on the other hand, was characterised by a variable rate of growth/decrease. The highest growth dynamics of expenditure on health care was observed in Dzierżoniów and Lubań Poviaties. The dynamics measured by the median value in years 2008-2018 was respectively 116.1% and 114.1%. The lowest dynamics were observed in Jelenia Góra Poviat and amounted to 99.9% (Table 11). In 2018, the total expenditure in the areas under consideration was as follows (in PLN): Dzierżoniów Poviat 1 950 197.2, Jelenia Góra Poviat 2 670 255.8, Kłodzko Poviat 4 233 521.4, Lubań Poviat 1 383 537.5 and Wałbrzych Poviat 1 209 656.9. The highest amount of expenditure on health care per capita was characteristic of Jelenia Góra Poviat. The amount of expenditure in 2018 amounted to PLN 41.7. The lowest was in Dzierżoniów Poviat, at the level of PLN 18.8 (Table 11).

Table 11.
Dynamics of growth/decrease in expenditure on health care in selected Poviaties of Dolnośląskie voivodeship in the years 2008-2018

Poviat	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Median	expen. per capita in PLN
dzierżo-niowski	100	137.6	418.4	120.2	96.0	104.3	111.0	117.0	111.0	117.3	115.1	**116.16**	**18.8**
Jelenia Góra, city	100	125.7	130.2	98.4	91.7	96.6	97.5	99.8	108.0	93.0	114.5	**99.1**	**41.7**
kłodzki	100	90.2	98.5	83.1	88.9	333.9	94.5	103.8	110.8	103.9	109.4	**101.1**	**26.5**
lubański	100	95.9	98.0	108.0	112.7	113.6	124.1	114.6	118.5	127.4	124.0	**114.1**	**25.2**
wałbrzy-ski	-	-	-	-	-	100.0	114.1	105.9	106.1	104.0	99.7	**105.9**	**21.5**

The symbol '-' indicates a lack of information due to: a change in the level of presentation, changes in the list of territorial units or modifications.

Source: Local Data Bank, Statistics Poland. Data aggregated in predefined public tables.

In the light of increasing expenditure on both education, upbringing, and health care, it is worth noting that according to demographic forecasts, number of people in working age in the European Union will fall by almost 21 million by 2030. The population of young Europeans will decrease by 20% over the next 20 years. This change is one of the key challenges facing modern Europe in education and health. This is very clearly noted by the European Expert Network on Economics of Education (EENEE), which in its report "The Future of European Education and Training Systems: Key Challenges and Their Implications" puts demographic change at the top of the four key challenges for education and training systems (Schlotteri et al, 2008). It is worth recalling here that it was the French demographer Adolphe Landry (1909) who at the beginning of the twentieth century developed a theoretical concept to explain the demographic development of the world. Over time, the concept has taken several characteristic names, such as demographic transition, phase development or cyclical demographic transition. This was the result of its development by the author and numerous further researchers (Wittthauer, 1959, pp. 289-298). Despite this work, basic assumptions shaping Landry's concepts were not subject to any changes. Following this approach, population development for each large social group follows several successive phases of time, differentiated by characteristic development of natural population movement determined by births and deaths. This process throughout history – from a society living in primitive conditions to a society functioning in a globalised world and rich knowledge-based economies – is universal (Landry, 1934).

In conclusion, demographic depression is an important challenge for many public policies, such as family, labour market, health, social security, and education. The challenges and areas of impact identified are part of a broader spectrum of reflection that should focus on a holistic approach to education and health, which are key determinants of human capital, where projections indicate that by 2050 people over sixty-five years old will represent 20% of total population of Europe as a whole.

3. Conclusions

On the basis of the analyses and research carried out, it can be concluded that a systematic increase in the standard of living of the inhabitants of the surveyed Poviaties, and thus of the tourist communes covered by the project activities, is clearly visible. The key factor that may determine further increase in the standard of living of the residents of the areas appears to be the development of knowledge-based economies together with the development of innovative technologies and products as well as efficient management. Together with the indicated economic benefit – which should be emphasized once again – in health resort communes covered by the project activities, further development of the quality of life, its level and numerous social benefits should also be expected, such as the decrease in crime, strengthening of social bonds, increase in tolerance behaviour, increase in ecological awareness or environmental protection activities.

A special role in the creation of the above-described vision of the development of the studied areas should be attributed to Jelenia Góra Poviat. All the results obtained in the research clearly indicate predominant position of this Poviat. It dominates in the area of number of employees per 100 inhabitants, a highly positive balance of arrivals and departures to work, a stable number of employees, in number of those working in services and industry and construction, the highest average monthly gross remuneration, it occupies the second position in the group of the analysed Poviaties due to the remuneration growth dynamics, the highest level of remuneration in relation to the national average, the lowest unemployment rate among the analysed Poviaties, the lowest unemployment rate in relation to its national value, the highest value of expenditure on education and upbringing and health care per capita.

When result of the study is presented in the cross-section of analytical variables, a few more important regularities are visible – due to the economic development of Poviaties – which should include:

- Low – except for the Poviat of Jelenia Góra city – number of employees per 1000 inhabitants,
- predominance in working female population - especially in service sector,
- high — except for Jelenia Góra Poviat – negative balance of labour migration,
- prevailing shares of employees working in two sectors, i.e. services and industry and construction,
- stable – with an upward trend – total number of employees,
- dynamically growing average gross monthly remuneration,
- lower than the national average – with an upward trend – the average gross monthly remuneration,
- a dynamic drop in the registered unemployment rate – with a high level in relation to the national rate,

- dynamically growing expenditure on education, upbringing, and care – with a trend towards stable growth,
- dynamically growing expenditure on health care – with a trend towards stable growth

Furthermore, in the light of the above-mentioned processes, regularities and trends, it is worth highlighting that as a result of the demographic processes taking place and mainly the related reversal of the age pyramid, maintaining balance in labour market will be a serious challenge. As a result of the ongoing changes, it will be a great challenge to keep older people in employment for as long as possible. This in turn, in the context of demographic challenges, will force economies to re-profile into the so-called silver economy, i.e. to create services and products that meet needs of a population dominated by the elderly. This process will also significantly determine development of the small and medium-sized enterprise sector, which in the vast majority of cases will provide necessary and indispensable food products, related to safety, professional activity, leisure, maintaining the independence and self-sufficiency of older people[3].

It seems that on the basis of all the considerations, the thesis that since it is impossible to stop the changes, one has to learn to benefit from them is confirmed. The view expressed above concerns changes that imply several important technological and social challenges, among which the following deserve particular attention:

- growing importance of local participation in global decision making in more culturally diverse conditions of cooperation,
- need to implement projects based on international mobility, adaptability, and cultural sensitivity,
- need to increase public awareness related to the responsibility for the natural environment,
- disappearance of the state policy in implementation of social functions and their assumption by an increasingly organised local society.

In conclusion, it should be recognised that development of the surveyed communes and Poviaties will largely be based on their endogenous conditions and their strategic advantages. The key potential in this area is people and their knowledge, as well as skills, competencies, and talents as they shape social attitudes and influence behaviour towards the changes taking place, thus influencing acceptability or resistance to them. Here, it seems that development of the examined Poviaties depends mainly on activity and mobility of people and achievement of the set goals. The ability to create a culture of cooperation based on trust among local communities, which may become the foundation shaping the future of the areas in which they operate, may prove to be crucial in this area.

[3] See: Strategia na rzecz Odpowiedzialnego Rozwoju do roku 2020 (z perspektywą do 2030 r.), Warszawa 2017, pp. 12-13.

References

1. Becla, A., Czaja, S. (2014). Rola kapitału ludzkiego i społecznego w określeniu ścieżki rozwoju ekonomicznego w regionach problemowych. *Optimum. Studia Ekonomiczne, nr 2(68)*.
2. Czapiński, J., Panek, T. (eds.) (2009). *Diagnoza społeczna 2009. Warunki i jakość życia Polaków*. Warszawa.
3. *Education at a Glance 2011: OECD Indicator*. http://www.oecd.org/document/2/0,3746, en_2649_ 39263238_48634114_1_1_1_1,00.html.
4. Gołaszewska-Kaczan, U. (2014). Działania podnoszące poziom kapitału ludzkiego w nowej perspektywie finansowania 2014-2020. *Optimum. Studia Ekonomiczne, nr 6(72)*.
5. Karaszewska, H. (2003). *Ewolucja wynagrodzeń w Polsce w okresie zmian systemu ekonomicznego*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.
6. Kiełkowska, M. (ed.) (2013). Rynek pracy wobec zmian demograficznych. *Zeszyty demograficzne, Instytut Obywatelski*. Warszawa.
7. Klamut, M. (1996). *Ewolucja struktury gospodarczej w krajach wysoko rozwiniętych*. Wrocław: Wyd. Akademii Ekonomicznej.
8. Kołodko, G. (2010). *Świat w zasięgu myśli.* Warszawa: Prószyński i S-ka.
9. Landry, A. (1934). *La revolution démographique.* Paris: Sirey.
10. Leszczewska, K. (2010). Aktywność ekonomiczna regionów peryferyjnych. *Nierówności społeczne a Wzrost Gospodarczy, z. 17*.
11. Mańkiewicz, P.J. (2016). Gospodarka oparta na wiedzy jako determinanta konwergencji gospodarczej Polski i wysoko rozwiniętych krajów Unii Europejskiej. *Annales Universitatis Mariae Curie-Skłodowska Lublin – Polonia, Vol. L, 3*.
12. Schlotter, M. et al. (2008). *The Future of European Education and Training Systems: Key Challenges and Their Implications*.
13. *Słownik pojęć*. GUS.
14. Sztanderska, U. (2008). *System edukacji a potrzeby rynku pracy w Polsce*. Warszawa: Wyd. Fundacja FOR, Fundacja im. Friedricha Eberta.
15. Tusińska, M. (2014). *Konkurencyjność międzynarodowa a rozwój społeczno-gospodarczy*. Katowice: Wyd. Uniwersytetu Ekonomicznego.
16. Wittthauer, K. (1959). der Bevölkerungsdynamik. *Petermanns Geographische Mitteilungen, t. C0III, nr 4*.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE STRUCTURAL EQUATION MODEL IN THE ASSESSMENT OF DETERMINANTS OF SUSTAINABLE DEVELOPMENT OF MANUFACTURING ENTERPRISES IN POLAND

Anna MISZTAL

Faculty of Economics and Sociology, University of Lodz; anna.misztal@uni.lodz.pl,
ORCID: 0000-0002-7455-5290

Purpose: The main aim of this paper is to assess the dependence between the pillars of sustainable development of manufacturing enterprises, financial security, and macroeconomic condition in Poland in the period from 2010 to 2019.
Design/methodology/approach: This paper is both theoretical and empirical. The theoretical part discusses selected theoretical issues related to sustainable development and its determinants. The empirical part discusses the results of the research. A structural equation modeling (SEM) is used to assess the impact of internal and external determinants on the sustainable development of manufacturing enterprises.
Findings: The research results confirm that there are relationships between the pillars of sustainable development as well as internal and external conditions.
Research limitations/implications: The research is based on quantitative data, which is quite a significant limitation. This is due to the fact of analysis at the sectoral level and the lack of access to qualitative data.
Practical implications: The distinction which internal or external determinants have an impact on the sustainable development of enterprises allows for taking appropriate actions at the national level or the level of enterprise management.
Social implications: The ecological development of the company means reducing emissions of harmful substances into the environment and thus improving the conditions and quality of life of society.
Originality/value The study is a new approach to the analyzed issues. It allows drawing conclusions regarding the level of sustainable development and its determinants.

Keywords: sustainable development, transport enterprises, determinant of sustainable development.

Category of the paper: empirical research.

1. Introduction

The sustainable development of enterprise means the achievement of economic, social, and environmental goals. It is associated with the need to adapt to changing environmental conditions, continuous learning, and reorienting business goals towards increasing value for stakeholders. As economic practice shows, the implementation of the triad of sustainable goals is often associated with the need to give up part of the profits in favor of pro-social and environmental protection initiatives. Implementation of the concept of sustainable development of the enterprises, according to many researchers, allows them to gain a competitive advantage.

The components of sustainable development are closely related to each other. The research results indicate that the basis for social and environmental investments is the possession of appropriate property resources. The sustainable development of the enterprise depends on a number of internal and external factors. Financial security and favorable macroeconomic conditions are the key factors for the implementation of environmental and social investments. Recognition of determinants will allow effective decision-making by the managers of economic entities. The analyzed issues are relatively poorly recognized in the literature on the subject. Although there are attempts to identify factors that are crucial for the sustainable development of enterprises. An example can be the research conducted by Poskrobko (2009), Smith (2010), Slimane (2012), Zu (2013), Kowalska, Misztal (2020).

The main aim of this paper is to show the dependence between the pillars of sustainable development of manufacturing enterprises, financial security, and macroeconomic condition in Poland in the period from 2010 to 2019. This paper is both theoretical, and empirical. The first part discusses selected theoretical issues related to the sustainable development of enterprises. The empirical part presents the results of the research. A multi-equation model was developed and estimated using the TSLS method. The data for the analyzes were taken from the Central Statistical Office (GUS).

2. Selected problems of sustainable development of the enterprise and its determinants

The concept of "sustainable development" has an ambiguous character, it is difficult to define, concerns many aspects of socio-economic life, and environmental conditions. The most frequently cited definition comes from the Brundtland Report and indicates that it “is a development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (Report of the World Commission on Environment and Development: Our Common Future, 1987).

Sustainable development should be seen through the prism of sustainability, balancing, and self-sustainability (Brzozowski, 2010). It is "the humanitarian concept of global development, whose primary determinant improved quality of life and well-being of humanity in conditions of limited natural resources, taking into account the long-term effects of industrial development" (Adamczyk, 2009, p. 66).

The key issue here is the simultaneous implementation of economic, social, and environmental goals (Newton, Freyfogle, 2005; Slimane, 2012; Misztal, 2019). Over the years, the idea of sustainable development has evolved significantly. It should be noted that it is still flexible and open to interpretation (Prugh, Assadourian, 2003; Misztal, 2018). Some researchers equate sustainable development with ecological development (eco-development), the others emphasize that this is a broader term.

Globalization, climate change, increasing environmental awareness, and market competitiveness have an impact on the development of the idea of sustainable development (Kowalska, Misztal, 2020). The effectiveness of implementing the concept of sustainable development requires commitment from all sides of socio-economic life, including institutions, organizations, enterprises, and ordinary people (Pezzey, Toman, 2002; Majewski, 2008).

Business activities are crucial for sustainable development, due to their role in the economy, and the negative impact of economic activity on the environment. The sustainable development of the enterprise means achieving economic, social, and environmental goals. In the literature on the subject, the sustainable development of enterprises is defined in various ways. It can be defined as a decision-making process (permanent, self-supporting development) involving the common value (Porter, Kramer, 2007; Poskrobko, 2009). Sustainable development is related to reducing the negative impact on the natural environment and society (Hyršlová, 2009; Drljača, 2012; Murphy, 2013). In economic practice, it means using environmentally friendly production methods, implementing eco-innovations in order to preserve natural resources for future generations (Zu, 2013; Oželienė, 2017; Andryashina et al., 2020).

Sustainable development of enterprises is traditionally associated with three basic factors (McIntyre, et al., 2009):

- economic, in which the need to improve the financial and property situation comes to the fore (the goal is to maximize profit);
- social, related to such aspects as taking care of employees' health and development, their support, care for local communities;
- environmental, based on taking action to protect the environment, reduce emissions of harmful substances, implement environmentally friendly solutions (eco-innovation).

It should be emphasized that in economic practice the implementation of all three objectives is complicated, difficult, and involves the necessity of incurring specific financial outlays (Misztal, 2018). It requires the ability to constantly learn, adapt to changes, reorienting company goals towards increasing value for stakeholders, multi-dimensional management,

implementation of effective sustainable business models and strategies (Burchell, 2008, pp. 111-118; Grudzewski et al., 2010, p. 27).

The implementation of sustainable development goals strengthens the enterprise competitive position on the market (Mazur-Wierzbicka, 2005, p. 37; Faleye, Trahan, 2011; Gadomska-Lila, Wasilewicz, 2016, p. 304). It depends on several factors, which can be divided into two groups (Misztal, 2019, p. 37):

- external: macroeconomic conditions, development directions of environmental policy, support from funds, level of research development, outlays for innovative activities;
- internal, related to the awareness of the management, financial possibilities of the company, and the adopted development strategy.

The macroeconomic conditions are important because they affect not only the enterprise but also its stakeholders. The body of the research on the topic has shown that GDP, low inflation, and low unemployment rate increase confidence and improve the economic, social, and sustainable development of the enterprises. A good macroeconomic situation is important for ecological and social investments (Smith, 2010; Krajnakova et al., 2018; Misztal, 2019). A significant number of researchers emphasize that financial security (an appropriate level of financial liquidity, profitability, and low level of debt) is the basis for the implementation of ecological investments (Carter, Rogers, 2008; Oberhofer, Fürst, 2013; Kowalska, Misztal, 2020).

3. Research methodology

The main aim of the research is to assess the relationship between the components of sustainable development of manufacturing enterprises, the financial security, and the macroeconomic condition in Poland in the period from 2010 to 2019. The research period covers the time of the economic slowdown and the slow recovery from the crisis. The results obtained for Polish enterprises, due to the similar state and structure of the economy, can be compared to other countries in the region.

In connection with this, the main hypothesis is formulated as follows: "Macroeconomic condition and financial security of enterprises have a statistically significant impact on the pillars of the sustainable development of manufacturing enterprises in Poland in the period from 2010 to 2019".

The research involved three stages. First, it is created the indicators of economic development (E_{DME}), social development (SOC_{DME}), environmental development (ENV_{DME}), the indicator of sustainable development of manufacturing enterprises (S_{DME}), financial security indicator (F_S), and the macroeconomic condition indicator (M_c) (an assumption: all analytical indicators have an equal impact on synthetic indicators) (Table 1).

Table 1.
Diagnostic variables used in the model

Indicators	Type of variable	Description of the variables
E_{DME}	Stimulants	Total revenues, net financial result, assets turnover inventories, short-term receivables, short-term investments value of production
	Destimulants	Long-term, and short-term liabilities
SOC_{DME}	Stimulants	Number of employees, average monthly salary, employment of women
	Destimulants	Injured in accidents at work
ENV_{DME}	Destimulants	Emissions of carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, sulphur dioxides, ammonia, PM10
F_S	Stimulants	Current financial liquidity, quick liquidity, return on sales (ROS), return on assets (ROA), return on equity (ROE), payables turnover in days (payables cycle), total assets turnover, share of equity in financing assets (self-financing), coverage of liabilities with tangible fixed assets, asset structure, overall financial situation
	Destimulants	Inventory rotation in days (inventory cycle), receivables rotation in days (receivables cycle), operating cycle in days, level of operating costs, general debt, Debt to equity – financial leverage, Long-term debt
M_c	Stimulants	Average life expectancy (year), number of live births, average monthly disposable income per person in the household (PLN), number of flats completed, density of expressways and motorways per 1000 km² (km), number of broadband connections per 100 inhabitants, the percentage of households with broadband Internet access at home (percentage), the number of doctors (with the right to practice a medical profession) per 10000 population, the number of university graduates, expenditure on R&D (mill. PLN), number of beds in general hospitals, sold production, of industry (mill. PLN), export (mill. PLN), number of SMEs per 10000 inhabitants, gross fixed capital formation (mill. PLN), GDP (mill. PLN)
	Destimulants	Total greenhouse gas emissions (ton), the unemployed (thous.), average monthly expenses per person in a household (PLN), HICP (percentage), import (mill. PLN)

Source: own study on the basis of GUS, https://stat.gov.pl, 10.07.2020.

Second, it is transformed the explanatory variables to unify their measuring scales using the following formulas:

– for the stimulants:

$$z_{ij} = \frac{x_{ij}}{\max_i\{x_{ij}\}}, z_{ij} \in < 0; 1 >; \quad (1)$$

– for the destimulants:

$$z_{ij} = \frac{\min_i\{x_{ij}\}}{x_{ij}}, z_{ij} \in < 0; 1 >. \quad (2)$$

where:

z_{ij} stands for the normalized value of the j-th variable in the i-th year;

x_{ij} is the value of the j-th variable,

xij – value of the i-th measure for the j-th year,

max xij – maximum value of the i-th measure for the j-th year.

The economic, social, and environmental indicators are created based on the formula:

$$S_j = \frac{\sum_{i=1}^{n} s_{ij}}{n}, \quad (3)$$

where:

Sj – aggregate metric for j-th year,

n – number of indicators used in the model.

The structural form of the model has been described by the formula:

$$BY + AX = \xi_t \,, \tag{4}$$

where:

y – endogenous variable vector;

X – vector of delayed and exogenous and endogenous variables;

B, A – parameter matrices for the corresponding vectors.

$$\begin{bmatrix} 1 & -\beta_{12} & -\beta_{13} \\ -\beta_{21} & 1 & -\beta_{23} \\ -\beta_{31} & -\beta_{32} & 1 \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{bmatrix} + \begin{bmatrix} -\alpha_{10} & -\alpha_{11} & -\alpha_{12} & \dots & -\alpha_{1k} \\ -\alpha_{20} & -\alpha_{21} & -\alpha_{22} & \dots & -\alpha_{2k} \\ -\alpha_{30} & -\alpha_{31} & -\alpha_{32} & \dots & -\alpha_{3k} \end{bmatrix} \begin{bmatrix} 1 \\ x_{1t} \\ x_{2t} \\ . \\ . \\ . \\ x_{kt} \end{bmatrix} = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \tag{5}$$

The model of the relationship between the pillars of sustainable development (E_{DME}, SOC_{DME}, ENV_{DME}), financial security (F_S) and macroeconomic conditions (M_c) is based on the formula:

$$\begin{aligned} E_{DME} &= const + SOC_{DME} + ENV_{DME(t-1)} + F_S + M_c \\ SOC_{DME} &= const + E_{DME} + M_c \\ ENV_{DME} &= const + ENV_{DME(t-1)} + F_{S(t-1)} \end{aligned} \tag{6}$$

The exogenous variables include: financial security indicator (F_S) and macroeconomic condition indicator (M_C). The analytical record presented, after conversion to the matrix record, gives a model of the form:

$$\begin{bmatrix} 1 & -\beta_{12} & 0 \\ -\beta_{21} & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} E_{DME} \\ SOC_{DME} \\ ENV_{DME} \end{bmatrix} + \left[\begin{bmatrix} -\alpha_{10} & -\alpha_{11} & -\alpha_{12} & -\alpha_{13} & 0 \\ -\alpha_{20} & 0 & 0 & -\alpha_{23} & 0 \\ -\alpha_{30} & -\alpha_{31} & 0 & 0 & -\alpha_{34} \end{bmatrix} \right] \begin{bmatrix} 1 \\ ENV_{DME(t-1)} \\ F_S \\ M_C \\ F_{S(t-1)} \end{bmatrix} = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \tag{7}$$

Reduced form of the equation was obtained by transforming the structural form of the model according to the following formula:

$$BY + AX = \xi_t \,, Y = -B^{-1}AX + B^{-1}\,\xi t \,, Y = \pi X + V \tag{8}$$

The reduced form of the model took the form:

$$\begin{cases} \hat{E}_{DME} = \pi_{10} + \pi_{11} ENV_{DME(t-1)} + \pi_{12} F_S + \pi_{13} M_C + \pi_{14} F_{S(t-1)} \\ \widehat{SOC}_{DME} = \pi_{10} + \pi_{11} ENV_{DME(t-1)} + \pi_{12} F_S + \pi_{13} M_C + \pi_{14} F_{S(t-1)} \\ \widehat{ENV}_{DME} = \pi_{10} + \pi_{11} ENV_{DME(t-1)} + \pi_{12} F_S + \pi_{13} M_C + \pi_{14} F_{S(t-1)} \end{cases} \tag{9}$$

Two-Stage least squares (2SLS/ TSLS) regression analysis is used in the analysis of structural equations. The linear TSLS objective function is given by:

$$(\beta) = (y - X\beta)'Z(Z'Z)^{-1}Z'(y - X\beta), \quad (10)$$

where:

Z – matrix of instruments;

y – dependent variable;

x – explanatory variable.

The coefficients computed in the TSLS are given by:

$$b_{TSLS} = (X'Z(Z'Z)^{-1}Z'X)^{-1}X'Z(Z'Z)^{-1}Z'y \quad (11)$$

and the standard estimated covariance matrix of these coefficients may be computed using:

$$\sum\nolimits_{TSLS}^{\wedge} = S^2(X'Z(Z'Z)^{-1}Z'X)^{-1}, \quad (12)$$

where: S^2 is the estimated residual variance.

4. The results and discussion of the research

The research is based on manufacturing enterprises operating in Poland in the period from 2010 to 2019. In 2010, there were 7280 manufacturing enterprises, and in 2019: 7216 (manufacturing enterprises comprise 40,7% of total enterprises) (Figure 1).

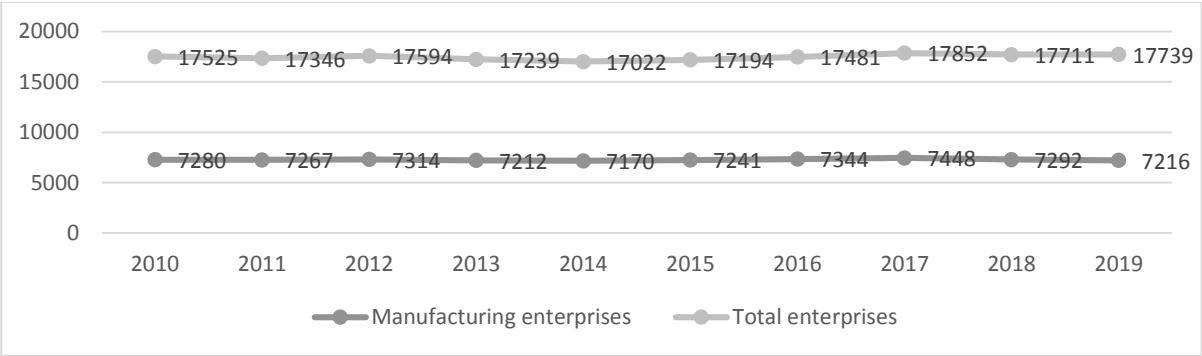


Figure 1. Research sample. Source: own study on the basis of GUS, https://stat.gov.pl, 10.07.2020.

The average value of the indicator of economic development of manufacturing enterprises in the period from 2010 to 2019 (E_{DME}) is 0.8, the indicator of social development (SOC_{DME}) is 0.91, the indicator of environmental development (ENV_{DME}) is 0.89, and the indicator of sustainable development (SUS_{DME}) is 0.87. The highest value of indicators is 1 (SOC_{DME} in 2019), the lowest value is 0.7 (E_{DME} in 2010). The obtained results indicate a positive trend of sustainable development indicators, which should be assessed positively. This is due to the introduction of more restrictive legal norms in the field of environmental protection and the increased environmental awareness of the managers (Table 2).

Table 2.
The sustainable development indicators for manufacturing enterprises in Poland (2010-2020)

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Max	Min	Mean
E_{DME}	0.70	0.73	0.74	0.76	0.76	0.80	0.84	0.88	0.89	0.91	0.91	0.70	0.80
SOC_{DME}	0.83	0.83	0.85	0.88	0.90	0.92	0.94	0.96	0.98	1.00	1.00	0.83	0.91
ENV_{DMe}	0.93	0.87	0.87	0.89	0.89	0.89	0.91	0.90	0.90	0.91	0.93	0.87	0.89
SUS_{DME}	0.82	0.81	0.82	0.84	0.85	0.87	0.89	0.91	0.92	0.94	0.94	0.81	0.87

Source: own calculation based on GUS, https://stat.gov.pl, 10.07.2020.

The indicator of financial security of manufacturing enterprises (F_S) increases in the period from 2010 to 2019. The average value of F_S indicator is 0.94, the maximum value is 0.98 (2019), and the minimum is 0.89 (2011). In the analyzed period, the indicator of macroeconomic condition (M_C) increases from 0.37 (2010) to 0.76 (2019). The results indicate that the improvement in the macroeconomic situation has a positive effect on the increase in financial security of enterprises (Table 3).

Table 3.
The financial security indicators for manufacturing enterprises (F_S), and the macroeconomic condition indicators (M_C) in Poland (2010-2020)

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Max	Min	Mean
F_S	0.91	0.89	0.91	0.93	0.92	0.95	0.96	0.96	0.97	0.98	0.98	0.89	0.94
M_C	0.37	0.38	0.43	0.55	0.62	0.69	0.72	0.76	0.76	0.87	0.87	0.37	0.62

Source: own calculation based on GUS, https://stat.gov.pl, 10.07.2020.

The trend line of SUS_{DME} is described by the equation y = 0.015x + 0.7847, the trend line of F_S = 0.0103 + 0.9207, and the trend line of M_C = 0.0429x + 0.5867. The highest increase is noted in macroeconomic condition indicator (0.0429), the lowest in financial security indicator (F_S) (0.0103) (Figure 2).

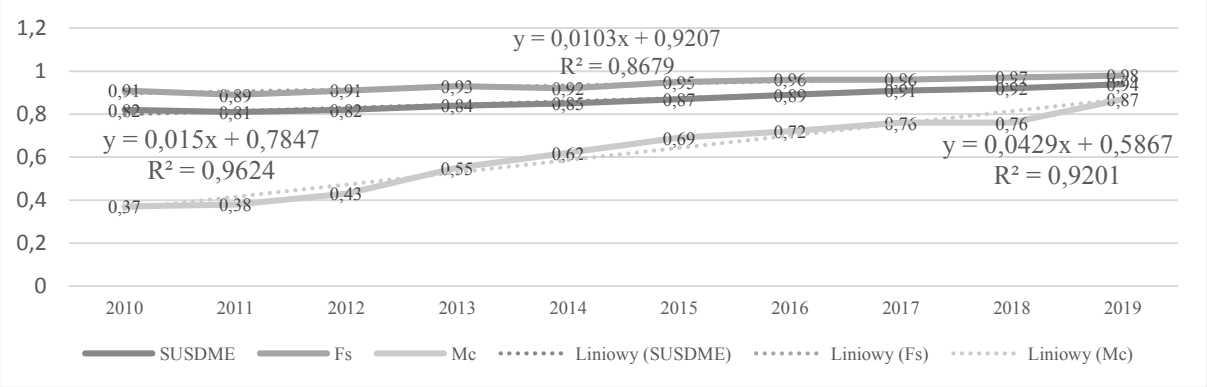


Figure 2. The indicators of SUS_{DME}, F_S, M_C. Source: own study on the basis of GUS, https://stat.gov.pl, 10.07.2020.

The results of the TSLS regression are presented in Table 4. The explanatory variables used in each of the three estimations have a statistically significant impact on the explained variable. The variables affecting the economic development indicator (E_{DME}) are the social indicator (SOC_{DME}), environmental indicator from the (t-1) period ($ENV_{DME(t-1)}$), financial security indicator (F_S), and the macroeconomic condition indicator (M_C). The economic indicator (E_{DME}) and the macroeconomic condition indicator (M_c) have an impact on the social indicator

(SOC_{DME}). The indicator of environmental development (ENV_{DME}) depends on the indicator of environmental development of the previous period ($ENV_{DME(t-1)}$) and the indicator of financial security from the t-1 period $F_{S(t-1)}$.

The research results for Polish enterprises are very similar to the results obtained in other countries of the European Union. Similar results were obtained in the studies conducted by Drljača (2012), Oželienė (2017), Kowalska, Misztal (2020). However, it should be emphasized that the situation differs depending on the section, size and scope of operation of enterprises (Misztal, 2018).

Table 4.
Results of TSLS regressions (instruments: $ENV_{DME(t-1)}$, F_S, M_C, $F_{S(t-1)}$ (2010-2020)

Dep. var.	Coefficient	Factor	SD	T-Student	P-value	R^2
E_{DME}	Const	−2.19621	0.359181	−6.114	0.003 ***	0.995930
	SOC_{DME}	1.53976	0.492663	3.125	0.0353 **	
	$ENV_{DME(t-1)}$	0.796616	0.211391	3.768	0.0196 **	
	F_S	1.18736	0.518418	2.290	0.0838 *	
	M_C	−0.359906	0.114785	−3.135	0.0350 **	
SOC_{DME}	Const	0.513040	0.0484038	10.60	0.0000 ***	0.993042
	E_{DME}	0.317603	0.0859427	3.696	0.0101 **	
	M_C	0.226079	0.0365263	6.189	0.0008 ***	
ENV_{DME}	Const	0.752439	0.0744236	10.11	0.0000 ***	0.935706
	$ENV_{DME(t-1)}$	−0.334392	0.0860276	−3.887	0.0081 ***	
	$F_{S(t-1)}$	0.468819	0.0502751	9.325	0.0000 ***	

Source: own calculation based on GUS, https://stat.gov.pl, 10.07.2020.

The equations of relationships between the components of sustainable development, the financial security of enterprises and macroeconomic conditions can be determined using the formula:

$$\begin{cases} E_{DME} = -2.19621\ const + 1.53976\ SOC_{DME} + 0.796616\ ENV_{DME(t-1)} + 1.18736\ F_S - 0.359906\ M_c \\ SOC_{DME} = 0.513040\ const + 0.317603\ E_{DME} + 0.226079\ M_c \\ ENV_{DME} = 0.752439\ const - 0.334392\ ENV_{DME(t-1)} + 0.468819\ F_{S(t-1)} \end{cases}$$

Sustainable development is based on the objective to achieve the best economic performance while respecting the environment and social development. The pillars of sustainable development are interdependent. The results of the research show that economic development depends on social and environmental development from the previous period. Social development depends on economic development. Environmental development depends on environmental development from the previous period. Macroeconomic conditions affect the economic and social development of enterprises. Financial security is crucial for economic and environmental development (in this case, financial security from an earlier period has an impact).

Most researchers believe that decisions to implement eco-innovations depend on financial considerations. Good financial and property condition is conducive to undertaking ecological investments (Adamczyk, 2009; Gadomska-Lila, Wasilewicz, 2016; Krajnakova et. al, 2018; Kowalska, Misztal, 2020). It seems that the basis for sustainable development are good economic foundations, therefore the managers of enterprises should make decisions conducive

to the improvement of their financial condition, which is crucial for the implementation of projects friendly to society and the natural environment.

The results of the study do not allow for an unambiguous adoption of the research hypothesis. It should be emphasized, that the relationships between the variables are visible. The results show that economic development depends on the largest number of factors. In turn, economic development determines social development, and environmental development is determined by the financial security of enterprises.

The results confirm that sustainable development depends on a number of determinants and their proper definition is of key importance for the development of enterprises. Sustainable development of enterprises is, therefore, the result of management skills, their ecological awareness, and conditions resulting from the external environment.

5. Conclusions

The sustainable development of the enterprise is an interesting and relatively new research issue. It includes three key pillars: economic, social, and environmental, and means an improvement in the financial situation of the entity, employee development, improvement of working conditions, and undertaking actions for the protection of natural resources. Sustainable development of enterprises depends on many determinants, both internal and external. Their correct determination is an opportunity for the expansion of enterprises. Research indicates that sustainable development is determined by such factors as the financial situation, environmental awareness of managers, macroeconomic conditions, legal regulations, and financial support.

In the period from 2010 to 2019, there was an increase in the sustainable development indicator of manufacturing enterprises in Poland. The financial security of enterprises, and macroeconomic conditions are also improving.

There is a relationship between the pillars of the sustainable development of manufacturing enterprises. The structural equations modeling indicates that the indicator of economic development is affected by the indicator of social development ($\alpha = 1.53$), the indicator of the environmental development ($\alpha = 0.797$), the indicator of financial security ($\alpha = 1.187$), and the indicator of macroeconomic condition ($\alpha = -0.36$, this is a negative impact, which can indicate that macroeconomic conditions are crucial for social development firstly). The indicator of social development is dependent on the indicator of economic development ($\alpha = 0.318$), and the indicator of the macroeconomic condition. The indicator of environmental development is dependent on environmental development in the previous period ($\alpha = -0.33$, negative correlation may result from the fact that environmental development is the result of previous

investments. This, in turn, may reduce financial resources for ecological investments in the current period), and the indicator of financial security ($\alpha = 0.469$).

The research results confirm that there are relationships between the pillars of sustainable development as well as internal and external conditions. It should be emphasized, that the results are determined by the selection of variables for the model. A serious limitation of the model is taking into account quantitative variables and not taking into account qualitative variables. This is due to the research sample and the lack of access to qualitative data.

To implement the idea of sustainable development of enterprises, it is necessary to take measures to increase ecological awareness and social sensitivity. In business practice, the implementation of the triad of goals is associated with the need to give up current profits for the benefit of the future. The economic situation and stability of environmental regulations, as well as, financial and research support from external institutions and organizations are also important for the sustainable development of enterprises. Undoubtedly, tax breaks and support programs for ecological investments would be an important solution.

References

1. Adamczyk, J. (2009). *Społeczna odpowiedzialność przedsiębiorstw*. Warszawa: PWE.
2. Andryashina, N.S., Garina, E.P., Garin, A.P., Seitova, Z.B., and Seitov, B.M. (2020). Features of Sustainable Enterprise Development. In: E. Popkova, and B. Sergi, *Scientific and Technical Revolution: Yesterday, Today and Tomorrow*. ISC 2019. Lecture Notes in Networks and Systems, vol 129. Cham: Springer.
3. Brzozowski, T. (2010). *Koncepcja zrównoważonego rozwoju wyzwaniem dla procesów transformacji przemysłu i usług*. Warszawa-Kraków: Prace Komisji Geografii Przemysłu.
4. Burchell, J. (2008). *The Corporate Social Responsibility Reader*. London-New York: Routledge, Taylor & Francis Group.
5. Carter, C.R., Rogers, D.S. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of Physical Distribution and Logistics Management, Vol. 38(5),* pp. 360-387.
6. Drljača, M. (2012). Koncept održivograzvoja i sustavupravljanja. Međunarodni skup Nedeljakvaliteta. *Kvalitet i izvrsnost, Vol. 1(1-2),* pp. 1-15.
7. Faleye, O., and Trahan, E.A. (2011). Labor-friendly corporate practices: Is what is good for employees good for shareholders? *J. Bus. Ethics, Vol. 101*, pp. 1-27.
8. Gadomska-Lila, K., and Wasilewicz, J. (2016). Zrównoważony rozwój i społeczna odpowiedzialność z perspektywy biznesowej. *Studia i Prace WNEIZ US, vol. 46/1.*

9. Grudzewski, W.M., Hejduk, I.K., Sankowska, A., and Wańtuchowicz, M. (2010). *Sustainability w biznesie czyli przedsiębiorstwo przyszłości, zmiany paradygmatów i koncepcji zarządzania.* Warszawa: Poltext.
10. Hyršlová, J. (2009). *Účetnictví udržitelného rozvoje podniku. Praha: Vysoká škola ekonomie a managementu.*
11. Kowalska, M., Misztal, A. (2020). *Wpływ bezpieczeństwa finansowego na zrównoważony rozwój przedsiębiorstw*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
12. Krajnakova, E., Navickas, V., & Kontautiene, R. (2018). Effect of macroeconomic business environment on the development of corporate social responsibility in Baltic Countries and Slovakia. *Oeconomia Copernicana, Vol. 9(3)*, pp. 477-492.
13. Majewski, E. (2008). *Trwały rozwój i trwałe rolnictwo: teoria a praktyka gospodarstw rolniczych.* Warszawa: Wydawnictwo SGGW.
14. Mazur-Wierzbicka, E. (2005). Koncepcja zrównoważonego rozwoju jako podstawa gospodarowania środowiskiem przyrodniczym. In: D Kopycińska, *Funkcjonowanie gospodarki polskiej w warunkach integracji i globalizacji*. Szczecin: Wydawnictwo Katedra Mikroekonomii US.
15. McIntyre, J.R., Ivanaj, S., Ivanaj, V. (2009). *Multinational Enterprises and the Challenge of Sustainable Development*. Cheltenham-Northampton: Edward Elgar Publishing Limited.
16. Misztal, A. (2018). Zrównoważony rozwój polskich przedsiębiorstw – ewaluacja. *Handel Wewnętrzny, Vol. 2(373)*, pp. 27-40.
17. Misztal, A. (2019). Zrównoważony rozwój przedsiębiorstw a stopień rozwoju społeczno-gospodarczego. *Studia i Prace Kolegium Zarządzania i Finansów , Vol. (174),* pp. 33-45.
18. Murphy, E. (2013). Sustainable Development in SMEs. In: S.O. Idowu, N. Capaldi, L. Zu, and A.D. Gupta, *Encyclopedia of Corporate Social Responsibility*. Berlin, Heidelberg: Springer.
19. Newton, J.L., and Freyfogle, E.T. (2005). Sustainability: a dissent. *Conservation Biology*, *Vol. 19(1),* pp. 23-32.
20. Oberhofer, P., and Fürst, E. (2013). Sustainable Development in the Transport Sector: Influencing Environmental Behaviour and Performance. *Business Strategy and the Environment*, *Vol. 22,* pp. 374-389.
21. Oželienė, D. (2017). *A review of enterprise sustainable development models: critical appraisal, scientific proceedings*. International Scientific conference "High technologies. Business. Society.
22. Pezzey, J.C.V., and Toman, M.A. (2002). Progress and problems in the economics of sustainability. In: E. Elgar, *International Yearbook of Environmental and Resource Economics 2002/2003*. UK: Cheltenham.
23. Poskrobko, B. (2009). Współczesne trendy cywilizacyjne a idea zrównoważonego rozwoju. *Przegląd Komunalny, Vol. 6.*

24. Prugh, T., and Assadourian, E. (2003). What is sustainability, anyway? *World Watch, Vol. 16(5)*, pp. 10-21.
25. Slimane, M. (2012). Role and relationship between leadership and sustainable development to release social, human, and cultural dimension. *Social and Behavioral Sciences, Vol. 41*, pp. 92-99.
26. Smith, A.D. (2010). Growth of corporate social responsibility as a sustainable business strategy in difficult financial times. *International Journal of Sustainable Economy*, *vol. 2(1)*.
27. Zu, L. (2013). Sustainable Enterprise Development. In: S.P. Idowu, N. Capaldi, L. Zu, A.D. Gupta. *Encyclopedia of Corporate Social Responsibility*. Berlin-Heidelberg: Springer.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE CONCEPT OF HUMAN RIGHTS IN PRACTICE: CIVIL SOCIETY

Aldona MUSIAŁ-KIDAWA

Politechnika Śląska, Wydział Organizacji i Zarządzania; aldona.musial-kidawa@polsl.pl,
ORCID: 0000-0001-9525-6348

Purpose: The paper presents a fundamental issue for contemporary democracy concerning two basic concepts shaping civic awareness.
Methodology: The main method is the analysis of the subject literature.
Findings: The paper discusses the fundamental values that directly determine a person's status as an individual and a citizen in the state.
Social implications: Reflections on the content of human rights and civil society are essential for the development of a model of citizen-state relations.
Originality/value: The paper indicates the existence of a moral aspect in the relationship between the citizen and the state and its importance for building individual subjectivity and civic awareness.

Keywords: dignity, freedom, equality, humanity, humanism.

Category of the paper: Conceptual paper, General review.

Introduction

The concepts of human rights and civil society comprise two complementary elements of the modern world of democratic values. These two concepts are associated with the freedom and autonomy of the individual and are not only a necessary condition for living in a social perspective, but above all they give it a sensible value from an axiological point of view. Through the affirmation of democratic values, human existence acquires the value of individualism, efficiency and responsibility. The implementation of the contents of these concepts guarantees human subjectivity and protects the limits of that subjectivity. These two concepts are also nowadays becoming a criterion for assessing the way in which the state's institutions and power structures function, its credibility, the rule of law or humanitarianism. These two concepts, having as their source the principles of moral laws, fundamentally shape the axiology of the state order.

Sources of human rights ideas

The idea of human rights founded on the concept of the innate dignity of all people is an essentially bold conviction that human nature tends to transcend its innate weaknesses and raise the level of moral consciousness to abstract values. Human rights are an intellectual response – in the individual dimension – to the humiliation of dangerous passions pushing man towards dehumanization and destruction, as well as a response – in the social dimension – to the temptation rooted in man to build total certainty, a world that is unconditionally predictable and perfect in its form. Human rights are an expression of respect for the subjectivity of the individual, recognition of his or her individual expression, a desire to submit to the dictates of moral authority, the hope of building a coherent moral constitution aimed at continuous improvement of actions and attitudes, and the affirmation of solidarity and friendship exemplifying itself in harmonious development and social order. This perspective reveals a very important feature of human rights concerning human nature, it points to a great effort to curb emotions and passions, to master natural instincts, so that man and the humanity he creates turn out to be not so much a natural object, in the existing nature, but a moral category that understands the clear difference between drives conditioned by nature and ethical duties that constitute an absolute foundation for the continuity of civilization. Hence, human rights are non-human in the sense of species, since they do not refer to man as a representative of the natural world, but to man as a rational being, endowed with free will. Human rights and the essence of humanity resulting from them are of a moral nature. Man and humanity "is not defined by specific determinants distinguishing them from other species, but by participation in the field of rational necessity, epistemologically implemented as a set of synthetic judgments a priori, as well as in the sphere of unconditionally compelling moral imperatives which cannot be empirically established" (Kołakowski, 1984, p. 132). Man is, therefore, a moral category, an abstract concept, a being who wants continuous self-creation, exceeding the framework of his individual, measurable and predictable existence, being in this dimension opens the space of consciousness above the individual, because ethical values are updated, in the field of vision of which another person appears, who becomes a reference for observing norms and rules. And man's life itself is rooted in an intellectual loyalty to reason, which creates a free will that henceforth marks life with a conflict of opposing values that remain in constant tension. In fact, this conflict shapes the humanistic subjectivity of man and determines the conditions for his survival as a creator and participant of social life, and this is decisive for the survival of civilization. In the world of nature, on the other hand, man is a completely reified figure, limited by his structure of existence and remaining as if outside himself, a figure reduced to the function of an accidental, labile existence in which the experience of meaning other than instincts and passions does not exist, or is radically reduced to the material content itself and is based on natural inclinations belonging to natural objects. Human rights are therefore a challenge to build

a space of consciousness in which a specific sacrum becomes subjectivity understood as the affirmation of moral rules, the acceptance of which marks and determines the history of human destiny, and which is exemplified by such concepts and values as free will, freedom, dignity, or justice and equality, and then, on their foundations, already in a broader perspective, build a sense of bond and community in thinking about themselves and others. Human rights make us aware, from a philosophical perspective, that man confirms his presence in the world by becoming, by taking responsibility for life, by affirming a life that ceases to be a place of exile and alienation. The subject of human rights is the assumption about the emancipation of man from the natural world, rejection of the "material" and an attempt to achieve an authentic way of existence. This assumption is based on the conviction that there are rules that not only do not express instinctive action, but that their causative power and moral value are based on the action of reason, proper power and the constitution of man. It is reason that is the instance that helps man to overcome his subjective nature. It is reason that creates the forms and categories that constitute the conditions for any possible experience of all intelligent beings; these forms and categories therefore relate to reason and not to species. Similarly, the reasonableness of the moral life is exemplified in the free will of freely acting beings, which translates into the consequences that humanity is not a natural find, a natural specimen, but an abstract moral category. The effort in shaping the spiritual and moral achievements of mankind is based on a constant desire to find and reconcile freedom of action and unconditionally obliging norn, to seek mutual and balanced relations between them. The fundamental question concerns precisely the absolutely binding norms, the way in which they are established, their moral constitution and their normative consequences, and the answer to this question will determine the future and the structure of reality, in which man will be understood either as an absolutely independent and unchangeable value or as a purely instrumental value. Which value will be strengthened depends on, it seems simple but still not obvious, the distinction between what is good and evil, and that this distinction cannot always depend on our arbitrary decisions, and therefore cannot grow from utilitarian criteria. Human rights are part of this field of metaphysical deliberations that try to consolidate and legitimize a human idea, an idea that cannot be derived from a psychological or anthropological source. The area of social and historical security of every culture depends on the search for criteria of duty, which cannot be empirically proved, and the acceptance and affirmation of which absolves the idea of humanity as a moral concept and man as a morally acting subject, hence, as Kołakowski writes, “it is difficult to define what human dignity is, it is not an empirical finding, but without it we are in trouble when we try to answer the question: why slavery is bad” (Kołakowski, 1999, p. 215). In this difficulty, in this foggy, paradoxically, the unconditional form of rules and duties ennobling man morally is confirmed, and without which the assumption of the unchangeable value of the human person loses its humanistic sense, reducing the dimension of human existence to the notion of zoology. It is hard to resist the impression that it is in concepts that the deeper meaning of human existence and human subjectivity is encoded, and through

concepts we recognize the fundamental assumptions about the moral destiny of the rational human being. Both in the axiological and semantic sense, the concept of human rights presupposes the existence of a transcendent being, an idea, and in it seeks to consolidate the abstract value of humanity. The idea of human rights is precisely such a concept, and it is philosophically and legally well enough to oppose the unbridled motivations and passions of human nature which are conflicting and which in a way agree to violence, the absence of moral brakes, or the failure to identify the difference between good and evil. The idea of human rights is sufficiently well-founded to promote, to a conclusive degree, the universal awareness and belief that there is humanity and a common human destiny, that we all share in this human solidarity, and that this humanity is a moral category and not a species. Finally, it seems that the idea of human rights is such an optimum that man in his biological condition could and still can achieve. This idea shows the direction of the development of the individual and the community in which he or she participates, on the one hand, to curb innate drives and establish a legal instance and, on the other hand, to establish a subjective barrier against the restraint of this subjectivity on the part of state institutions. The core content of the idea of human rights is an assumption about the freedom of will of rational beings. Kantowska's moral theory focuses on man's ability to recognize the difference between good and evil. It is precisely this ability that is rooted in the power of reason, and on this basis it concerns and embraces all people, hence all people endowed by the power of reason with free will, while remaining morally acting subjects, have an unconditional participation in the morally defined concept of humanity. The Enlightenment Age, searching for moral and intellectual inspirations to sanction human subjectivity, found in Kant's formula "a way out of his own culpable immaturity" the source of the European spirit of individualism, respect for otherness, the secular legal order, tolerance, fraternity, the ability to self-criticise, or to give up the sanction of violence. The Enlightenment, in a way, turned man to man, abandoning faith in religious dogmas, has taken up the challenge of making faith in the unchangeable value of the human person a reality, faith in the irreducible and unique core of his personality, this faith constituted modern humanism with its both cultural power and misery. By power, because this humanism built a moral and social order based on the law of independent reason, the principle of personal rights and the conviction that all human beings are equal and equally valuable. These are the values on which the modern democratic state is founded today and which form our European genetic cultural code. Poverty, because this humanism claims, in extreme conditions, the right to consider that no norm is transcendent, that there are no rules of good and evil that man himself could not decree, that man has an unlimited right to deny absolute values, which he can use according to his own needs and beliefs. In this unstable equlibrum, the Western civilization takes place and shapes its destiny in this spirit of uncertainty and endlessness, the ontological status of Europe is coded and, as Kołakowski notes, "ultimately, it can be said that European cultural identity is confirmed by the refusal to accept any endless identification, i. e. in uncertainty and anxiety" (Kołakowski, 1984, p. 15). The essence of the idea of human rights is the recognition of the inherent and

inalienable rights which a human being acquires at birth and which belong by virtue of being human. It is, and was, a historically revolutionary assumption, since it indicates the autonomy of the individual to whom it attributes absolute value as a moral subject, grants personal rights and rights to participate in power, and also protects against interference by the individual in spheres henceforth considered personal and private. This is not a revolutionary assumption from a transcendental perspective, and it is the source of the criteria of duty, rules and absolutely binding norms that are justified in the supreme instance of reason. Human rights are therefore a morally established reality, the source justifying and proving the existence of these rights can only be a reference to transcendence and not to anthropology. Kołakowski points out that this is a matter of judgment for the life of societies and civilisations: "humanity is a moral concept and if we do not recognise it, we do not have any good grounds to question slavery or the ideology of slavery" (Kołakowski, 1984, p. 139). Thus, Kant's legacy is stamped in the philosophy of human rights as a form of existence of the human person and as a form of this existence it shapes not only a system of valuations which becomes integrative and meaningful, but above all it indicates that the notion of man can only exist as an abstract category, in consequence it means that man in this sense is not a natural object, but exists as a moral object. The possibility of experiencing the world through Kant's moral rules means that there is a perspective of what is human, that every human being as a rational being is secured in the fundamental rights he is entitled to by virtue of his participation in human nature, as a consequence of which every human being should be treated as an end in itself, never as a means. This conviction autonomizes the human individual in his or her rights, concretizing himself or herself in the acceptance of the universal consciousness that man can not only be free, but that no man can belong to another man by becoming his or her property. Thus the concept of humanity as a moral category can effectively oppose the evil of slavery or its version of social Darwinism. The consequence of a moral theory about rational and free moral subjects is the basic premise on which the idea of human rights is based, concerning the inherent and inalienable dignity of the human being as a source of his freedom, equality and rights. This is a fundamental issue for legal and political solutions in a modern democratic state, since, in addition to the positive law established by the institutions of the state, the dignity of the individual as an expression of the natural law must be taken into account and respected by the positive law. Any rule of positive law that violates fundamental moral norms, which clearly violates those norms or is unjust may be considered unlawful and cease to apply. The right to dignity as an innate individual is independent of the positive law that is being established and is a reference for the system of values that positive law seeks to promote and implement. The concept of human dignity is fundamental to human freedoms and rights. It is from the inherent dignity of the human being that his freedom and right. „The recognition of inherent dignity as the source of all rights indicates that they are secondary to the person, indicates their subordination to the good of the person. The raison d'être of existence and such and not other content is man, they do not have an independent existence. The relationship to the good of the

human being as a whole is an integral part of every law and cannot be disregarded when determining the content of the demands made. Consequently, the ultimate point of reference for a legal order that protects or respects human rights is not those rights, but the human person" (Piechowiak, 1999, p.78).

Civil society: idea and practice

The modern democratic state shaped as a result of the religious conflicts of the 16th and 17th centuries is defined by the adoption of the fundamental principle of equality of citizens before civil and political law. The institutionalisation of civil law is carried out through independent courts and is expressed in the principle of *habeas corpus*. Political rights including, inter alia The right to vote and to stand for election is a right to express one's opinion and a basis for political decisions. The order of a democratic state is above all the protection of the common good understood as the sum of conditions of social life "which allow either associations or individual members of society to achieve their own perfection more fully and easily" (Novak, 1998). The political system of democracy is therefore the consequence of such secular relations of a society liberated from all superstitions and religious dogmas, as well as universal education that strengthens independence of judgement and tolerance. However, active participation in public life is not a value in itself, especially as being a citizen is about ensuring equal treatment and having a real influence on decision making. The system of a democratic state, by defining the scope of citizens' rights and duties, shapes at the same time a mechanism of political responsibility, responsibility that conditions political consensus that enables identification with others and limits the threat of turning social dialogue into a phenomenon of ideological struggle: "the social system of democratic nations does not lead to revolution, but rather distances them from them" (Tocqueville, 1996). Society is looking for the principle of "balanced majority consent" rather than absolute unity, which means negation and elimination of all differences, because man, i. e. a citizen of society, has been secured in the inalienable right to formulate his own views. Tocqueville notes that man as a social being is neither completely free nor totally enslaved, and that this particular extent makes it up to him whether this development process will lead to submission or freedom, to enlightenment or to barbarism (Tocqueville, 1996). As a consequence, the choice of how to understand freedom and equality may manifest itself in the economic sphere as a zone of prosperity or misery. The ability to actively participate in the liberal order of a democratic society is a principle of co-management, i. e. responsibility and moral and political consequences of elections. The position of the citizen is thus shaped not only as a prospect of respect for his or her right to privacy, but also as a commitment to strengthening the democratic power structure. The effectiveness of democratic governance is tested by means of properly formed social ties,

which are not only a precondition for reconciling selfish reasons, but above all the framework of a pluralistic society. The common good is a rationally justified model of one's own and group's value hierarchies, the ability to cooperate collectively, the ability to debate for political consensus. The consequence of community awareness is the formulation of a concept of actions that determine the condition of the state and society, a concept that goes beyond short-term benefits. Democratic solutions require knowledge of legal and political principles. The basis of their presence remains respect for and adherence to established solutions in the field of law and morality as superior values. The sustainability of democracy (Kołakowski, 1984) is subordinated to responsibility for public affairs, including dependence on the strength of tradition. The definition of democracy determines the position and status of a person, defines the degree of moral commitment expressed by the need for competence and tolerance necessary for the proper assessment of phenomena, for building and supporting the subjectivity of the individual. A sufficiently high level of competence and tolerance also determines the right proportions of individualism, especially since the morality of social life is an implication of morality in the private area. The definition of democracy therefore focuses not only on the institutional forms of a pluralistic system, the proper electoral law, the principle of balance of power, or the shape of the constitution. The political tradition of democracy also indicates the cultural layer, which exists as an experience of proper evaluation of phenomena, to consolidate the principles of representativeness, justice, compromise, respect for minorities and human rights. An active civil society is not only the sum of civic communities and common goals, it is also a community of values, sharing of virtues and customs by the participants of these communities (Putnam, 1995). The ideal of democracy is realized in a society living with the awareness of the idea of the common good, the value shaping the relationship between the mutual dependence of public life and the ability to cooperate. The common good, while remaining a moral value of society, is in opposition to the notion of the universal will of the people in the form of the unlimited right to pursue selfish interests. The common good, not being the same as the will of the people or the will of the general public, is achieved through consensus, i. e. the resignation of each group and individual from part of the particular benefits and goals. Democracy aware of the moral consequences of the choice between the common good and the common will of the people is a limited democracy and realizes the ideal of civil society. The concept of “civil society” points to a society of competent people, capable of formulating critical opinions, realizing the ideal of compromise and moral individuals realizing the value of the common good together with the inalienable right to express their own views. The model of civil society is centred around the idea of the human being as an individual who directs and organizes the world with his free will and has the inalienable right to make personal decisions. As a supreme value, man becomes a civil society actor in confrontation with himself and through his fellow citizens and can freely articulate ethical values and express interests and needs in the economic sphere. Individualism, which is the basic content of civil society, is defined by the right to implement the plans, intentions or ambitions of an individual who has

a free will source of independence. However, Individulism is not only a relationship of rights, it is also a way to understand the condition of a person entangled in reality. Individualism is therefore also a way out of the trap of any social utopia that guarantees the perfect overcoming of the tragedy of the structure of human existence. For, as Kołakowski points out, the world of human goals and desires is real and inevitable, and man as a creative individual, free through individualism, reduces this conflict not in a perfect way, but allowing the rationality of the world to be preserved in a safe way (Kołakowski, 1999). In the life of every culture it is a condition of its existence. In social practice this means that a social hierarchy is formulated, because "in an open society many people seek social advancement and take the place of other people" (Popper, 1993, p. 45). The development of the social hierarchy is not only achieved through structured operating procedures, but is an expression of a functioning system of values such as justice, equality, competition and humanity. The principle of civil society organisation also requires a serious reduction in the role of the state and the centralised authority that represents it in favour of an institutionalised society. Civil society requires that the authorities respect citizens' rights and are guided primarily by their welfare. This issue continues to dominate society's relations with the state, especially as the democratic state and civil society require constant and partnership-based cooperation in the area of society, citizen, the state through the participation of political and social institutions, so that subsequent changes of power are carried out without shocks, while respecting the value of the autonomous structure of civil society. Dahrendorf points out that democracy and civil society determine the political quality of social relations by creating the rule of law and making freedom a reality (Dahrendorf, 1993). The limited power of the state is sufficient to guarantee the independent position of civil society, a strengthened position, inter alia a change in the meaning of the concept of privilege. Civil society controls and criticises the ruling power using democratic institutions that support freedom and the system of rights. The credibility of democracy is tested by its experience in the daily practice of social life, by its compliance with established norms and rules. The priority is the broadly understood principle of citizen's freedom as freedom of speech, freedom of association, freedom of decision, freedom of choice, or freedom of competition. Contemporary American political scientist Huntington notes that the competence of democracy does not come down to simple principles of social engineering and is not an easy mechanism to achieve economic growth and increase the income level of society. Democracy will also not protect against incompetent or cynical governments. Democracy works well when it is first and foremost in the hearts and minds of citizens, because it is intended to protect the fundamental public and political rights that uphold civil liberties (Huntington, 1995).

The philosophy of the Enlightenment, together with the evolution of bourgeois liberalism, pointed to the value of individual rights in relation to the aspirations of the state, which should only be an instrument to safeguard the natural rights of the individual. Based on individualism, the idea of a citizen, a fully-fledged member of the community, secured by the right of freedom, the right of equality, including the right to property, has developed. An established set of natural

rights guaranteed the individual's independence, providing for its sovereignty over the structures of the state. The Enlightenment era strengthened the sovereignty of the people based on the sovereignty of the individual. The Enlightenment's idea of the laws of nature committed the state to securing human rights as comprehensively as possible, while at the same time setting the limits and scope of power activities towards the individual and society. For Locke, who made the social contract the foundation of civil society, the state is a secondary result of the organisation of that society, a society forming a government, establishing a political community. The social contract is an expression of the society's adaptability, it is a wave that raises awareness and at the same time exceeds dependence on conditions imposed by nature. Thanks to it, the emancipation of man from nature takes place, which means that man can effectively protect rights such as the right to property, the right to freedom. It is also paradoxical that man, thanks to a social contract, protects the values with which nature has equipped him (Sylwestrzak, 1994). This design means, among other things that any change of government has no political consequences in terms of dissolution of society. Such a strong rooting of the idea of citizenship can be a strong safeguard against the mechanism of escape from freedom, against the invalidation of subjectivity, because there is always a temptation to give up the independence of the individual "I" in favour of a reified, tribal bond. Therefore, a change in political structures, labile or defective political life does not directly affect the stability of a society, which is a fundamental link in the organisation of the lives of individuals or groups. Although the existence of the state in Locke's philosophy is based on a wide range of powers entrusted to the government, the permanence and political stability of the government is only guaranteed if the terms of the social contract are respected, and its violation threatens a revolutionary change in power structure. The doctrine of liberalism has equipped the state, in accordance with the content of the social contract, with a wide range of competences enabling the repression of individuals who do not submit to the letter of the law. Such an interpretation of the role of the state draws attention to the purpose and limits of power intervention in the life of civil society. Apparently, this is evident in Hobbes' concept of social contract. His contractual vision of the state clearly shows that society is renouncing violence in favour of the Sovereign. It is therefore the highest dimension of freedom, freedom from violence. At the same time, it should be stressed that the state is becoming a monopoly of violence. This is a sine qua non condition for civil liberties. His violation is a return to a situation where homo homini lupus est. Civil society therefore has the task of protecting the individual from overwhelming power through the institutions of social life, on the one hand, and safeguarding the rights to express the sovereign will of the individual on the other (Kołakowski, 1999). Monteskius' aristocratic liberalism built the foundations of civil society on the basis of monarchic rule, referring to English models. Unlike Locke, who expressed limited confidence in the institutions of the state, it was through the state, of which the monarchy remained the expression, that Monteskius established the basis of the rule of law and freedoms. In particular, the principle of moderation of the constitutional monarchy, i.e. the legal limitations of the authorities secure the balance

between those in power and members of civil society. The search for consensus creates conditions that reduce the danger of political antagonisms in the form of anarchy and despotism. Monteskius assumed the existence of a strong constitutional monarchy, identifying its strength and powers with respect for the freedom of the citizen and respect for the rights of the people (Aron, 1997). Only the implementation of the principle of moderate rule has been able to guarantee the political freedom of society, which in practice comes down to a conscientious observance of the virtues, because experience shows that a person with power is prone to abuse it and goes on as long as he meets the limits. The security of the freedom of individuals and society is defined by the principle of rights, because "freedom is the right to do everything that laws allow". Thus, Monteskius recognizes civil liberties in the idea of the rule of law, without which freedom does not exist. By implementing the principle of respect for civil liberties and being a guarantor of individual security, the law balances the balance of power between the competences of the state, central authority and civil society. According to Monteskius, the state must not jeopardise civil society. In this sense, a strong state is not synonymous with despotic, totalitarian power. The power of the state is based on its competence, effectiveness, on clearly defined rules of law, in a three-tier division of powers (Siciński, 1993, pap.). Monteskius' thought introduced a new form of organization of the state, basing it on respect for individual freedom as a fundamental value defended by the rule of law. The law has gained full legitimacy by establishing relations between society and the state, expressing itself in practice and rationality, and constituting a force and value superior to the state institutions. Today, the problem of the dominance of the democratic state becomes particularly important: whether and how a democratic state threatens the ideals of civil society, whether such a state can threaten an individual, how it should be protected from the overwhelming institutionalisation of the state. Structured and stable relations between the citizen and the state are concluded between the principle of freedom, which determines the citizen's rights, and the principle of state competence, which are strictly defined and cannot hinder the citizen's freedom and activity. The competence of the state is primarily to define its area of activity in relation to the citizen's freedom, i.e. the possibility for the citizen to do what is not prohibited (Aron, 1997). Contemporary philosophers place the essence of the problem between the content of a ban and a warrant, where freedom is a reality free of warrants, but without the need to eliminate bans: “freedom without limitation becomes conceptually impossible” (Kołakowski, 1999, p.170). Moreover, the concept of a democratic state in this perspective does not mean systematic interference in all areas of life and does not contradict the meaning of a 'strong state', since the strength of the state is constituted by a deeply democratic basis for action: “without the effective performance of the state's tasks, the effective functioning of civil society is not possible” (Siciński, 1993, pap.). A feature of civil society remains its autonomy from state structures. The society hinders and balances the state's interests and actions aimed at despotic forms of governance based on a network of horizontal links between individuals and groups.

Conclusion

The idea of human rights and the idea of civil society are two values and two criteria that shape the contemporary image of parliamentary democracy. Their essential role is focused on building and consolidating the awareness of the civic subjectivity of each participant in social life, and they are a source for the established law, whose main objective and task is to protect and respect this very subjectivity of the human being and citizen. Human rights as morally established are a rudimentary element of the transcendent category of humanity. It is from this position that the state law is evaluated and analyzed, which is absolutely obligated to respect moral values of human rights. Any legal provision which fails to comply with these values shall cease to have effect. The strength of civil society is based on this assumption. These otherwise enigmatic, empirically difficult to prove abstract values not only uphold our civil rights, but also seriously neutralize the passions of an unintelligent nature so as to limit the unpredictability of our actions, which may lead to dehumanization and degrade the human being morally.

References

1. Aron, R. (1997). *Esej o wolnościach.* Warszawa: Aletheia.
2. Dahrendorf, R. (1993). *Nowoczesny konflikt społeczny: esej o polityce wolności.* Warszawa: Czytelnik.
3. Huntington, R. (1995). *Trzecia fala demokratyzacji.* Warszawa: PWN.
4. Kołakowski, L. (1984). *Czy diabeł może być zbawiony*. Londyn: Aneks.
5. Kołakowski, L. (1999). *Moje słuszne poglądy na wszystko.* Kraków: ZNAK.
6. Novak, M. (1998). *Wolne osoby i dobro wspólne.* Kraków: ZNAK.
7. Piechowiak, M. (1999). *Filozofia praw człowieka. Prawa człowieka w świetle ich międzynarodowej ochrony.* Towarzystwo Naukowe Katolickiego Uniwersytetu Lubelskiego.
8. Popper, K. (1993). *Społeczeństwo otwarte i jego wrogowie.* Kraków: PWN.
9. Putnam, D. (1995). *Demokracja w działaniu.* Kraków: ZNAK.
10. Siciński, A. (1993, pap.). O idei społeczeństwa obywatelskiego. *Wiedza i Życie, nr 6,* Kraków, p. 44.
11. Sylwestrzak, A. (1994). *Historia doktryn politycznych*. Warszawa: PWN.
12. Tocqueville, A. (1996). *O demokracji w Ameryce.* Kraków: ZNAK.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

PHILOSOPHY AS ART OF LIFE AND THERAPY: THE EPICUREAN-STOIC MODEL OF ETHICS IN THE FACE OF CONTEMPORARY HOLISTIC VIEWS OF HUMAN BEING IN COACHING

Anna MUSIOŁ

University of Silesia in Katowice, Faculty of Humanities, Institute of Philosophy, Poland;
anna.musiol@us.edu.pl, ORCID: 0000-0001-7325-4456

Purpose: The purpose of the article is an attempt to show philosophy as an art of living and therapy by referring to the ancient philosophical schools founded by Epicurus of Samos and Zeno of Citium. Drawing on the ethical postulates of the systems indicated, the author proves their validity. Author argues that ethical assumptions of the distinguished schools are also revealed in many contemporary concepts of sustainable development; this could lead to further research.
Design/methodology/approach: The article uses the method of comparative analysis (method), showing the way of possible adaptation of the ancient ideal of aretaic ethics to the contemporary, holistic views of human being in the 21st century.
Findings: The analyses undertaken confirm the theses about the therapeutic role of philosophy, especially in its practical dimension. Classical philosophy as an art of living and therapy can also today become a source of inspiration referring us to a permanent and objective hierarchy of values, providing us with an inner sense of security, teaching understanding and distance to the world and to ourselves.
Research limitations/implications: The author deliberately limits her research solely to characterizing the two leading philosophical schools of the ancient Hellas. Thus, she paves the way for further research on the role and significance of practical philosophy in shaping the condition of contemporary men (human being) and their environment.
Practical implications: The issues raised in the article emphasize the practical dimension of philosophy. The domain of ancient systems of philosophy lies in their therapeutic, healing and strictly practical character. Ancient philosophy is an art of living focused on the realization of the ideal of eudaimonia (full/complete life). It is in such a handy and not only speculative-theoretical approach that its proper goal is expressed (results/conclusion).
Social implications: The thematic scope of the thesis presented in the article includes both elements of value ethics, philosophical anthropology, philosophy of civilization and social philosophy. The author focuses her attention on the description of human condition and recognized forms of striving for its improvement, both in the dimension of individual and social life (results/conclusion).
Originality/value: The article shows the possible use of classical humanistic knowledge, in particular philosophical knowledge, in combination with contemporary concepts of self-development that are part of a wide range of support professions developing rapidly in the 21st century: psychology, psychotherapy, therapy, counseling and coaching (discussions).

Keywords: philosophy as an art of life, epicureanism (Epicurus), stoicism (Zeno of Citium), coaching, holism.

Category of the paper: research and viewpoint paper.

1. Introduction

Various circumstances of life today make us try to consider the value of philosophy and philosophical reflection from the perspective of its practical meaning. Practice, especially the philosophical one, links a certain behaviour with life and preferential value within it. The freedom of valuing makes life an art and philosophy, especially the one that is not speculative but practical. It becomes a therapy – a specific remedy for the psycho-physical ailments, worries, distress and everyday concerns that torment people.

By presenting these theses in the article, I combine them with a historical and philosophical analysis focusing on the ancient Epicurean-Stoic models of ethics, and then associate them with contemporary concepts that capture man *in toto*: in his totality, completeness and fullness. In other words, referring to the words of Urszula Wolska, author of the book *Terapeutyczne aspekty filozofii*..., I want to show that „philosophy can be a therapy, and the result of such a philosophical therapy can be the recovery of spiritual harmony and a sense of happiness" (Wolska, 2017, p. 7). Experiencing happiness is a holistic feeling of fullness of life as a possibility of realizing values important for oneself, both in the area of physical life (health and vitality, care for one's own body), spiritual life (self-reflection, self-cognition, meditation), as well as intellectual life (mental activity, intellectual creativity, insight, prudence or erudition), which translate into the quality of single (individual) and community (social) life.

2. Epicurean school ethics

The first of the great schools of the ancient Hellas, to which I want to refer by dividing philosophy into canonics, physics and ethics – three coherent, complementary areas – gives ethics the status of knowledge „about what to choose and what to avoid, how to live and what is the purpose of life" (Laertios, 2004, p. 599). Its intellectual inducement is the system of philosophy of Epicurus of Samos.

According to Epicurus, the aim of life of every person is to experience pleasure. This pleasure, as the highest value of life, means sober reason (*νήφων λογισμός*). This is because the proper understanding of the value of pleasure, associated with reasoning, is both the absence of physical suffering of the body and the absence of anxiety of the soul. In a qualitative way,

the absence of anxiety of the soul means much more than experiencing physical distress, because the body is only affected by the present suffering, while the soul is constrained by the past, present and future suffering. Likewise, experiencing spiritual pleasures is more precious than experiencing physical ones. Epicurus expresses this conviction by saying: ”It is not continuous drinkings and revelings, nor the satisfaction of lusts, nor the enjoyment of fish and other luxuries of the wealthy table, which produce a pleasant life, but sober reasoning, searching out the motives for all choice and avoidance” (Laertios, 2004, p. 648).

The consequence of this position, maintained in a climate of aretaic ethics, is the recognition of wisdom as the most precious of all virtues. It teaches us that „It is impossible to live a pleasant life without living wisely and well and justly. And it is impossible to live wisely and well and justly without living a pleasant life” (Laertios, 2004, p. 648). Thus, Hedonism permeating the Epicurus system makes pleasure a superior value which, based on prudent behaviour, makes one happy.

Prudence, in turn, as a rational action, makes us concentrate on satisfying natural and necessary pleasures – those that are necessary for us to preserve and strengthen life. They are a kind of models. The Ancient Sage convinces us that all other types of pleasures, for example, natural and unnecessary or unnatural and unnecessary (the so-called delusional ones) should be rejected, because they constitute a superfluous element testifying to superfluity (Fabjański, 2020, pp. 25-27). Meanwhile, lavishness, splendour and overload, especially with unnatural and unnecessary needs, become a source of negative emotions, internal tensions, fears, anxieties, inner confusion, suffering and the experienced mess (Reale, 1999, pp. 257-260).

Negative feelings, however, can easily be overcome, as the sources of their appearance and their impact often originate from unreasonable fears, unfounded anxiety and unjustified concern. „We suffer because we fear gods, death and pain. Needlessly” (Fabjański, 2020, p. 23). An effective remedy in the fight against oppressive anxiety is the Epicurean Tetrapharmakos (four-part cure) covering four principles: 1) what is terrible is easy to endure; in other words, the evil that happens to us is bearable and acceptable (Wolska, 2017, p. 72); 2) what is good is achievable; it is easy to acquire and work out (Wolska, 2017, p. 70). For example, joy is easy to gain, because it is enough for a person to realize the fact of his own existence; 3) death should not be feared, because one does not feel it; 4) judgments of higher forces should not be feared of either; deities or actions of higher powers should not frighten us, because one can only see them with the mind. „Gods are not dreadful, it was man who made them like this in his own image” (Wolska, 2017, p. 68).

According to Epicurus, man needs little for happiness. In his choices, he should be guided by reason, striving only to satisfy necessary and absolutely basic needs. Self-limitation in his needs as a kind of asceticism should mean his way of life, because „the less needs, the less suffering” (Wolska, 2017, p. 62).

Such a simple and ascetic form of functioning in everyday life is to be accompanied by *λάθε βιώσας!*: conscious evasion of life in the hustle and bustle of the city, voluntary resignation from living in a public center; also deliberate and unforced isolation. This attitude is intended to strengthen the inner/spiritual life. Its aim should be to balance, control, calmness and ataraxia, that is – as Marcin Fabjański writes – what we „often overshoot in everyday life, chasing intense experiences and collecting objects" (Fabjański, 2020, p. 30). According to the ancient Greeks, ataraxia is the achievement of complete peace of mind. In the feeling of ataraxia, man experiences joy from the very fact of existence. This joy is a pleasure – the flagship value of Epicurean ethics.

3. Stoic school ethics

Quoting the words of the Polish psychologist and philosophy historian Władysław Heinrich[1]: „Stoicism arises contemporarily with Epicureanism. Its creator is Zeno, brought up in a school of Cynics and his teaching of morality refers to their views" (Heinrich, 1925, p. 150).

The School of Stoics is the second great center of ethical reflection of the ancient Hellas, where the philosophical art of life is taught by Zeno of Citium. He teaches stoic doctrine by strolling through the Painted Porch called the Porch of Peisianax (Laertios, 2004, p. 371). By his very nature, he is a kind, modest and reticent man.

This Ancient Sage, consistent with the characteristic of being reticent, convinces us that: „nature has given us one tongue and two ears to listen twice as much as we say" (Laertios, 2004, p. 380). Criticizing human vanity, Zeno calls us to live in harmony with nature, to act wisely, and at the same time to exercise our mind systematically. He calls us to follow the path of composure and seek unity with the world. The search for this unity is considered to be a good in itself, in which Zeno sees a special value (*ἀξία*) as „help for a rational life" (Laertios, 2004, p. 417).

According to Stoic doctrine, human nature is a particle of the rational universe (Heinrich, 1925, p. 153). Thus, life according to nature becomes life according to the laws of the universe – this is the motto of Stoic ethics. According to the Stoics, man is not the opposite of the world. „He is in it and with it an inseparable part of the universe" (Heinrich, 1925, p. 159). „Therefore our goal is to live according to nature, i.e. to live according to our own [individual – A.M.] nature and the nature of the universe, i.e. not to do what is forbidden by the common law, which is all penetrating healthy mind" (Laertios 2004, p. 410; Fabjański, 2020, pp. 105-107).

[1] Władysław Heinrich (1869-1957) – Polish psychologist-behaviorist and historian of philosophy associated with Krakow scientific institutions: the Jagiellonian University and the Polish Academy of Learning.

Living in accordance with nature means specifically living in accordance with reason, and living in accordance with reason is living in accordance with virtue, including the virtue of preserving one's system as strengthening oneself by taking care of those dimensions of life that serve/assist us and at the same time eliminating from life those elements that harm us (Laertios, 2004, p. 408). Such realization in virtue is an exercise in becoming a good person. Good, in the conviction of the Stoics, that is, nurturing the value of nature and harmony within it. In the ethical doctrine of the Stoics, harmony is identified with symmetry and balance. Improvement in this harmony of nature, as well as its maintenance, allows one to accept with dignity all the horrors that fate brings (De Botton, 2000, p. 86.).

As Allan De Botton writes when analysing the thought of Seneca Stoic, „regardless of how vast an area of our life's frustrations may be [...], all its characters share a basic structure: a conflict of desire with an unremitting reality" (De Botton, 2000, p. 88). This conflict is related to the impossibility of obtaining a sense of satisfaction because „the sources of satisfaction are beyond our control" (De Botton, 2000, p. 88). On the other hand, according to Stoic ethics, man can only learn what to do so that the world is not „even more tenacious because of our reactions: bursts of rage, self-pity, anxiety, self-righteousness and paranoia" (De Botton, 2000, p. 89). Only those frustrations for which we manage to prepare and understand them properly in advance turn out to be bearable. The greatest troubles in turn are those of our sorrows and grievances that we do not expect and cannot understand (De Botton, 2000, p. 89). So what remains for man to do with the unpredictable? In the conviction of the Stoics then there is nothing left to do but to accept with dignity what is involuntary and inevitable.

In this attitude there is a spiritual-physical aspect of our growth, of updating ourselves in the typical human *physis*, as well as an aspect of strengthening our own *psyche* in order to shape the virtue of a harmonious disposition. This virtue is referred to by the Stoic philosopher Cleanthes, suggesting that it this very virtue – the virtue of a harmonious disposition – does the happiness of the soul lie. As in the book *Lives and Opinions of Eminent Philosophers*, the Greek chronicler of philosophers, Diogenes Laertios reports: „There is happiness in virtue as in the soul created to harmonize all life" (Laertios, 2004, p. 410).

This harmonisation does not only apply to the human-individual. The Stoics do not only mean the individual. The domain of individual life is that we also go beyond our own individuality by entering the sphere of social life. The rational drive, which obliges us to strengthen ourselves, „forces us also to take care of our closest family, and further on, of relatives and fellow citizens, in order to ultimately extend ourselves to the whole of humanity. We feel that we are made to live together with others" (Heinrich, 1925, p. 164).

Both the ancient Epicurean and Stoic systems – with a strong emphasis on the practical aspect of philosophy – refer to a life consistent with the proclaimed science. The call to live according to the principles that one learns means „to live according to the content of one's science" (Hadot, 2000, p. 334). It is a kind of focus on the practical dimension of philosophy, the role of which, according to the ancient wise men, is not played out in acts of vain speculation

and vain theorizing, but should be fulfilled in the therapeutic disposition: the attitude of character shaping, in acts of strengthening the strength of the spirit and care and systematic concern for maintaining the balance of life by fulfilling oneself in the virtue of concentration, rational action and constant striving to maintain the peace of mind (inner life). Also in the awareness of the individual and – as I have already mentioned – social, even communal range of our existence. The sciences promoted in both ancient schools may, to a various extent, be seen in many contemporary development programmes.

4. Holistic views of a man in coaching on the example of selected models, tools and techniques

Currently, an excellent, holistic form of taking care of the balance is carried out through coaching – a method of work focused on the growth and development of potential, efficiency and resources of a person as an individual, as well as a group or team (icf.org.pl). So far, this method has developed a number of tools, models and techniques of work; the original ways of striving for holistic human development, whose sources lie in the social-humanistic sciences: philosophy, sociology or psychology.

Development trends in coaching are often signed by psychological knowledge supported by scientific evidence. Coaching most often uses the cognitive behavioural trend (Watson, Rayner, 1920; Wolp, Lazarus, 1966), cognitive psychology, positive psychology, as well as many therapeutic concepts, e.g.: rational emotive behaviour therapy cognitive-behavioral therapy (CBT) and solution focused brief therapy (SFBT).

Therapeutic sources include the holistic SPACE model used in coaching developed by Nick Edgerton and Stephen Palmer (Edgerton, Palmer, 2005, p. 25-31). As Anna Syrek-Kosowska, trainer, coach and lecturer in MBA Executives programmes, writes: „The literature on the subject describes a wide range of possibilities of applying the SPACE model – both in development processes, stress management training programmes, and in business and life coaching. In the Polish adaptation, the English acronym SPACE[2] […] replaced by the SFERA abreviation meaning successively: social context or social situation, physiology, emotions, reactions and thought analysis" (Syrek-Kosowska, 2014, p. 62). The distinguished contexts of human life are assumed by the ethical doctrine of Epicureans and Stoics. Therefore, it is worth mentioning at this point that the humanistic foundations of psychological and psychological-coaching tools and work models often lie precisely in philosophy, for example, in the Epicurean-Stoic idea of holism (Ziemacki, 2014).

[2] The acronym SPACE stands for: Social context (or Situation), Physiology (Physical), Actions, Cognitions, Emotions.

The referenced contexts, similarly to the ethical programmes of Epicurus and Zeno, include the human being in its entirety, taking into account the aspect of his functioning in the social environment; the physiological aspect emphasizing the dimension of physiological reactions of the body to emotions; analogously, it is also human emotionality or in other words the sphere of emotional reactions of the human being as an individual to specific situations; also the area of undertaking actions and accompanying mental analysis (Syrek-Kosowska, 2014, p. 64). As a result, the SFERA model, through its therapeutic and healing character, is effectively used in coaching practice, becoming a model tool for multidimensional work on oneself and another human being.

Man is captured in similar multidimensionality, self-knowledge and holism by Philippe Rosinski's integrated global coaching approach. Rosinski calls for the opening up of six contexts of human functioning in everyday life that emphasize various aspects of life, even those that are not even brought together. He calls these contexts perspectives. These are in turn: 1) the physical perspective related to health care, vigour and physical fitness; 2) the managerial perspective, in which a person fulfils tasks efficiently and skillfully; this is also the ability of logical-analytical analysis; 3) the psychological perspective responsible for the development of emotionality and relationships; 4) political perspective – community and social – combined with generating power and a sense of service to others; 5) it is also a community cultural perspective – promoting diversity, skilfulness and cleverness in cooperation with others; 6) and lastly, a spiritual perspective: the individual, within which the human being, striving for unity, reflexively seeks deeper meanings and universal meanings in life. The last perspective distinguished by Rosinski has philosophical-religious connotations (Rosinski, 2011, pp. 51-175; Musioł, 2018, pp. 279-290).

Another therapeutic model of the aided tool, developed today, is proposed by self-development expert Stephen Covey (1932-2012). Covey's project focuses on the values of human body, mind, heart and spirit. It is also a program of self-development and self-improvement in the dimension of individual life, which expresses concern for style and physical quality of life, intellectual development, ability to learn and acquire new mental skills. In the dimension of social life, community life it heralds a strong commitment to others through sensitivity and full and careful listening, which is a source of fulfilment and joy. The highlighted aspects are complemented by the supernatural dimension of the spirit, in which one asks for the meaning of life, discovers the meaning of life or finds arguments that give meaning to life (Covey, 2018, p. V-VI; Musioł, 2019, p. 221-229).

5. Conclusion

Today, in the era of man lost in liquid post-modernity, both ancient philosophical concepts, especially the architecture of the ethics of the Epicurean and Stoic virtues, as well as many contemporary – inspired by history of psychology – coaching projects, do not lose their validity and relevance. They find their application not only in – increasingly popular – coach's offices, but also in the offices of advisors, trainers, personal development specialists or therapists (Mukoid, 2017).

Such a state of affairs may result from the more and more often observed loss of man in the contemporary, changing reality, whose intellectual atmosphere can be described as philosophical irrationalism. It is a fuzzy, fragmented, liquid, blurred, incoherent reality, full of contradictions/ambiguities and semantic chaos. It is the Austrian philosopher Paul Feyerabend's inevitability, almost imposed from the outside (the rule *anything goes*); it is a demand to act in an atmosphere of a lack of cognitive/epistemological homogeneity, a deficit of values and socio-political apathy (Wolska, 2017; pp. 23-24, Feyerabend, 1975). In this mess of labile everyday life, as a result of internal tears and emotional turmoil, modern man looks for a way back to what is permanent and stable.

In this article, I have attempted to show that this durability and stability can be guaranteed by a kind of return to reliable humanistic and social knowledge contained in the theses originally proclaimed by the classics of philosophy: axiologies of objective values and virtues, as well as the rules of logical-rational proof, disseminated in the teachings of thinkers; also among the Ancient Sages of the Delphi formula *γνωθι σεαυτόν*: know yourself. I boldly claim that the thought they proclaim does not lose its relevance and is, in a way, a response to the needs of a modern man who, noticing the disadvantages of living in liquid postmodernity, struggles to make a turn and, as a result, strive for an effective rebuilding of his own, in a way ruined physical, mental and spiritual condition. For this purpose, he visits the offices of the representatives of the aforementioned aid professions. The current popularity of all this type of profession is a clear sign of the desire of the contemporary man seeking support to abandon everything that is changeable and at the same time, a strong pursuit of self-knowledge and an increase in self-awareness expressed by the desire to permanently renounce what is inconstant; it is also an active search for unity, cohesion, universal values, harmony, happiness and life fulfillment built on the canvas, universally applicable and guaranteeing stability, laws or norms (Wolska, 2017, pp. 25-26, 31). All of the above-mentioned elements that teach full life, originally contain the – eudaimonia oriented – classical philosophy, which is why I am in favor of a contemporary attempt to grasp it in terms of the art of life and therapy. I openly defend the thesis that the systems of classical philosophy, as if in contrast to the chaos of external reality, provide a person with an internal sense of security. It is enough to realize that philosophy is present in every, even the most banal aspect of human life. It effectively teaches

how to relive the world; indicates a multitude of strategies, gives a sense of freedom, allows you to notice your own flaws, and at the same time recommends working on yourself, teaches you to understand and distance yourself and the surrounding world.

References

1. Covey, S.R. (2018). *Siedem nawyków skutecznego działania*. Poznań.
2. De Botton, A. (2000). *O pocieszeniach jakie daje filozofia*. Warszawa.
3. Edgerton, N., Palmer, S. (2005). *SPACE: a psychological model for use within cognitive behavioural coaching, therapy and stress management. The Coaching Psychologist, 2(2),* 25-31. http://dx.doi.org/10.4135/9781446279908.
4. Fabjański, M. (2020). *Uwolnij się! Dobre życie według siedmiu filozofów – terapeutów*. Kraków.
5. Feyerabend, P. (1975). *Against Method*. London.
6. Hadot, P. (2000). *Czym jest filozofia starożytna*. Warszawa.
7. Heinrich, W. (1925). *Zarys historii filozofii*. *T. 1. Część pierwsza: Filozofia grecka.* Warszawa-Kraków-Lublin-Łódź-Paryż-Poznań-Wilno-Zakopane.
8. icf.org.pl.
9. Laertios, D. (2004). *Żywoty i poglądy słynnych filozofów*. Warszawa.
10. Mukoid, E. (2017). *Książka dla ciebie. Kim jesteś i dokąd zmierzasz.* Poznań.
11. Musioł, A. (2018). Sześć perspektyw coachingu globalnego w paradygmacie złożoności holograficznego modelu Philippe'a Rosinskiego. *Zeszyty Naukowe Politechniki Śląskiej. Seria: Organizacja i Zarządzanie, nr. 123.* Gliwice, pp. 279-290.
12. Musioł, A. (2019). Principles of comprehensive self-renewal by Stephen R. Covey in the perspective of ancient Greek παιδεία and the ideal of καλοκάγαθία. *Scientific Papers of Silesian University of Technology. Organization and Management Series, no. 140*. Gliwice, pp. 221-229.
13. Reale, G. (1999). *Historia filozofii starożytnej III. Systemy epoki hellenistycznej.* Lublin.
14. Rosinski, P. (2011). *Globalny coaching. Podejście zintegrowane*. Warszawa.
15. Syrek-Kosowska, A. (2014). Coachingowe narzędzia: Model SFERA. *Coaching review, 1,* pp. 60-70.
16. Watson, J.B., Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, *3,* 1-4. http://dx.doi.org/10.1037/h0069608, 22.06.2020.
17. Wolp, J., Lazarus, A. (1966). *Behavior Therapy Techniques*. New York.
18. Wolska, U. (2017). *Człowiek rzecz czy osoba? Filozoficzne ujęcie człowieka jako osoby terapią dla zagubionych w płynnej ponowoczesności.* Warszawa, Radzymin.
19. Wolska, U. (2017). *Terapeutyczne aspekty filozofii Sokratesa i Epikura*. Radzymin.
20. Ziemacki, J. (2014). *Emocje są jak zarazki*. https://www.wysokieobcasy.pl/wysokie-obcasy/1,96856,15616640,Emocje_sa_jak_zarazki.htmldrf, 08.06.2020.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

COMPARISON OF MANAGEMENT MODELS: PARTICIPATORY GOVERNING IN ORGANIZATIONS AS A NEW KIND OF POST-NPM MODEL

Robert NAHAPETYAN

University of Warsaw; robert.nahapetyan@gmail.com, ORCID: 0000-0002-8587-2814

Purpose: Modern researchers substantiate the need to investigate the transformation of management style in various organizations. Socium cannot successfully function and develop without its own, corresponding to its goals, style of state management interaction, ideology of social control.
Design/methodology/approach: Basing on the analysis, thinking and generalization of theoretical approaches and attitudes of various researchers, updates of approaches to the study of the participatory management style in the civil service system are presenting, the essential features of participatory management style are clarifying.
Findings: Research tries to understand how roles of management can not be fulfilling by chance, borrowing from the side and reflecting the spiritual experience of someone else's experiences.
Originality/value: It really now explains current scientific direction of study of management style, showing it's path from classic style into post-NPM style of ruling.

Keywords: New public management, government, participatory governing, management styles.

1. Introduction

Research confirms sociologists or politologists substantiate the common features of organizational management styles. Prove that the modern life of society is characterized by the explosive flow of social processes. Under these conditions, a strictly regulated professional activity, an authoritarian (command-administrative) or classic style of human resource management, a rigid construction of organizational systems, become not only ineffective, but also threaten the preservation of the integrity of the social organizational structuring.

Thus, importance of democratic transformations of management style practices is adaptability, flexibility of forms of social organization of social systems, the ability of officials to act in unexpected and extreme situations. In the new conditions, the state faces the serious

task of creating such a system of government, which, on the one hand, will be able to democratize the style of social management interaction itself, gradually reducing the role of public servants in this process. On the other hand, the state should become an integral element of the mechanism of socio-political protection of society against various social pathologies. It should be borne in mind that the problems of public service are associated with deep-seated social interests, ideological preferences and ideological orientations. The interests of the state are closely intertwined in the general socio-cultural context. As Ansell C, Torfing J. are arguing in their paper: "It is common to attack the governance literature for suggesting a totalizing and radical shift from "government" to "governance." While governance theories arose, in part, as a critique of state-centric government, new forms of governance often supplement or extend the state rather than supplant it… [If] proliferation of NGOs might be eroding… states in developing countries, NGOs may complement state capacity and even enhance democratic access to the state. [So] governance often operates in the shadow…, does create more decentered, pluri-centric modes of governing…, is best understood as a hybrid of different modes" (Ansell & Torfing, 2016, p. 552).

Researchers claim, as of management style is the most important indicator of the effectiveness of management of any social system. T. Parsons, developing this approach, notes that the concept of efficiency, the style of organizational interaction and the concept of social control complement and mutually enrich each other (Sergushko, 2002, pp. 256-258). Authors consider the transformations of management style in the context of improving managerial relations and correlate them with updating the set of permanent personal professional qualities of managers and subordinates. Researchers traditionally set the task of scientific analysis of various management styles, identifying how management style relates to the leadership behavior of managers and others. Researchers are trying not only to classify various management styles, but also try to identify the "best" management style, i.e. an ideal set of models of managerial behavior that managers must demonstrate in organizations of various types and various forms of ownership.

In the framework of our research, we find attempts to investigate the processes of transformation of the style of management of social systems. As Ansell C., Torfing J. are arguing in their paper: "Fordist logics of production were transformed, and new forms of transnational political and economic organization arose. Powerful fiscal pressures pushed states to engage in major reforms of the welfare state and pushed public agencies to explore new logics of public management" (Ansell & Torfing, 2016, p. 551).

We share the position of researchers who consider the improvement of management style in the context of improving and developing the social system of society. The development of the social system of society is associated with the general democratization and improvement of civil society. The latter objectively must be accompanied by the improvement of the management style in each social organization.

As of it, it is necessary to agree with the conclusions of D. Hampton, who convincingly proved that all modern management styles are embedded in the classical model of management styles: authoritarian, democratic, liberal (Hampton, 2001, p. 78), which in our opinion, correspond to classic, NPM, governing styles. As Klijn E.H. is mentioning: "If we look at both dominant views on management and the way they view complexity in society, we see that it is treated differently… In NPM the manager tries to keep as far as possible from the complex interaction system itself…, [which] is treated as a black box… Governance acknowledges that the processes are very dynamic…, which can be addressed by being part of the interactive system through influencing… choices of… coordinating the interactions of [others]" (Klijn, 2012, p. 211).

The latter approach is actively developed in his studies P. Northhouse. He proves the universality of the manifestation of an classic, new public (various forms of its manifestation), governing management styles. It shows that in the conditions of the formation of a civil society, both classic and new public management styles are ineffectively manifesting themselves. In this context, governing management style has various forms of manifestation: group management, supporting style, task-oriented style, situational style, participative style. The author's conclusion is important that ther governing style should be investigated both systematically and at the level of individual forms of manifestation. In practice, a gradual democratization of the management style in the conditions of the formation of a civil society is necessary.

Based on these approaches, we can conclude that governing model or corresponding management style in various forms and manifestations (a high degree of care for people and a high degree of care for production) is ideal in the conditions of the emergence of civil society. As of it, it is necessary to use the management within the framework of any large social system as the basis for the leadership development program for managers and subordinates. As Klijn E.H. is mentioning: "Thus, where NPM is mainly intraorganizational, trying to improve the internal operation of governments, governance is mainly interorganizationally oriented, trying to improve coordination of governments with the other actors who are necessary to deliver services or implement policies. One could also say that NPM is more occupied with efficiency and improving existing services and policies, while governance is more concerned with delivering new solutions for complex problems by improving coordination between the various actors" (Klijn, 2012, p. 210). Successful application of a group governing democratizing management style will lead to a high dynamics of career growth in the social system, which in turn increases the motivation of the officials' professional work activities.

2. Transformation of governing styles

Douglas McGregor uses various sociological methods to study the transformation of the management style of the social organizational system. The author argues that all social organizations (including labor organizations) are objectively forced during their development to gradually democratize and improve the management style. The gradual democratization of the management style is the most important regularity in the development of any social system (both at the macro and micro levels). The author emphasizes that within the framework of the classical social organization, managers treat employees as lazy people who need constant guidance and control (theory "x"), and not as responsible people who want to work and are able to take responsibility for their organization (theory "y") (Torrington, Hall, & Taylor, 2004, p. 386).

If a management style is built up according to the "x" theory, workers will behave in accordance with the "x" theory; on the contrary, if they are governed by delegating power management authority, assuming that they behave according to the theory of "y", they react like the workers of the theory of "y".

In particular, it is well known that the gradual democratization of management style is always a cyclical process. Therefore, the gradual democratization of management style has negative and at the same time positive consequences.

Applying this theory in practice, authors comes to the important conclusion that the implementation of the social program to democratize the style of public administration objectively leads to the demonstration of behavior by officials according to the model of the governing leader. However, this leads to unexpected and undesirable consequences. In some cases, the members of the management team are frightened that their leaders unexpectedly change their management style, and in some cases the management style does not fit the situation. In the end, within the framework of these organizational systems, it may be decided to abandon the further implementation of the program of phased democratization of management style.

Classic (administrative, directive) management style: the manager's behavior is task oriented. New public (supportive) management style: managerial behavior is focused on human relations.

Further development of the concept of management styles is carried out in the framework of the theoretical developments of P. Hersey and C. Blanchard. These authors develop a paradigm of democratic leadership style. (Hersey, 1985, p. 20)

The authors emphasize that preparedness for the phased implementation of democratic principles of governance implies managerial abilities and desires. In this case, the authors focus on the managerial abilities and desires of both the managers and the governed. Abilities include managerial knowledge, skills and experience that employees have in relation to a particular

work situation. Desires include motivation and responsibility, self-reliance. Based on these approaches, it is easy to see that the manager must determine the degree of maturity of the performers, and depending on this, the management style and behavior of both the manager and the subordinate changes.

So, it should be noted that in the above concepts there is no study of management styles by the criterion of public participation in management decisions and their social control. We find partial overcoming of these shortcomings in social concepts that model social management systems.

The version is confirmed that the participative management style is a clear manifestation of the highest level of democratization of managerial relations. The characteristic of a participatory management style is given, its essential feature is the attraction to management of not only managers of middle and lower levels, but also immediate social actors who are the object of management. It is hypothesized that as the formation of a civil society, the effectiveness of a participatory management style will increase. The disadvantage of this concept, in our opinion, is its isolation from practical research, not systematic empirical research confirming it.

The presented ideas are actively promoted and developed by P. Drucker. He substantiates the need for a gradual democratization of the management style of any modern social system. The important conclusion is that in twenty years in a typical social organization there will be half as many management levels and three times fewer managers than today. The structure, the problems of management and other tasks facing it will not be very similar to what is typical of modern social organization. Organizations in the future will become more like a hospital, university or symphony orchestra. (Drucker, 2006, p. 208)

3. From classic to new kind of public management

In scope of our research we have chosen other 4 articles which were analyzed according 4 questions.

1. How is it describing terms of governance or management?
2. What are its research questions?
3. What data is put into analysis?
4. What is results it achieving?

First text is Sancino A., Hudson L. Leadership in, of, and for smart cities–case studies from Europe, America, and Australia. Public Manage. Rev., 2020.

1. It doesn't provide scientific descriptions of this term but provides description of leadership:
2. According authors: "question posed by this lens is: Where is leadership emerging?" (Sancino & Hudson, 2020, p. 12) "Why is leadership created?" (Sancino & Hudson, 2020, p. 13) "Who are the leaders?" (Sancino & Hudson, 2020, p. 13) or so
3. It uses data of Policy documents, Websites, Reports, Academic literature or so: "We collected the case study evidence from multiple sources: academic literature, policy documents, reports, websites, the re-analysis, and interpretation of data sets from previous smart city studies and from knowledge gained by one author participating as a consultant and researcher in two of the cities" (Sancino & Hudson, 2020, p. 8).
4. According its comparative analysis it result propose some theoretical generalizations about 'modes' of smart city leadership in their matrix.

Second text is Biondi L., Demartini P., Marchegiani L., Marchiori M., Piber M. Understanding orchestrated participatory cultural initiatives: Mapping the dynamics of governance and participation. Cities, 2020, p. 96.

1. Article is not suggesting clear description of this term but says: "governance and participation can be adequately understood with the figure of 'bricolage'. According to the very requirements of the situation, the orchestrator acts as a bricoleur experimenting with an ephemeral mix of vision, coordination, empty canvasses and loose ends. However, we have to be aware that the orchestrators might also have their own political agendas or be instrumentalised by powerful political actors or elites" (Biondi, Demartini, Marchegiani, Marchiori, & Piber, 2020, p. 8).
2. According authors: "research question we address in this paper is: What elements provide a deeper understanding of the development and the governance of PCIs" (Biondi, Demartini, Marchegiani, Marchiori, & Piber, 2020, p. 2).
3. Data of participatory initiatives is from various primary and secondary sources: "PCIs were selected through a purposeful sampling technique. In it motivation for this study sprang from the growing importance of participation as a major theme at the European level. Therefore, we decided to select from European PCIs. To the purpose of the inquiry, we identified four cases, each of which involves different forms of orchestration and governance – public, private, hybrid. We collected data from both primary and secondary sources. In terms of primary data, each researcher conducted an in-depth investigation of one case through direct observations and semi-structured interviews with several key actors and stakeholders. The secondary sources of data included documents, official reports, press releases, publicly accessible videos, social media postings, meetings observations, and websites" (Biondi, Demartini, Marchegiani, Marchiori, & Piber, 2020, pp. 2, 3).

4. In result analysis authors say they: “found a similar pattern of development in all the PCIs: i) the starting phase (generation of ideas); ii) the opening-up phase (design/preparation/production of the cultural projesct); and iii) the implementation of the project (expected uses according to the goals of the PCI). So it during these phases, the complex dynamics of participation unfold.” (Biondi, Demartini, Marchegiani, Marchiori, & Piber, 2020, p. 6).

Third text is Hausberg J.P., Spaeth S. Why makers make what they make: motivations to contribute to open source hardware development. R. D. Manage. 2020, 50(1), pp. 75-95.

1. While new public management is not described as a process, it is shown in forms of motivation of Open source software (OSS) and hardware (OSH) developers to contribute their private resources to public open innovation goods.
2. Research question is: “Can we really assume the motivations behind the development of the OSH to be the same as those behind OSS?”
3. According authors, research collected data from the most common and active 3D printing communities, which are the main loci of OSH development: “survey included mainly FabLabs and RepRap maker- and hackerspaces, but as well a few university-based 3D printing groups/spaces and online communities or forums, like those of sites like thingiverse, ultimaker, and youmagine. Since our contacts distributed the invitation to participate within their respective communities, we have no possibility to estimate the response rate. However, 279 clicked the link, and 169 of these responded to at least some questions and 119 (42.6%) sufficiently completed the questionnaire to include the responses in it” (Hausberg & Spaeth, 2020, p. 81).
4. As research states: “analysis reveals several important findings: firstly, the motivations are in some aspects very similar to those in open source software notwithstanding different possibilities, hurdles, and incentives regarding the OSS and OSH. Above all, enjoyment-based intrinsic motivation is a major factor affecting contribution levels. Secondly, among internalized extrinsic motivations, expected private benefits through improving own skills stands out. Thirdly, different factors of internalized extrinsic motivations can have different moderating effects on the effect of enjoyment-based intrinsic motivation. Investigating the motives behind the contributions to OSH communities based on the selfdetermination theory, it showed that some of the classical motivations behind OSS development contribution are the major factors also in the case of OSH development, but we also show some interesting interaction effects and thus contribute to theory development of the selfdetermination theory as well as to a better understanding of the OSH development” (Hausberg & Spaeth, 2020, p. 87).

Fourth text is Li J., Krishnamurthy S., Pereira Roders A., van Wesemael P. State-of-the-practice: Assessing community participation within Chinese cultural World Heritage properties. Habitat Int., 2020, p. 96.

1. As of describing new public management, no strict description is in research, but is says if management needs to not only include governmental agencies, experts and businesses but also NGOs and representatives of residents, with the aim of achieving community goals or so.
2. Research question is: how community participation is positioned within World Heritage management in PRC properties in World Heritage List?
3. According authors, research: "developed a targeted assessment framework through which to assess community participation within the management practice of the 36 Chinese cultural heritage inscribed on the WHL from 1987 to 2018" (Li, Krishnamurthy, Pereira Roders, & van Wesemael, 2020, p. 9), showing data of participation, initiatives from government or population.
4. Research says: "Through the application of the assessment framework to UNESCO documents, the results provide an overview of Chinese practices in facilitating community participation in World Heritage management. Generally, Chinese World Heritage management is a government-led process wherein community participation is happening to a minimal degree of it" (Li, Krishnamurthy, Pereira Roders, & van Wesemael, 2020, p. 9).

For analysis of public participation in contexts of NPM or governing developments we chose 4 recent texts, which show this trajectories. The first text looks to Participative Planning with Management. This research aims showing differences within organisations that are using participation in planning and realization, and come in conclusions, that its more resulting aims and effective now comparing to organizations that do not include its beneficiaries (Garcia-Zamor, 2019).

Next text which looks to this phenomenon, believes private-public partnership is modern way to reach aims and efficiency in management, being a recent part of NPM. Research shows participation of stakeholders in solving issues in management being in realization in different countries in different modes, but can not show which is exactly right for practicing NPM, it really connects to specifics of sociums. (Norton & Blanco, 2009).

Our next text researching this issue focuses on development of post-NPM, which is seen in it as of newest form of development in management. As author shows, in its developments to improve organization management, public administration has been introducing in its scientific research NPM and now post-NPM, limits of which are shown usual in socium it is introducing in. (Jong, p. 161)

In our next text we can find author's explanations on how innovation in public sector can bring to development of management way or practices, shows recent trends of innovation, from NPM to governing institutions, creating competition in stakeholders, up to participation.

It is important to understand this process in order to understand way of making such sort in collaboration work, as it slowly changes into co-issuing of policies with stakeholders, its construction, organizers (Sørensen, 2012, p. 215).

Summarizing the above presented theoretical approaches, it is easy to see that in modern conditions a new democratic model of managing an organization is being formed with a corresponding transformation of the stylistic models of managing actors. In accordance with the established practice, the management model is developed on the basis of the style and cultural preferences of the formal leaders of the organization. At the same time, the system of managerial interaction should correspond to a model that, under certain conditions of labor emancipation, has maximum socio-economic results.

Based on these theoretical assumptions, it can be concluded that the design of a new democratic model of social organization management involves a gradual process of democratization of management relations, ensuring the transition from a predominantly administrative to a predominantly participative management style of the organization.

The improvement of public administration as any other form of government can be conditionally considered in the context of the transformation of the style of managerial interaction that manifests itself in relations between managers, subordinates and the public. Improvement of any form of management (including state) is, above all, progressive transformations in the system of management style management, updating the collective characteristics (manners) of the professional management behavior of managers, changing the attitudes emerging in the implementation process of management processes. With a certain degree of abstraction, it can be stated that the improvement of public administration involves a gradual transition from the authoritarian style (manner) of managerial professional behavior of public servants to a democratic one, and then to a participatory one. In this context, it is important to clarify the essence of the various management styles in the context of sociological paradigms.

Classic management style is characterized by the use of a centralized management model, rigid administrative methods of management, suppression of the initiative and discussion of decisions made by both subordinates and representatives of the population.

The classic style is characterized by rigid authoritarian methods of management, centralization of decisions and their lack of alternatives. So it is inherent in the omnipotence of the highest governing center (represented by one ruler or a group of public servants) and powerlessness of lower-level governing bodies excludes the latter in the selection of goals, ways and means of their implementation, social control. In the framework of classic style practices, top management of the civil service is always right. He never makes a mistake; only the head of the state hierarchy has the right to make the right decisions. These principles manifest the authoritarian management stereotype. Subordinate subjects heading their subordinate organizations are also trying to translate the basic principles of authoritarianism.

The conviction reigns here that the only vertical of management authority from top to bottom minimizes the self-organization of the governed and subordinates.

Basin on it can be stated that a distinctive feature of the classic management style is the authoritarian style (manner) of managerial professional behavior of public servants. Here management is characterized by a high degree of sole power. Civil servants determine all the strategies of the social management subsystem and its individual groups; no authority is delegated to social groups; the population is not involved in management. Management activities are implemented through a single state vertical of power. System methods of administrative coercion of a social control object are of mainkyness uses.

This style, in the short term, can be effective. At the same time, it is characterized by low motivation of managers, lack of group thinking and creativity, less friendliness and a desire to cooperate with the population. Within the framework of this management style, it is easy to notice the active emergence of social contradictions, social conflicts and social aggressiveness.

In essence, the classic (administrative – rigid) type of management is directed solely at a specific result; it provides for unquestioning obedience, strict accountability, insistence on mindlessly following instructions, of it within the framework of this style there is no effective stimulation of professional growth, conditions of stagnation are created and the current stagnation is provoked.

Researchers of organizations of various types and ownership prove that theo new public style (in various models of its manifestation) is opposite to the classic one. So D. Hampton stresses that within the framework of governing management changes there is an alternative choice of goals, carried out by the board, collective discussion of projects and decision-making under the leadership of a senior official and under his personal responsibility is the most important feature of a new public style.

Participatory governing style characterizes the way a manager makes decisions. The participatory governing style is characterized by the development of principles of consensus, collegial decision-making, development and encouragement of the transfer of managerial authority, stimulation of initiative and discussion of decisions.

Participatory governing style is a developed governing style with specific forms of public participation as a social object of management in the management process. Like the new public style, the participative governing style is characterized by the development of principles of consensus, collegial decision-making, development and encouragement of the transfer of administrative authority, stimulation of initiative and discussion of decisions taken by higher-ranking employees by lower-ranking employees of the civil service. In addition to this participative governing style, the participation of the population (workers) in the management process is inherent. At the same time, responsibility is not concentrated, but distributed. Therefore, the participatory governing model provides for expanding the powers of individual departments of the management structure, involving the population, public organizations, and the media not only in the process of social control, but also in the implementation of other

functions of government. The subject of management here is represented by the hierarchical structure of management institutions and officials, as a rule, elected by the population (workers) and replaced by them. In its extreme manifestation, the participatory style of government assumes the relative autonomy of involving the population in the implementation of government functions (as a subject and object of management at the same time) and the possibility of its activity in extended kinds.

The essentialness of the participatory management style lies in its orientation towards the realization of the necessary diversity of public interests, at blocking the forced unification of the needs and motives of the social action of the population, unnatural for civil society. The most important principle of a participatory management style is the combination of state administration with the self-organization of social groups of organizations and the population.

We share the scientific position of Balandina in the fact that the participative style of government is the highest manifestation of the democratic management style. Here, the democratization of management is associated with the transfer (delegation) of the most important management functions not only to individual divisions of the civil service system, but also to the population of the region, and in some cases, individual processes are completely transferred to the system of activities of public organizations, the media, and informal associations of citizens.

A distinctive feature of the new public management style is the democratic style (manner) of the managerial professional behavior of public servants. In the context of a democratic model of social management, individual units are vested with a wide range of managerial powers, and the separation of managerial power is intensified. New public (progressive group – innovative) management style assumes that not only results are important, but also ways to achieve as of.

Governing style has a number of forms of maturity. The most mature form of the governing style defines its manifestations as a participative styles. Bilateral information flows are developing here, moreover, full, and not dosed at the behest of the manager, as the main condition for decentralization of decisions, as well as involving the population in making and implementing management decisions, stepping up bidirectional social control over the implementation of management decisions. Controlling formal and informal activities are focused mainly on social management outcomes.

Ludwig von Mises emphasizes that the bureaucracy “is not in itself either bad or good. This is a management method that can be applied in various spheres of human activity” (Mises, 1993, p. 40). He noted that bureaucratic government is a government that must follow the detailed rules and regulations established by the authority of a higher authority. The most unfavorable consequence is that the main concern of the employee becomes compliance with these and other formalities. This contributes to the preservation of the management style of civil servants.

The participatory management style reflects the maturity of the development of democratic principles of governance. It is inherent in the participation of the population in the management process. Within the framework of this style, the powers of individual departments of the management structure are maximally expanded, the population, public organizations, and the media are optimally involved in management processes. The subject of management here is represented by the hierarchical structure of management institutions and officials, as a rule, elected by the population (workers) and replaced by them. In its extreme manifestation, the participatory style of government assumes a relative, independent involvement in the implementation of government functions of the population (as a subject and object of management at the same time) and the possibility of its activity in expanded forms. The most important principle of a participatory management style is the combination of state administration with the self-organization of social groups of organizations and the population.

In practice, the processes of improving the management style are actively carried out within the framework of organizations of various types and forms of ownership. Just 10 years ago, American managers didn't want to use the concept of participatory management style. Under the new conditions, thanks to the support of the Association of Automotive Workers, the managers of leading enterprises such as Ford, General Motor, Chrysler, large state and public organizations, have changed their attitude to this concept, and in recent years organizations successfully implement management model optimization programs, involving workers in the management process. For organizations of the new type, the use of autonomous work teams has become characteristic. Building a new democratic management model involves the use of autonomous, self-governing labor collectives, determines the need for a radical rejection of the old management methods, the elimination of many labor restrictions that have linked the initiative not only of managers, but also engineering and technical workers, ordinary employees of the organization.

It is easy to see that any modern organizational system involves a constant transformation of the interaction of the head with the team, improving the style of managerial interaction of workers. The transformation of management style contributes to the elimination of deviant (socially deviant) behavior in social groups and society as a whole (Giddens, 2005). There is a need to abandon authoritarian regulators of management activities. The leader in the new conditions cannot concentrate all the power in his hands, take all the responsibility for the results of labor activity, and exercise ultimate control over management and labor activity. It is necessary to abandon the authoritarian management style, from the predominance of the sole management methods, the preferential use of administrative administrative influence on subordinates. The activities of managers cannot be carried out without partner interaction with subordinates, decisions must be made more collectively, a constant search for consensus with subordinates is necessary. Categorical, orderly form, frequent reference to the sanctions of the head in the new conditions can not be effective.

4. Conclusion

Social organizations of various forms and types of ownership reduce the direction of their activities, become less large and less stable, they dynamically develop on the basis of a qualitative transformation of social, material, and technological factors. There are tendencies in staff cuts, improving the quality of human capital, updating the structure of the organization, and dividing the staff in terms of the accumulated intellectual and educational human capital into main and secondary labor. The number of independent managers, part-time workers under contract (part-time employment) is growing. Subcontracting and temporary contracts are gradually spreading, the composition of permanently work is reduces, flexibility, innovative mobility of managers, their ability to participate independently in the labor innovation process becomes a major factor of competitive advantages.

We share the findings of theorists of social government that, in the face of increasing environmental variability, effective state organizational systems should function as open social systems, which implies, on the one hand, the introduction of new participatory principles of general management theory. On the other hand, the creation of objective conditions for attracting the population to self-development and self-improvement of public administration processes. It creates the need for the constant democratization of the managerial interaction of public servants (as a subject of government) and the population (as an object of government). The effectiveness of public administration increasingly depends not on the applied management technologies, labor discipline and the severity of the planned strategy, but on the presence of part-time interaction of civil servants with the population, coherence, creativity and innovative accumulation of new administrative ideas of residents of various regions.

The formation of a participatory management style is an objective process, since this style is characterized by a number of major competitive advantages. The most significant of the benefits are as follows. This type is based on the innovative type of organizational culture, which creates conditions for attracting people not only to social management control, but also to the implementation of a dynamic accumulation of research and management innovations. This creates prerequisites for the destruction of barriers to the use of social initiative of officials, employees of various ranks, social organizations, and the public. Creative innovative activity of the population is incompatible with the activities of authoritarian leaders of management, it requires emancipation, involvement in the adoption and implementation of management decisions.

The formation of a participatory management style reflects the principle of civic integration, which is the most important indicator of building a civil society.

The first phase of the formation of a participatory style is associated with the emergence of simple methods of democratic managerial interaction. Management is carried out taking into account the views of the population in solving its main problems. Within this phase there is no

rectilinear administrative imposition of the will. Here the forms of managerial activity of civil servants are developing, the managerial actions of employees are motivated through the development of social needs of a higher order. So second phase of formation is associated with the development of complex methods of democratic management interaction, the emergence and improvement of the involvement of performers in the implementation of management functions themselves. Within the framework of the second phase, the population is complicit in solving basic management tasks related to the development of strategic and tactical goals, the development of social plans, projects, programs, the development and implementation of specific management actions, the implementation of management control and self-control by civil servants.

The third phase of formation is associated with the development of complex methods of democratic public management interaction, the formation and improvement of public involvement in the implementation of public administration management. Within the framework of the third phase, the participation of the population in solving basic management tasks and in the development and implementation of social development projects is activating.

References

1. Ansell, C., & Torfing, J. (2016). The current status and future development of governance theories. In: C. Ansell, & J. Torfing. *Handbook on Theories of Governance* (pp. 551-560). Cheltenham: Edward Elgar Publishing.
2. Biondi, L., Demartini, P., Marchegiani, L., Marchiori, M., & Piber, M. (2020). Understanding orchestrated participatory cultural initiatives: Mapping the dynamics of governance and participation. *Cities, 96*.
3. Drucker, P. (2006). *Birth of a new organization, Knowledge management.* Alpina Business Books.
4. Garcia-Zamor, J.-C. (2019). *Public Participation In Development Planning And Management: Cases From Africa and Asia.* Taylor & Francis.
5. Giddens, E. (2005). *The Disposition of Society.* Academic Project.
6. Hampton, D. (2001). *Organization of the future.* M.
7. Hausberg, J., & Spaeth, S. (2020). Why makers make what they make: motivations to contribute to open source hardware development. *R. D. Manage.*, 75-95.
8. Hersey, P. (1985). *Situational Selling.* Escondido, Calif: Centre for Leadership Studies.
9. Jong, S.J. (n.d.). The Limits of Post: New Public Management and Beyond. *Public Administration Review, Vol. 69, No. 1*, 161-165.

10. Klijn, E.H. (2012). Public Management and Governance: a comparison of two paradigms to deal with modern complex problems. In: D.L. Faur, *The handbook of governance* (pp. 201-214). Oxford: Oxford University Press.
11. Li, J., Krishnamurthy, S., Pereira Roders, A., & van Wesemael, P. (2020). State-of-the-practice: Assessing community participation within Chinese cultural World Heritage properties. *Habitat Int*.
12. Mises, L. v. (1993). *Bureaucracy. Planned chaos. Anti-capitalist mentality.* Progress.
13. Norton, S.D., & Blanco, L. (2009). Public-private partnerships: a comparative study of new public management and stakeholder participation in the UK and Spain. *International Journal of Public Policy, Vol. 4, Iss. 3-4*.
14. Sancino, A., & Hudson, L. (2020). Leadership in, of, and for smart cities–case studies from Europe, America, and Australia. *Public Manage. Rev*.
15. Sergushko, S.V. (2002). *Organizational culture as a factor in the strategic development of an organization, Management of public institutions and processes in Russia: theory and practice.* Saratov: Povolzh. Acad. state Service.
16. Sørensen, E. (2012). Governance And Innovation in the Public Sector. In: D. Levi-Faur, *The Oxford Handbook of Governance.*
17. Torrington, D., Hall, L., & Taylor, S. (2004). *Human Resource Management.* Publishing house "Business and Service".

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SOCIAL ACTIVITY OF SENIOR CITIZENS – SOME SOCIOLOGICAL REMARKS ON THE ISSUE

Marek NIEZABITOWSKI

Silesian University of Technology, Faculty of Organization and Management, Department of Applied Social Sciences; Marek.Niezabitowski@polsl.pl, ORCID: 0000 0002 7730 2483

Purpose: The aim of the paper is to discuss the issue of social activity of senior citizens from the perspective of sociology and social gerontology.
Design/methodology/approach: The barriers of social activity experienced by elderly people as well as its amenities are presented in the order of the SWOT-like analysis. The main issue has been discussed within the scope of gerontology. Psycho-social and sociological theories has been applied to distinguish two levels of potential factors of social activities of senior citizens: individual level and the level of society.
Findings: As a result of discussion in the summary author the role and the connection of theory and research in the practice of providing the opportunities for social activities of senior citizens. The special role belongs to action research which directly lies in between science and practice, the surveys which provide knowledge about scale of the problems and forms of activity of elderly people whereas longitudinal studies indicate the changes in attitudes and the modes of activity in the life course of aging individuals.
Originality/value: The paper combines and puts in order the scientific arguments concerning chances and factors hindering social activity of senior citizens. It is addressed to sociologists, social workers and some other specialists in the scope of social sciences and practical professions dealing with the issues of elderly people.

Keywords: elderly people, social activity, sociological theories, social gerontology.

Category of the paper: in between viewpoint and conceptual paper.

1. Introduction

There used to be some moments in history when older people gained very special importance in societies due to demographic changes across the country or continent. One of such moments was the turn of the XIV and XV centuries in Europe. As a result of epidemic of plaque and high mortality rate mostly among young people and children the populations of older people grew a lot in several countries like e.g. England, Italy, Germany, France or Spain. Among the consequences of this dramatic phenomenon were increase of

authority of older people in families, especially when it came to teaching the profession, exacerbation of intergenerational conflicts, the concentration of material assets (property) and power in the hands of the elderly (Minois, 1995).

So as the analyses of historians and demographers proved changes in population structure according to age can result in a completely different social status of given age group – in this case – of elderly people.

As regards to the turn of the XX and XXI centuries and next few decades a demographic aging of population of European countries is a social fact with many consequences. Earlier, especially in between 1940s and 1980s, growing awareness of this process contributed to the rise and dynamic development of modern social gerontology as an interdisciplinary field and then sociology of old age with their theories, concepts, research and predictions. One of the subjects of the explorations, investigations and analyses within social gerontology and sociology of aging are very complex issues of activity and social participation of elderly people. The observations and some research allow gerontologists to predict that social activity of senior citizens is still growing phenomenon. The chances of the development of that phenomenon will be discussed in this text referring to the sociological and gerontological theory.

2. Chances of the growth of social activities of elderly people

When debating chances of rising the social activity of elderly people the logic of SWOT analysis will be applied, which includes: 1) strengths, 2) weaknesses, 3) opportunities, 4) threats. Discussing strengths and weaknesses I am going to focus on such psychological traits of elderly people as individuals and social category which enable them to participate in social activities or limit this participation. When discussing opportunities and threats I will present some aspects of sociological perspective on atmosphere surrounding senior citizens in society.

2.1. Strengths of older adults in the light of gerontology

As regards to strengths I consider some theories, qualities and facts worth mentioning as a very important context of willingness to remain active despite being old or process of aging.

I am going to focus on theories below:

1. Theory of Activity.
2. Theory of competence.
3. Theory of continuity.

According to activity theory when remaining active as it used to be at middle age people become satisfied with their life despite their old age or aging process. Within this theoretical frame it was also obvious that lowering level of activity compared with this in one's middle age

resulted in dissatisfaction. This conviction is based on the famous researches conducted by Cavan and his coworkers, e.g. Havighurst (Cavan et al., 1949), nevertheless the theory of activity itself had been developed by Robert Havighurst. As activity is considered as necessary condition of successful aging it is worth mentioning that these two authors (researchers) included social interactions in clubs and associations in their inventory of attitudes being indicators of a said successful aging (Havighurst, 1963). This paradigm proposed by the aforementioned researchers only indicates that activity in old age is essential for life satisfaction at that stage of one's biography (or life cycle).

In turn, continuity theory not only assumes that our activity is just a continuation of one which use to be the case when we were at middle age. It also suggest that when adapting to our aging and to its consequences we tend to continue (follow) the patterns previously applied when we were at middle age. It primarily means that we use our resources to cope with problems and challenges in everyday life in late years. So the key term of this theoretical view on aging is adaptation (Atchley, 1972).

Another very important social theory in gerontology which shows the significance of activity is theory of competence (Halicki, 2000). It is focused on challenges that can be taken up by older adults. It can mean coping with activities of everyday life despite difficulties as well as learning new things and discovering new skills, talents and hobbies. The viewpoint of this theory, which is in contrast to a disengagement theory, inspired the development of Universities of the Third Age in several European countries like Great Britain, France, Germany etc.

The very significant contribution to the recognition of activity issues regarding elderly people in Poland has made nation-wide project PolSenior (Mossakowska, Więcek, and Błędowski, 2012). As it was stated in previous gerontological research (Synak, 2003) lack of satisfactory activity as well as social contacts and ties after retiring are the problems very often experienced by Polish senior citizens (Halicka, and Halicki, 2003). The above mentioned last nation-wide research PolSenior prooved that the higher the level of education of respondents from the cohort 55-59-year-old the higher the coefficient of professional activity and employment. The conclusion drawn from this fact by some Polish gerontologists is that social policy in further decades should give possibilities for senior citizens to maintain professional activity but as a part time job (Szukalski, 2012). The other significant result of this research is the fact that the older respondents are the more often they feel lonely (Szatur-Jaworska, 2012b).

2.2. Weaknesses of older adults and their psycho-social aspects

Regarding the weaknesses which can limit activity of older adults I am sure that few facts and theories has to be emphasized. I mean first of all:

1. Disengagement theory.
2. Deficit model.
3. Portend of embarrassment according to Steven J. Miller.

4. "Social breakdown syndrome" described by Jack Zusman (see Synak, 1999) – problem which occurs in social interactions of older adults and has the permanent impact on their self-esteem and some other features of their self.

One of the first scientific perspective on the old age within gerontology is focused mostly on the processes of weakening older person and it is a deficit model (Halicki, 2000). So this viewpoint is concentrated on losing some resources, not gaining new ones. A disengagement theory (Cumming, and Henry, 1961) which is a very traditional theory in the scope of gerontology fall within the deficit model. According to this theory aging process lies in three basic kinds of withdrawal from life (Cumming, and Henry, 1961; Synak, 1999; Zych, 1999; cf Niezabitowski, 2007):

1. Gradual decrease in social interactions.
2. Weakening of emotional bond with the outside world.
3. Decrease in the level of conformity with social norms in their country.

This three signs of withdrawal Cumming and Henry considered as characteristic of the process of human aging and the adaptation to its biological inevitability is a necessary condition of optimal course of that process. So for these researchers the abovementioned manifestations of disengagement were normal which means that according to their opinions older adults want to withdraw from life and social activity not only in terms of interactions but also in terms of conformity and emotional bond with the outside reality. In that form this theoretical perspective stoked much controversy among scientist in the field of gerontology, because it so difficult to agree that such a level and scope of disengagement is a sign of normal aging process.

This level and scope of course depends on the individual, so one want to withdraw to a great degree whereas some other want to remain active or even discover new fields of activity. Furthermore it was also accentuated by some gerontologists that older adults who could have been active in some spheres may experience barriers of different kind, also socio-psychological. One of such barriers has been discovered and described by Steven J. Miller as a "portend of embarrassment" which means a fear of being treated as boring and grumpy old retiree who has nothing interesting to do in his free time. That kind of fear stops retired person from engaging in social activities and is a stigma on one's self formed as a result of so called "embarrassing encounter" (Miller, 1965). This term mean the event in which retired person has been treated as it was described above – someone unadjusted to the rest of society and uninteresting.

The other theoretical model of a process in which something abnormal happens to older adult is a "social breakdown syndrome" characterized by Jack Zusman (see Synak, 1999). It describes pathological process of decline in self-esteem and some other psychological qualities of older person as a result of being stigmatized due to being treated as a dependent human being in relations with help givers. The very important reasons for such a process is the formation of specific "psychosocial void" around older person as a consequence of (Kuypers, and Bengtson, 1973):

- The lose social roles and positions subjectively meaningful for a senior.
- The lose of social identity.

The void formed in that way makes elderly people a subject to two subsequent processes:

- Gradually becoming dependent from identities imposed by other people.
- Gradual adjustment and taking the role of dependent person if this role is imposed in subsequent acts of stigmatization[1].

There are two noticeable mechanisms of above mentioned "social breakdown syndrome": stigmatization and susceptibility to such acts of stigmatization due to e.g. bad financial situation or inaccessibility of some other goods (social position, prestige etc.).

This means that objective social and economic situation of elderly people may be a threat to their dignity, especially when they lose their independence when losing their physical efficiency.

2.3. Opportunities – psychological and social aspects in the light of gerontology

The strengths and weaknesses analyzed above are only positive or negative potential of social activity of older persons. Moreover they are proposed potential strengths and weaknesses, not necessarily real. It depends on social, law and political circumstances if these strengths and weaknesses become real chances of stimulating activity (activity which is needed by seniors).

When discussing the opportunities of social activity of elderly people it is worth showing that in contrast to the weaknesses of older adults they also have evident resources predisposing them to activities in some spheres of life.

Some theoretical perspectives and facts accentuate such resources and chances to activate them. One of these perspectives is the concept called Selective Optimization with Compensation (SOC) which resulted from Berlin Aging Study (Baltes, and Carstensen, 2003). The practical implication of this concept is that despite some deficits senior citizens can reach life satisfaction based on the resources which they still have.

The other chances to prevent some risk of lowering the quality of life of elderly people are exposed in "Social reconstruction model"[2]. These are the features of social atmosphere surrounding senior citizens (as individuals and as a group) like e.g. (Bengtson, 1973):

[1] I discussed some aspects of „social breakdown syndrome" in: Niezabitowski, M. (2020). Prawa osób starszych – kilka uwag z perspektywy gerontologii społecznej. In: A. Kuzior (Ed.), *Globalne konteksty poszanowania praw i wolności człowieka. Współczesne problemy i dylematy. 12* (pp. 197-211). Gliwice: Wydawnictwo Politechniki Śląskiej.

[2] I discussed some aspects of „social reconstruction model" in: Niezabitowski, M. (2020). Prawa osób starszych – kilka uwag z perspektywy gerontologii społecznej. In: A. Kuzior (Ed.), *Globalne konteksty poszanowania praw i wolności człowieka. Współczesne problemy i dylematy. 12* (pp. 197-211). Gliwice: Wydawnictwo Politechniki Śląskiej.

1. Breaking them free from "productive" social roles and understanding the need and right to individual, preferable, pleasurable lifestyles.
2. Improving housing, health and economic living conditions.
3. Giving elderly people an opportunity to control their lives, activities and solutions favoring the quality of their lives.

The above mentioned postulates concern social policy and the rights of older people written in some documents of that policy like for example Madrid International Plan of Action on Aging (United Nations, 2002; Szatur-Jaworska, 2012a). As some of these rights are only written not necessarily followed by institutions it may mean that senior citizens are compelled to fight for their rights on their own. The theory of subculture of the aging emphasizes such possibility (Rose, 1965). Indeed, as the specificity of problems concerning older people are not satisfactorily included in overall social policy of Poland, a special policy, called aging policy has been "invented", introduced and implemented by some legislation acts.

2.4. Threats as a social atmosphere surrounding elderly people

As threats to the development of social participation of elderly people are concerned one of the first sociological intuitions related to this issue is modernization theory specially adjusted to social gerontology (Cowgil, and Holmes, 1972; cf Synak, 1999). According to this perspective modernization of societies with its technological advancements, formation of new professions, expansion of new mass-media etc. decreases position of elderly people as their knowledge often becomes obsolete. This issue is even defined in terms of change of system of culture by American anthropologist Margaret Mead. She stated that when the knowledge of older people, also in the role of worker becomes outdated they stop being authority for younger generations in the societies of permanent change (Mead, 2000, cf 1978), which really means information societies (Castells, 2000; Krzysztofek, and Szczepański, 2002). According to Mead retiring older workers in organizations and substituting them with younger ones is a tool of enabling the organization to respond adequately to change. It is very difficult to agree with this statement as older workers also have some significant qualities emphasized mostly by the theory of competence mentioned earlier. So it should be clear that this radical view is based on stereotype of older people. The content of this stereotype includes such features like e.g.: outdated knowledge, reluctance to any change and learning new skills, gaining new competences etc. Such stereotypes strengthen ageism as an attitude which becomes rationale for an institutional common practice of the rejection of candidates for jobs at the age over 50 and 60 or withdrawing them from positions and tasks they need and are competent to do.

Ageism which lies on the view that older people are weak and old-fashioned and useless in terms of economy is one face of the issue of impediment to their social participation which is in accordance with their needs. Such view of this age group as a whole supports and justifies no efforts made to create offer or adjust institutions for their needs.

The other facet of the issue of ageism are the practices based on the conviction that the elderly are lonely, ill, inefficient, handicapped, depressed, passive, dependent, in need of permanent help and care. The conviction that all old people are such is of course a stereotype. However some senior citizens are in such situations. Then, indeed, they need help, support and if despite such limitations they want to participate in some activities it is worth recognize their needs and limitations to create offer well-adjusted to them. The offer specially adjusted to them can prevent these people from being painfully and depressingly isolated, excluded from the rest of society, local community and their peers. I think that this also refers to seniors living in nursing homes. Living in such a place shouldn't mean that people can be cut from the rest of the outside world.

3. Summary

To summarize the discussion above It has to be said that according to the logic of the SWOT analysis elderly people encounter some barriers of their social participation as well as facilities. Thinking about weaknesses it is worth focusing on the barriers of individual, mostly psychological, not necessarily related to health problems. This kind of barriers lie mostly in what kind of attitude towards themselves older adults expect. These imaginations (predictions) as I discussed earlier can make them abstain from social activities. As regards to strengths, the resources that older people still have despite losing their physical efficiency are crucial. These resources are emphasized by psychological and sociological theories in the scope of gerontology – for example by the concept of Selective Optimization with Compensation mentioned earlier.

As opportunities and threats to social participation of elderly people are concerned I think it is worth analyzing them at a broader social level. It means that actions planned and taken by the agendas and institutions of society should create chances to overcome barriers and activate resources of elderly people as individuals and as a group in different social contexts.

Such actions should deal with the issues like e.g.:

1. Isolation, marginalization, exclusion of the elderly.
2. Stimulating the intergenerational integration – by e.g. organizing meetings concerning the history of a local community or region.
3. Fighting with gerontophobia by inter alia popularizing positive images of old age and old people, for example showing senior citizens having their hobbies or some other pleasurable activities of leisure time.

4. Ageism in the job market and in other spheres of social life – one of possible strategies can be offering a job training at Universities for elderly people if they need it and showing positive examples of activities organized by seniors and for seniors which turned out to be fruitful for community they live in.
5. Fighting with negative stereotypes – like the stereotype of a boring retiree or only and always lonely, ill, inefficient, handicapped, depressed, passive, dependent, in need of permanent help and care, grumpy old man (crinkly) – in this case creating opportunities for participation in caregiving or some other forms of volunteering inter alia can be a good strategy.
6. Fighting against ghettoization – which means cutting special areas of space and social life which gather older people from the rest of society; it can also refer to cutting old people living in nursing homes from normal life outside the facility – in this case activities wanted by seniors and organized with their participation and moreover attractive for younger people can be a good strategy.

As regards to inclusion of the elderly in a local community there were some action research studies concerning this issue in Poland (Czekanowski, 2000; Halicka, and Pędich, 1997; Klimczak, and Nowalska-Kapuścik, 2019; Witkamp, and Meerstra, 1995). This kind of research were focused on organizing activities for senior citizens of given district of a town after recognizing their needs. When activities organized were performed the researchers studied (mostly by surveys) what were their benefits and drawbacks (disadvantages) perceived by the subjects of these actions – senior citizens themselves. The last stage of that kind of research becomes an evaluation of organized activities.

If the diagnosis of situation of elderly people in Poland has to be provided the large-scale surveys become a necessity. Such research show forms of activity of the elderly and types of their problems concerning the scale of these issues. Such research provide very useful information for social policy, even if that information is incomplete and has to be supplemented by further and deeper analyses. The tradition of such research in Poland hails back to 1960s (Piotrowski, 1973; Synak, 2003) and has been being continued for subsequent decades till the PolSenior project (Mossakowska, Więcek, and Błędowski, 2012). As it was concluded from Polish above mentioned researches there should be more opportunities for Polish retirees to participate in a job market. Such demand has also been articulated by some international organizations dealing with the issues of active aging. The idea of having opportunity to work as long as one wants in societies in which people live longer was put forward by e.g. "Active Ageing" European Union Policy (Fernández-Ballesteros, 2008).

The above mentioned types of research lie in between science and practice, so they are directly fruitful for that practice. One of the research which provide us with a lot of scientific knowledge about mechanisms of activity of older adults as individuals are longitudinal studies which also have tradition in gerontology. In this kind of research the same persons are studied, mostly interrogated, several times, in intervals of given amount of years. This method gives

possibility to observe and encompass processes and changes that occur in attitudes and activities of researched persons. Due to that kind of studies there is a widely held view among gerontologists that activity in old age is a necessary condition of a wellbeing and it should be adjusted to the personality and individual needs of a senior citizen. It has been clearly confirmed at least in a study conducted in the years 1990-1996 on a sample of 1537 elderly people who were involved in 16 kinds of activities, mainly arranged outside and having societal and social character (Coenen-Huther, Menec, and Synak, 2001; cf Halicka, and Halicki, 2003).

All in all to create opportunities for organizing activities adjusted to the needs of senior citizens there is a need for many actions based on knowledge driven from theory and research of different kind also research in between science and practice.

References

1. Atchley, R.C. (1972). *The Social Forces in Later Life*. Belmont Cal.
2. Baltes, M.M., Carstensen, L.L. (2003). The Process of Successful Aging: Selection, Optimization and Compensation. In: U.M. Staudinger, and U. Lindenberger (Ed.), *Understanding Human Development: Dialogues with Life-span Psychology* (pp. 81-104). Dordrecht: Kluwer Academic Publisher.
3. Bengtson, V.L. (1973). *The Social Psychology of Aging*. Indianapolis: Bobbs-Merrill.
4. Castells, M. (2000). *The Rise of the Network Society*. Oxford: Blackwell.
5. Cavan, R.S., Burgess, E.W., Havighurst, R.J., and Goldhamer, H. (1949). *Personal Adjustment in Old Age*. Chicago: Science research Associates.
6. Coenen-Huther, J., Menec, V., Synak, B. (Ed.) (2001). Activity and Successful Aging. *Gerontology. International Journal of Experimental, Clinical and Behavioral Gerontology*, *47 (suppl. 1)*, *1*.
7. Cowgil, D.O., Holmes, D. (1972). *Aging and Modernization*. New York: Appleton-Century-Crofts.
8. Cumming, E., Henry, W. (1961). *Growing Old: the process of disengagement.* New York: Basic Books.
9. Czekanowski, P. (2000). Aktywizacja osób starych w społeczności lokalnej (z uwzględnieniem doświadczeń z realizacji polsko-holenderskiego Projektu MATRA COP). In: B. Synak (Ed.), *Ludzie starzy w warunkach transformacji ustrojowej* (pp. 32-42). Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
10. Fernández-Ballesteros, R. (2008). *Active Aging: the Contribution of Psychology*. Hogrefe.
11. Halicka, M., and Pędich, W. (1997). *Działania samopomocowe ludzi starszych*. Białystok: Akademia Medyczna.

12. Halicka, M., Halicki, J. (2003). Integracja społeczna i aktywność ludzi starszych. In: B. Synak (Ed.), *Polska starość* (pp. 189-218). Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
13. Halicki, J. (2000). *Edukacja seniorów w aspekcie teorii kompetencyjnej*. *Studium historyczno-porównawcze.* Białystok: Wydawnictwo Uniwersyteckie „Trans Humana".
14. Havighurst, R. (1963). Successful Aging. In: R. Williams, T. Tibbitts, and W. Donahue (Ed.), *Processes of Aging*. New York: Atherton Press.
15. Klimczak, J., and Nowalska-Kapuścik D. (2019). *Starość w (wielkim) mieście*. Katowice: Wydawnictwo internetowe e-bookowo.
16. Krzysztofek, K., and Szczepański, M.S. (2002). *Zrozumieć rozwój*. Katowice: Wydawnictwo Uniwersytetu Śląskiego.
17. Kuypers, J.A., and Bengtson, V.L. (1973). Competence and Social Breakdown: A Social-Psychological View of Aging. *Human Development*, *16*, *2*, p. 37-49.
18. Mead, M. (1978). *Culture and Commitment. A Study of the Generation Gap*. New York: Doubleday.
19. Mead, M. (2000). *Kultura i tożsamość. Studium dystansu międzypokoleniowego*. Warszawa: PWN.
20. Miller, S.J. (1965). Portent of embarrassment. In: A.M. Rose, and W.A. Peterson (Ed.), *Older people and their social world* (pp. 87-92). Philadelphia: FA Davis.
21. Minois, G. (1995). *Historia starości. Od antyku do renesansu*. Warszawa: Wydawnictwo „Marabut".
22. Mossakowska, M., Więcek, A., Błędowski, P., (Ed.) (2012). *Aspekty medyczne, psychologiczne, socjologiczne i ekonomiczne starzenia się ludzi w Polsce [Medical, psychological, sociological and economic aspects of the aging of people in Poland]*. Poznań: Termedia Wydawnictwa Medyczne.
23. Niezabitowski, M. (2007). *Ludzie starsi w perspektywie socjologicznej. Problemy uczestnictwa społecznego [Elderly people in a sociological perspective*. *The issues of social participation]*. Katowice: Wydawnictwo Naukowe „Śląsk".
24. Niezabitowski, M. (2020). Prawa osób starszych – kilka uwag z perspektywy gerontologii społecznej. In: A. Kuzior (Ed.), *Globalne konteksty poszanowania praw i wolności człowieka. Współczesne problemy i dylematy. 12* (pp. 197-211). Gliwice: Wydawnictwo Politechniki Śląskiej.
25. Piotrowski, J. (Ed.) (1973). *Miejsce człowieka starego w rodzinie i społeczeństwie*. Warszawa: PWN.
26. Rose, A.M. (1965). *The subculture of the aging: a framework for research in social gerontology*. In: A.M. Rose, and W.A. Peterson (Ed.), *Older people and their social world* (pp. 3-16). Philadelphia: FA Davis.
27. Synak, B. (1999). *Ludzie starzy. Encyklopedia Socjologii, t. II*. Komitet Socjologii PAN. Warszawa: Oficyna Naukowa.

28. Synak, B. (Ed.) (2000). *Ludzie starzy w warunkach transformacji ustrojowej*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
29. Synak, B. (Ed.) (2003). *Polska starość*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
30. Szatur-Jaworska, B. (2012a). Aktywne starzenie się i solidarność międzypokoleniowa w debacie międzynarodowej [Active aging and intergenerational solidarity in international debate]. *Problemy Polityki Społecznej. Studia i Dyskusje*, *17*, pp. 15-28.
31. Szatur-Jaworska, B. (2012b). Sytuacja rodzinna i więzi rodzinne ludzi starych i osób na przedpolu starości. In: M. Mossakowska, A. Więcek, and P. Błędowski (Ed.), *Aspekty medyczne*, *psychologiczne*, *socjologiczne i ekonomiczne starzenia się ludzi w Polsce* (pp. 419-448). Poznań: Termedia Wydawnictwa Medyczne.
32. Szukalski, P. (2012). Aktywność zawodowa. In: M. Mossakowska, A. Więcek, and P. Błędowski (Ed.), *Aspekty medyczne*, *psychologiczne*, *socjologiczne i ekonomiczne starzenia się ludzi w Polsce* (pp. 407-417). Poznań: Termedia Wydawnictwa Medyczne.
33. United Nations (2002). *Political Declarations and Madrid Plan of Action on Ageing*. New York. Retrieved from https://www.un.org/development/desa/ageing/madridplan-of-action-and-its-implementation.html, 31.07.2020.
34. Witkamp, M., Meerstra, R. (1995). *TEMPUS welcome to Poznań*. Leeuwarden: Noordelijke Hogeschool Leeuwarden.
35. Zych, A.A. (1999). *Człowiek wobec starości. Szkice z gerontologii społecznej*. Katowice: Wydawnictwo Naukowe „Śląsk".

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

FEMALE MIGRANTS – THE ISSUES OF ADVANCING AGE

Monika NOVA

Charles University, Hussite Theological Faculty; monika.nova@htf.cuni.cz, ORCID: 0000-0002-0759-5997

Purpose: The paper addresses the subject of female migrants who are on the threshold of old age or already old, and who live in Poland, Hungary and the Czech Republic. The author attempted to depict the process of aging through the eyes of the female migrants themselves, persons concerned with the migrants and the professional community as such. The effort was supposed to disclose specific features of women´s life.
Design/methodology/approach: The background research applied the qualitative method and the relevant information was obtained using the technique of interviews. Our research was built on hypothesis that the elderly female migrants will constitute (and in fact already constitute) a fast growing group of population. This hypothesis is supported by statistical data on naturalized migrants and on their changing age patterns. Though the elderly migrants are still few in numbers when compared with the overall number of newly coming immigrants, they should be paid closer attention by government agencies and the non-profit sector and the attention should encompass both the conceptual framework and the practical aspects. Media attention, previously devoted to the elderly migrants, is now distracted by the themes of global migration and by the predicament of refugees.
Findings: Their advanced age disadvantages the elderly on the labor market despite the qualifications and a vast pool of professional experience that they gained during their stay in the host country. Pushed by their precarious economic situation and an inborn cast of mind, the people remain active, and even as seniors they seek new jobs, often beneath their qualifications.
Research limitations/implications: As the female participants in our research told us, throughout their entire stay in emigration they were feeling guilty toward the people they left back home while themselves were privileged with a life of better quality abroad. These observations testify to the importance of psychological and social assistance that should be provided by the receiving country.
Practical implications: Asked about their plans for returning to the home country, the women expressed worries about getting only low pensions because of the insufficient number of years worked there.
Social implications: Though we think it important to highlight the painful experiences of migrants, our research results by no means indicate that the women perceive themselves as "victims". On the contrary, the research painted a picture of exceptionally strong and determined ladies. We believe that the stories and reflections of our research participants can be very useful for the receiving country and more than interesting for many persons coming into contact with immigrants – employyers, regional administrators and the public generally.

Originality/value: The situation mentioned above is influenced by the short history of migration to the Czech Republic, Poland and Hungary. Making just a slight simplification we can say that the age of retirement is reached chiefly by women who arrived to the newly reestablished democracies in the early waves of immigrants after 1989. Having the opportunity of dealing with female migrants in detail, we have also tried to identify the pitfalls (long-time hidden) of the currently applied integration policies.

Keywords: aging, female, migration, socio-economic status.

1. Introduction

History suggests that, despite always being a relevant factor in migration, women have never been properly appreciated as regards their economic and social participation in the process. Some authors maintain that as recently as the 1970s women were perceived as just passive followers of their husbands who were, in contrast, seen as the prime movers of migration (Pazdera, 1991). A different situation was faced by women who waited for their emigrant husbands back home, fully dependent on money that the husband earned abroad. Past researches indicated that these women depended on their husbands both economically and socially. The roles split along the gender lines then eroded the women´s traditional position of just home makers and allowed them to also seek a degree of independence in a foreign country.

No matter how young the immigrants to EU may appear when compared with the majority population, and irrespective of the fact that the elderly immigrants are still just a minority in the entire immigrant community, the situation begins to change. By 2030, the group of elderly immigrants is supposed to grow five times in Germany and ten times in Netherlands. The greater part of the elderly immigrants will consist of women 65+, whose life expectancy is longer than life expectancy of males (Hradečná, 2016). The elderly female migrants are at risk of poverty possibly caused by long-term unemployment; low wages; irregular or otherwise precarious jobs; and difficulties in claiming pensions (Eurosat, 2019)

1.1. Theoretical background

In the 1980s and 1990s the studies of migration were heavily influenced by the theories of feminism which perceived gender as a set of identities, behavioral patterns and power relationships molded by society and its culture. This paradigm affected the perception of gender in migration in two ways: the first way related to patriarchate, the hierarchy of power, male dominance and male control of women; the second way related to relationships between males and females and the shift that their relations to the other family members (including spouses) underwent in the process of migration. This is closely related to the position of women not only in the majority society, but also the position of women - Roma in the conditions of the Slovak Republic (Budayová, 2017). Researchers set their sights also on the participation of

migrant women in the labor market of the host country; on the impact of control over women and the distribution of power within families; on the greater share of male work in domestic chores and the care of family; and on the change in the concept of masculinity (Boyd, and Grieco, 2003).

Some authors raised the question of possible cultural incompatibility of the migrants, or another risk of their cultural reduction to a new type of "western materialism" (Polačko, 2019). Subjects of research could also have to deal with some new kinds of risks in social networks and internet communication (Budayová, Toporcer, 2019). Nonetheless, the mentioned European countries of the migrants´ origin are sharing almost the same cultural background, technical level and are dealing with the same modern problems like the host countries.

In every society, regardless of its homogeneity or heterogeneity, there are minority groups that require special attention and treatment, as their social and cultural characteristics, physical appearance or other lifestyle are different from the majority group (Šuľová, 2014).

The subject of migrants´ aging that we chose to analyze has been neglected in all the previous studies of migration, the main reason being that the policies of migration are not designed to cover long periods of time – put simply, the migrants are not supposed to reach old age in their host countries. Moreover, the elderly migrants (males and females) are rather invisible, since, being "unproductive", they are absent from the local labor market.

The situation mentioned above is influenced by the short history of migration to the Czech Republic, Poland and Hungary. Making just a slight simplification we can say that the age of retirement is reached chiefly by women who arrived to the newly reestablished democracies in the early waves of immigrants after 1989. As obvious, the local societies are not ready to deal with the issues of aging migrants who have been granted permanent residence, and that is what we have focused on in our qualitative research.

2. Methods

Paper size: Having considered the professional literature and profiting by the author´s (Monika Nová´s) familiarity with the subject, we decided that this type of research is best conducted using the qualitative method. With this in mind we chose to ask these questions: How do female migrants look back on their journey through life in a foreign country?; What narrative can they offer of their early experiences in a new society?; and In what way do they see their role changing with advancing age and accumulating experiences?

The qualitative method allowed, and the applied character of our research required, that the relevant data be obtained through in-depth topical interviews.

Conducting the interviews, we were interested in these subjects: history of migration; work/ employment (history of jobs; accommodation to work conditions in advanced age); care for children and transnational care for parents left in the home country; preparations for retirement and strategies for spending the retired age. We have opted for what is known as the "purpose sample". To be included in the sample, the participants had to be: (1) females moving abroad without husbands, with kids or without; (2) living abroad for 20 years or longer; (3) 60 years old or older. The research was conducted in the Czech Republic, Hungary and Poland. The women came from a country of former Yugoslavia (i.e. Bosnia, Herzegovina, Serbia, Macedonia, Montenegro), from Armenia, Romania and Albania. The research covered six women from each host country (i.e. the Czech Republic, Hungary and Poland), the overall number of participants thus being eighteen. They emigrated primarily to escape from war; from a war devastated country; from poverty and/or unemployment. Their secondary wish was to secure a better life for their children and families that they left behind.

3. Discussion of results

The research sample comprised exclusively females and the research question aimed mainly at the specifically female experience of migration and its unfolding in the process of aging. Surprisingly enough, the responses strongly indicated that the situation typical of migration pushes women to the central position in the families and increases their importance. Our research thus painted a comprehensive picture of family relationships, including relations between partners (and their reflection) and intergenerational relationships in both directions: towards children *and* towards parents (also the partner´s parents). The relationships then exerted a profound impact on the personal strategies of our research participants.

Women who have been traumatized by war and oppression are never able to recover fully, and the traumatic memories are haunting them unabated for many years in emigration, in fact till their old age. Though their everyday struggle for dignified life in the new country may temporarily suppress the painful memories, they are relived with a vengeance when the kids are already provided for and the twilight years come. As the female participants in our research told us, throughout their entire stay in emigration they were feeling guilty toward the people they left back home while themselves were privileged with a life of better quality abroad. These observations testify to the importance of psychological and social assistance that should be provided by the receiving country.

The second most important aspect of emigration emerging from the interviews, i.e. the arrival in a new country, highlighted the insufficiency of aid offered by the receiving country. On this point, the reported experiences were diversified - the process of settling in the new country was obviously easiest for those women who could fall back on their already settled

relatives and/or acquaintances. Later on, the assistance was obtained primarily from social networks (still in existence) consisting of people who came from the same country. No matter how positive this fact may appear and how soothing it may be for the people´s emotions, it may also indirectly attest to the difficulties they face in cultivating similar relationships with the local population. Ambivalent experiences reported by our participants exemplify the nature of xenophobia. Feelings of shame are evoked by the narratives of women who were kept with kids in a refugee camp for a prolonged period of time, unaware of when the situation would allow them to become independent. Women now in Hungary and the Czech Republic told us that no local lady ever came to ask whether they needed something, and the same can be said about the local clergymen, representatives of non-profit organizations and people from the local municipality. Better experiences were reported by women who have emigrated to Poland – local ladies did come to offer material assistance and Polish clergymen and parish authorities showed interest in the mental condition and spiritual needs of the immigrants.

As follows from the stories related by women included in our research, both the leaving and the coming are never-ending processes. The locals still treat immigrants as strangers and, more importantly, the authorities frequently treat the women as foreigners, irrespective of their being Czech citizens of long standing. Such approaches have been reported by women residing now in all the three countries: Hungary, Poland and the Czech Republic.

The research showed that our respondents automatically assumed responsibility for the material well-being of the families, especially children, and strove to mitigate their social marginalization. Besides, they have always done their best to keep themselves neat and smart and be thus a credit to the families into which they married.

The women mostly abandoned their own career ambitions, pinning them on the children and focusing on the children´s educational support. This strategy proved to be successful and the second-generation children acquired good education. Quite a few women of those we have researched, however, found a professional occupation. As regards purely economic success, the most effective way to go was establishing a family business.

The heroism of conduct that our respondents demonstrated does not lie only in the enormous professional and personal effort they invested in their children. The women themselves stressed the importance of traditions and family ties, just like that of the obligations and customs respected in their home countries. Our research indicated that back home the women, often university or at least high-school educated, were professionally active and successful. In achieving the success they also had to rely on assistance provided by their wider families, particularly as regards care for children. Some well-to-do women even hired a paid domestic help to assist with children´s upbringing, but, having emigrated, their way of life underwent a dramatic change.

Several of our respondents were given help with children by their own mothers who either accompanied them on their way abroad or followed them, and in their new country they felt lost and perplexed. Some other women, in contrast, had to take care of their mothers and/or

mothers-in-law. All respondents strove to provide remote material support to their parents left behind in the home country. Currently, some of them surrender their holidays and travel back home several times a year to help their retired parents. Taken all in all, the women had in many respects sacrificed (and have still been sacrificing) themselves for others, but they maintain it was their free decision that they are proud of and do not consider a sacrifice.

With this in mind, it may seem rather paradoxical that our respondents, when envisaging their retired life, did not wish to depend on their children. This attitude antagonizes the declared tradition according to which the family is expected to help and the children are supposed to support their retired parents. This strange shift in attitudes can be in fact perceived as consistency: the women thus only perpetuate the strategy of investing everything in the next generation. If the children had to assume responsibility for the maintenance of their parents, the effort would diminish their prospects and, by allowing this, the women would damage their previous "investment".

Since their pensions are meager, the women plan to live as economically as achievable and, more importantly, to work as long as possible. In point of fact, pensions paid to 58% of the women are not adequate to fill their basic needs, as was confirmed by the already retired women included in our sample.

The age of retirement is inevitably a critical period in the life of immigrants, when the people encounter even more and new forms of discrimination related not only to the age but also to the ethnicity (i.e. the stigma of a foreigner) and social position.

Their advanced age disadvantages the elderly on the labor market despite the qualifications and a vast pool of professional experience that they gained during their stay in the host country. Pushed by their precarious economic situation and an inborn cast of mind, the people remain active, and even as seniors they seek new jobs, often beneath their qualifications. Our respondents thus go on struggling to keep the social status that they had already achieved in emigration. Once again they find themselves in a position in which they are grateful for just any job, but, at the same time, feel ashamed by the indignity of their lowly status after lifelong excellence at work and in upbringing children. The women made every effort to prepare their kids for the labor market and to give them education they needed to smoothly integrate into the majority population, in fact into its elite. And once again they alluded to the prejudiced attitude of institutions because of their foreign origin.

Asked about their plans for returning to the home country, the women expressed worries about getting only low pensions because of the insufficient number of years worked there. Forced thus to remain in emigration, they had to develop new strategies of economic survival. In the process of aging they find it increasingly difficult to organize "caring" visits to their own parents and, in point of fact, they have to shoulder a double burden: on the one hand they must try to keep their work so as to boost their chances of getting a decent pension and on the other hand they must meet the traditional and normative commitments of providing transnational care for the elderly in the home country (as expected particularly of women). As follows from our

research, only a comprehensive inquiry into the identity and social standing of the women, as affected by their sex, age and foreign origin, allows us to fully appreciate the plight of their social situation and the moving stories of their lives.

4. Discussion

If the receiving country wishes success in the process of integration, than its givers of help will have to expand their own helping capability by developing a greater empathy for the traumas suffered by the newcomers; for the difficulties they had to face in adjusting themselves to their new environment; and for their old-age limitations.

It is also worth mentioning that the receiving countries could miss out on some potential benefits. The immigrants included in our sample were middle-class persons, in fact more upper-middle than lower-middle. They were educated, qualified, and in their home country well-to-do people (that is why they could "afford" to emigrate). Apparently, this social status should be a precursor of a trouble-free integration - the women were independent, industrious, did not expect any substantial assistance from government and invested their earnings and time to children. Society should learn how to tap the unfulfilled potential of the women, their cultural and social capital (a concept framed by Pierre Bourdieu), and help them take on a qualified work, for example in services and/or culture - this applies also to the elderly, males and females. As regards the language barrier, our research participants admitted their limited language skills, early or still existing, but the problem is not so serious as to prevent the first generation of immigrants from doing professional work and it cannot justify any discrimination on the grounds of their advanced age.

Though we think it important to highlight the painful experiences of migrants, our research results by no means indicate that the women perceive themselves as "victims". On the contrary, the research painted a picture of exceptionally strong and determined ladies.

We believe that the stories and reflections of our research participants can be very useful for the receiving country and more than interesting for many persons coming into contact with immigrants - employers, regional administrators and the public generally. We should remember that every person has its own identity based on the unique life story (Vaňková, 2017). Especially in a culture characterized by the prevailing phenomenons of globalization and fragmentation of the personal experience (Vaňková, 2013). Such social inequality could even endanger value of peace in Europe. On the other hand, mutual solidarity has the potential to rebuild the trust (Polačko. 2012).

Acknowledgements

The theme and research of this paper „Female migrants – the issues of advancing age“ was realized from the project: Právní a společenské aspekty migrace a problémy postavení menšin – Progres Q05.

References

1. Boyd, M., Grieco, E. (2003). *Women and migration: Incorporating gender into international migration theory*. Migration Policy Institute.
2. Budayová, Z. (2017). *Social exclusion of the Roma ethnic group in the interest of social work*. Warszawa: Fundacja Art przeciw przemocy, p. 107. ISBN 978-83-949225-0-.
3. Budayová, Z., Topocer, R. (2019). Sociálne siete, ich využitie a riziká v internetovej komunikácii. In: D. Hrehová, J. Mičko (eds.), *Vysokoškolská edukácia pre digitálnu spoločnosť a v informačnej spoločnosti. Vzdelávanie, zručnosti a trh práce* (pp. 18-22). Košice: Technická univerzita.
4. Eurostat (2019). *Migration statistics and migrating populations*. Available online http://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migration_and_migrant_population_statistics/cs, 21.05.2020.
5. Hradečná, P. (2016). *Analýza postavení a situace migrantek a žen s migračním původem ve vyšším středním a seniorském věku*. Praha: Sdružení pro integraci a migraci. ISBN 978-80-906488-1-4.
6. Pedraza, S. (1991). Women and migration: The social consequences of gender. *Annual Review of Sociology, 17,* pp. 303-325.
7. Polačko, J. (2012): Hodnoty a ich (de)formácia v európskom civilizačnom priestore. In: M. Kmec (ed.), *Multilaterálne aspekty života spoločnosti*, *No 6* (pp. 116-125). Vysoká škola medzinárodného podnikania ISM Slovakia v Prešove.
8. Polačko, J. (2019). Christian Culture as Antagonism of Relativism and Byzantine singularity. In: E. Pribišová, J. Polačko (eds.), *New dimensions in the quality of life. Interdisciplinary research* (pp. 129-140). York University.
9. Šuľová, M. (2014). *Komunitné centrum ako nástroj na podporu rómskej kultúry. Rómske komunitné centrum Zbudské Dlhé – okres Humenné*. Ružomberok: Verbum, p. 74. ISBN 978-80-561-0196-4.
10. Vaňková, I. (2013). Človek-čas-jazyk, Naratívny pohľad na filozoficko-antropologický problém osobnej identity človeka. In: O. Sisáková (ed.), *Človek v pluralite perspektív súčasnej filozofie* (pp. 71-150). Filozofická fakulta Prešovskej university.
11. Vaňková, I. (2017). *Život ako story – Ja ako text*. Prešovská univerzita v Prešove.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE ADOPTION OF SERVQUAL METHOD TO ANALYZE THE QUALITY ASSURANCE FACTORS OF PERSONAL PROTECTIVE EQUIPMENT FOR HEALTH CARE WORKERS

Bartosz ORZEŁ[1*], Anna Maria HORODECKA[2]

[1] Silesian University of Technology, Faculty of Organisation and Management, Department of Economics and Computer Science; bartosz.orzel@polsl.pl, ORCID: 0000-0003-1506-4798
[2] Silesian University of Technology, Faculty of Organisation and Management, Department of Logistics and Management; anna.horodecka@polsl.pl, ORCID: 0000-0001-9853-3806
* Correspondence author

Purpose: The purpose of article is to perform the analysis method based on SERVQUAL method, which will allow us to analyze and asses factors connected to quality assurance of health care workers' personal protective equipment and its level.
Design/methodology/approach: The main objective is to present method of data collection. It should be achieved by using a SERVQUAL method adoption to create a set of questions, which can be directed to medical and health care workers. The main method used in research is questionnaire. Scores from it can be useful for further statistical analysis. The approach on this stage of research is theoretical.
Findings: The main finding is create useful questionnaire, which can be helpful to analyze and asses factors and level of quality assurance of health care workers' personal protective equipment (PPE). The other one is to use GAP method to discover 5 gaps in PPE delivery to health care workers in Polish medical facilities.
Research limitations/implications: This paper presents only adopted to research in PPE quality of health care workers SERVQUAL method and the build of questionnaire (survey), which will be useful to next researches and statistical analysis It will be introduce in future, however the proposition of action path was shown in this paper.
Practical implications: A useful questionnaire can be implicate in broader understood improvement of health care workers' personal protective equipment quality. This questionnaire should allow us to analyze and define, which elements of equipment are mostly limited and need in Polish health care institutions such as hospitals, clinics etc.
Social implications: The main positive result is define what is necessary to improve and assure good quality and safety in COVID-19 pandemic times both for health care workers and patients. Introducing of further suggested actions can help to minimize risk of infection, which can contribute to improving the sense of security and social order in these times.
Originality/value: This paper touches important in COVID-19 pandemic times issues, which are connected to health care workers safety and hence for all society.

Keywords: SERVQUAL, method, health care, COVID-19, medical, equipment.

Category of the paper: conceptual paper, literature review.

1. Quality assurance of health care workers' personal protective equipment importance

In order to emphasize the importance of the personal protection of health care workers, it is necessary to go back to the Middle Ages. Even then, and much earlier, special safeguards were applied during contact with sick people, especially during epidemics and pandemics, which were so often affected medieval cities, and even devastated entire countries. Both in these times and nowadays, the importance of personal protective is the same. Medical knowledge and technical development allow us to recognize biohazard and take up activities to reduce it. Nevertheless, knowledge, technical development and ability to recognize it, often does not go with practical following medical procedures, their implementation and taking precautionary measures. This issue is of particular importance in times of COVID-19 pandemic. Personal protective equipment (PPE) is a tool that allows healthcare professionals to perform their work both in Poland and around the world due to minimalize risk of infection. PPE is absolute base of contact ability with infected patients, people in risk groups, during researches conducted in laboratories and also everyday performance of professional duties. This paper shows the concept of data gathering and proposal of further proceed for measure of the quality level of personal protective equipment of health care workers in Polish health care institutions during the COVID-19 pandemic. This data- gathering method is necessary to PPE quality level measure and assessment. It is based on SERVQUAL method. Taking the form of a questionnaire, it addresses a set of questions related to the issues of general safety in health care institutions and personal protection equipment of their workers directly to them.

2. SERVQUAL Method, GAP model and a term of "quality"

SERVQUAL (Services Quality) is the method of quality assessment, which was developed by American scientists team at University in Miami. SERVQUAL method and its model is useful tool for identifying customers' demands (Prentkovskis et al., 2018). Its origins are related to the GAP model developed in 1985 by Parasuraman, Zeithaml and Barry. The GAP model consists of 5 gaps, which performing is connected to decrease of services and products quality. Additionally, the GAP model combines quality of services designing from customer's point of view and organisation's perception of customer's expectations (Urbaniak, 2013; Hsu et al., 2018; Gronroos, 1988). The GAP model of services quality with 5 gaps was shown below (Figure 1).

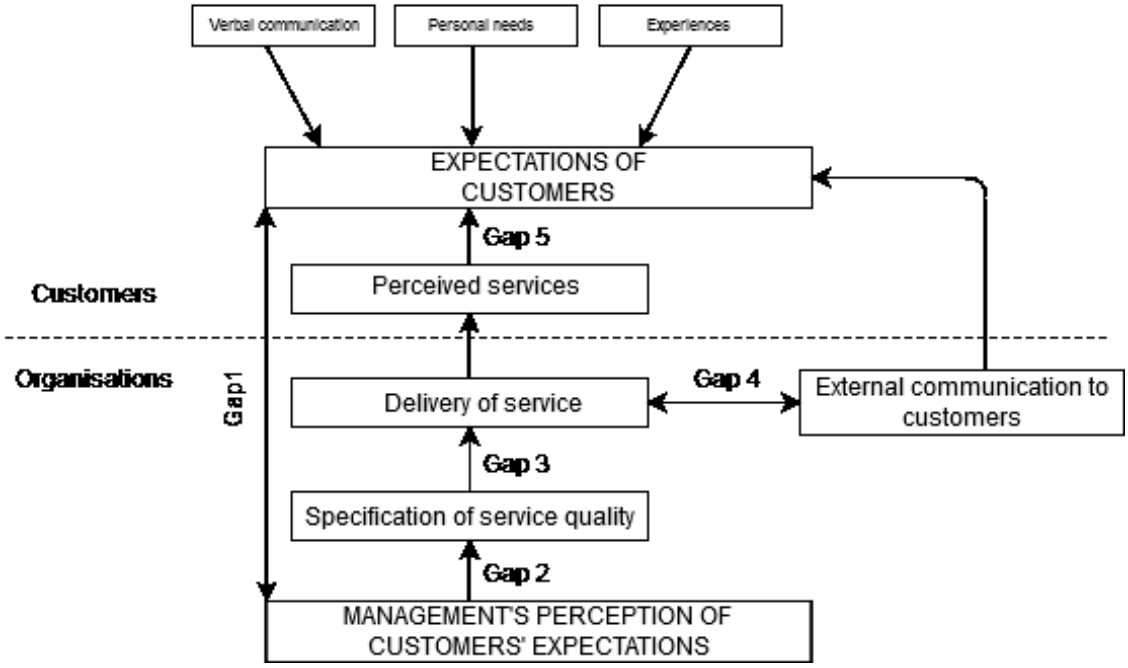


Figure 1. The GAP model of services quality with 5 gaps. Adapted from: Stasiak-Betlejewska, R., Kaye, M., Dyason, M., Stachová, K., Urbancová, H. (2014). The services quality level assessment at the technical university using the SERVQUAL method, *ERIES Journal*, *7,3-4*, 53-58 doi:10.7160/eriesj.2014.070302

The five gaps, which was shown above are: (Guerguis, 2018; Wolniak, and Skotnicka-Zasadzień, 2009)

- Gap 1: not meeting the expectations of the consumer and how it was received and perceived by the organisation,
- Gap 2: inconsistencies and inadequate quality standards in the organisation, which lead to misunderstanding of customer expectations and their incorrect perception by managers,
- Gap 3: service performance gap, meaning a discrepancy between the internal standards and quality specifications of the services provided by the organisation and the actual level of their quality,
- Gap 4: differences in the way of communicating about the quality of provided services and the actual quality of the process of their provision. The promises do not meet the consumer's expectations regarding the service delivery,
- Gap 5: the difference between how customers perceive is the service they received and what they received,

An original version of SERVQUAL is based on 2 parts. The 1st one is 22 items part, which role is to measure customers' expectation of companies in particular sector. The 2nd one is also consists of 22 items and its role is to measure customer's perception of company in this sector (Parasuraman et al., 1991; Kar, 2016). Therefore, the original version of SERVQUAL is approaching to the topic of service quality from importance of different factors, expectations and gaps (Kaldenberg et al., 2019; Tavakoli et al., 2019). There is also exists a version of

SERVQUAL method, which omits the expectation part, assuming that expectations are always maximal. This type of this method is called SERVPERF (Wolniak, 2010). Such variation of SERVQUAL Method can be useful during comparing results of research with using this method and its variations (Banahene et al., 2017). The term "services" can be described as "service is appliance of particular capabilities, via distinct procedures to assist individuals" (Sheikh, and Waqas, 2019).

Inextricably linked with the SERVQUAL method and services is quality. The term "quality" can be mean as "all properties of the object related to its ability to meet the identified and expected needs" (Hamrol, and Mantura, 2002). This definition suggests that quality is the total sum of factors, which are able to satisfy customers' needs. The other definitions tell: quality is meeting the expectations of recipients, the quality is determined by the set of service features, allowing for the satisfaction of assumed and planned needs (Urbaniak, 2013; Abramov, 2011). From the other hand "service quality is seen as an important factor that affects client satisfaction and behavioral intention. It is considered as business success important contributors (Sunindijo, and Bonaventura, 2014). The result of researches suggests that when functional quality of service is perceived as superior by consumers, the employees of a service business are more trusted (Chang et al., 2013). In the case of providing PPE quality for health care workers the "quality" means both performing factors, which will cause that risk of work in high risk environment will be correspondingly low and it will be translated into a sense of security and comfort. This makes that the medical services will be perform in a satisfactory, effective and first of all, safe manner also for patients. In medical staff services there are 5 major dimensions: (Lestari, and Setyawan, 2019; Ko, and Chou, 2020)

- Reliability,
- Assurance,
- Tangible,
- Empathy,
- Responsiveness.

3. A GAP model adoption to analyze PPE quality factors and create based on SERVQUAL method questionnaire

Therefore, it can be concluded that by adopting a GAP model to personal protection quality factors analysis, health care workers become clients. The medical facility and its authorities/owners become an organisation. Below the GAP model of services adopted to described situation was shown (Figure 2).

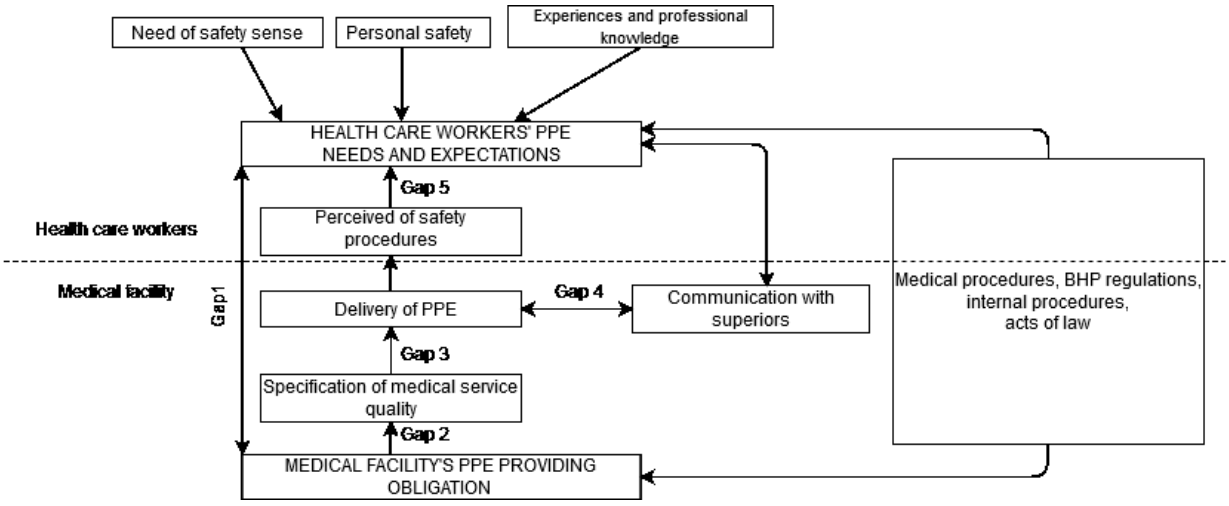


Figure 2. The GAP model of PPE quality assurance for health care workers. Own work based on: Stasiak-Betlejewska, R., Kaye, M., Dyason, M., Stachová, K., Urbancová, H. (2014). The Services quality level assessment at the technical university using the SERVQUAL method, *ERIES Journal*, *7, 3-4*, 53-58 doi:10.7160/eriesj.2014.070302.

Looking holistically at this model, it would be necessary to include also patients who could be treated as a separate group of clients. It would be necessary to examine the impact of the personal protective equipment usage by health care workers on the sense of patients' safety and their satisfaction with the medical services provided. However, this is not the subject of this paper. According to presented on Figure 2, 5 gaps in PPE quality assurance for health care workers could be described as:

- gap 1: not meeting the expectations of the workers and how it was received and perceived by the medical facility,
- gap 2: inconsistencies and inadequate quality standards in the organisation, which lead to misunderstanding of workers expectations, non-compliance with medical procedures and their incorrect perception by authorities/owners of facility,
- gap 3: service performance gap, meaning a discrepancy between the internal standards and personal protection procedures and quality specifications of the services provided by the organisation and the actual level of their quality,
- gap 4: differences in the way of communicating about the quality of provided PPE and its actual quality. The promises do not meet the health care workers' expectations regarding the PPE quality,
- gap 5: the difference between how health care workers perceive their safety (safety sense) and what they received (what is the objective level of PPE quality equipment).

The SERVQUAL method based on questionnaire was created in the form of questions set related to the issues of general safety in health care institutions and personal protection of their workers. The 1st step in preparing questionnaire was create 2 characteristic for SERVQUAL method sections. The 1st one is containing questions connected to PPE quality assurance of health care workers' waiting. In 1st column of table there are 20 questions connected to waiting

of PPE. Additionally, in 2nd column in scale 1 to 7, health care worker marks one number. “1” means "firm not consent" and “7” means “firm consent” with the stated statement. The 2nd part of the questionnaire is connected to the current state of ensuring the quality of personal protective equipment elements for healthcare workers. Similar to the 1st part, workers mark one number. “1” means "firm not consent" and “7” means “firm consent” with the stated statement. Exampled fragments of questionnaire, both 1st (table 1) and 2nd questionnaire (table 2) was shown below.

Table 1.
Questions connected to PPE quality assurance of health care workers' waiting

	Firmly not consent						**Firmly consent**
1/ Employees should be regularly and scrupulously informed about the possible occurrence or occurrence of infections with an infectious or viral disease, both among patients and hospital staff	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2/ The hospital should have separate hand disinfection points for staff	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3/ The hospital should have separate hand disinfection points for employees in places particularly important from the point of view of asepsis	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4/ Hospital authorities should provide an individual set of hand washing and disinfecting fluids for each employee	*1*	*2*	*3*	*4*	*5*	*6*	*7*
5/ Hospital authorities should provide access to individual items of personal protection such as: gloves, masks, visors, aprons for employees	*1*	*2*	*3*	*4*	*5*	*6*	*7*
6/ Hospital authorities should provide a full set of individual protective clothing for each employee	*1*	*2*	*3*	*4*	*5*	*6*	*7*
7/ The hospital should have a place for decontamination of protective suits and their reusable elements	*1*	*2*	*3*	*4*	*5*	*6*	*7*
8/ The hospital should provide the possibility of decontamination of protective suits, change of elements such as protective masks, visors, gloves, aprons to every employee in a situation where such a need is identified or in accordance with health and safety regulations and hospital procedures.	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Source: own work based on SERVQUAL Method.

Table 2.
Questions is connected to the current state of ensuring the quality of personal protective equipment elements for healthcare workers

	Firmly not consent						**Firmly consent**
1/ Employees are regularly and scrupulously informed about the possible occurrence or occurrence of infections with an infectious or viral disease, both among patients and hospital staff	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2/ The hospital has separate hand disinfection points for staff	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3/ The hospital has separate hand disinfection points for employees in places particularly important from the point of view of asepsis	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4/ Hospital authorities provide an individual set of hand washing and disinfecting fluids for each employee	*1*	*2*	*3*	*4*	*5*	*6*	*7*
5/ Hospital authorities provide access to individual items of personal protection such as: gloves, masks, visors, aprons for employees	*1*	*2*	*3*	*4*	*5*	*6*	*7*
6/ Hospital authorities provide a full set of individual protective clothing for each employee	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Cont. table 2.

7/ The hospital has a place for decontamination of protective suits and their reusable elements	*1*	*2*	*3*	*4*	*5*	*6*	*7*
8/ The hospital provides the possibility of protective suits decontamination, change of elements such as protective masks, visors, gloves, aprons to every employee in a situation where such a need is identified or in accordance with health and safety regulations and hospital procedures.	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Source: own work based on SERVQUAL Method.

The next part of questionnaire is assessment of quality assurance validity factors for health workers protection measures. A few exampled factors in form of questionnaire was shown below (table 3).

Table 3.
Assessment of quality assurance validity factors for health workers protection measures

	Not important						**Very important**
1/ Provision of hand disinfectants for each employee by hospital authorities	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2/ Provision by hospital authorities of access to individual items of personal protection, such as: gloves, masks, visors, aprons for employees	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3/ Provision by hospital authorities of a full set of individual protective clothing for each employee	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4/ Providing the possibility of decontamination of protective suits, changing elements such as protective masks, helmets, gloves, aprons to each employee in a situation where such a need was identified or in accordance with health and safety regulations and hospital procedures	*1*	*2*	*3*	*4*	*5*	*6*	*7*
5/ Regular disinfection of flat surfaces and surfaces exposed to contact with people potentially suffering from viral and/or infectious diseases	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Source: own work based on SERVQUAL Method.

The 4th part of questionnaire is the determine by the employees the frequency (in a scale from 1 to 6), of what personal protective equipment they use. A few exampled positions were shown below (Table 4).

Table 4.
Frequency of PPE usage questionnaire

	Not often						**Very often**
Protective gloves	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Protective masks	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Face shield covers	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Protective glasses	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Aprons	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Hands Disinfectant	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Source: own work based on SERVQUAL Method.

The 2 last parts of questionnaire are devoted to examining employee satisfaction with the use of security measures (table 5) and supplementing the data on technical issues allowing for further statistical processing of the data (table 6).

Table 5.
Employee's satisfaction from PPE questionnaire

	Firmly not consent						**Firmly consent**
1/ The hospital reacts quickly to the changing epidemic situation by providing employees with appropriate personal protective equipment	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2/ The hospital authorities guaranteed me access to personal protective equipment (hand disinfectants, masks, gloves, visors, protective glasses, full protective clothing, both during medical procedures, operations and contact with a patient potentially infected with a viral and / or infectious disease.	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3/ Medical services in the hospital are provided in a safe manner	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4/ As a hospital employee, I have been informed and trained about the possible occurrence or occurrence of infections with an infectious or viral disease, both among patients and hospital employees. I have also been acquainted with the individual procedures of dealing with such a patient or person	*1*	*2*	*3*	*4*	*5*	*6*	*7*
5/ I understand the procedures for individual handling of a person infected with a viral and / or infectious disease	*1*	*2*	*3*	*4*	*5*	*6*	*7*
6/ I can decontaminate the elements of reusable personal protective equipment and change the elements of removable personal protective equipment when necessary or required by health and safety regulations as well as medical and hospital procedures.	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Source: own work based on SERVQUAL Method.

Table 6.
Metrics

Gender	
MALE	
FEMALE	
Education	
Basic school	
Middle School	
University Graduated	
Age	
Below	
20-30	
30-40	
40-50	
Up to 50	
Role at work	
Type of medical facility	
Public/Private medical facility (please choose and mark correct answer)	
City	

Source: own work based o SERVQUAL Method.

Having a prepared questionnaires and knowledge about GAP model adopted to research in PPE quality for health care workers it is necessary to establish a path of action for the implementation of further researches. One of exampled path can be based on directing a requests to the owners or management of health care facilities. then, if consent is obtained, it is possible to deliver questionnaires to the facility by post or by e-mail in order to conduct the survey. The next step is complete the surveys by health care workers and give it back. The collected questionnaires should back to surveyors. Proposition of such path was shown below in a graphic manner.

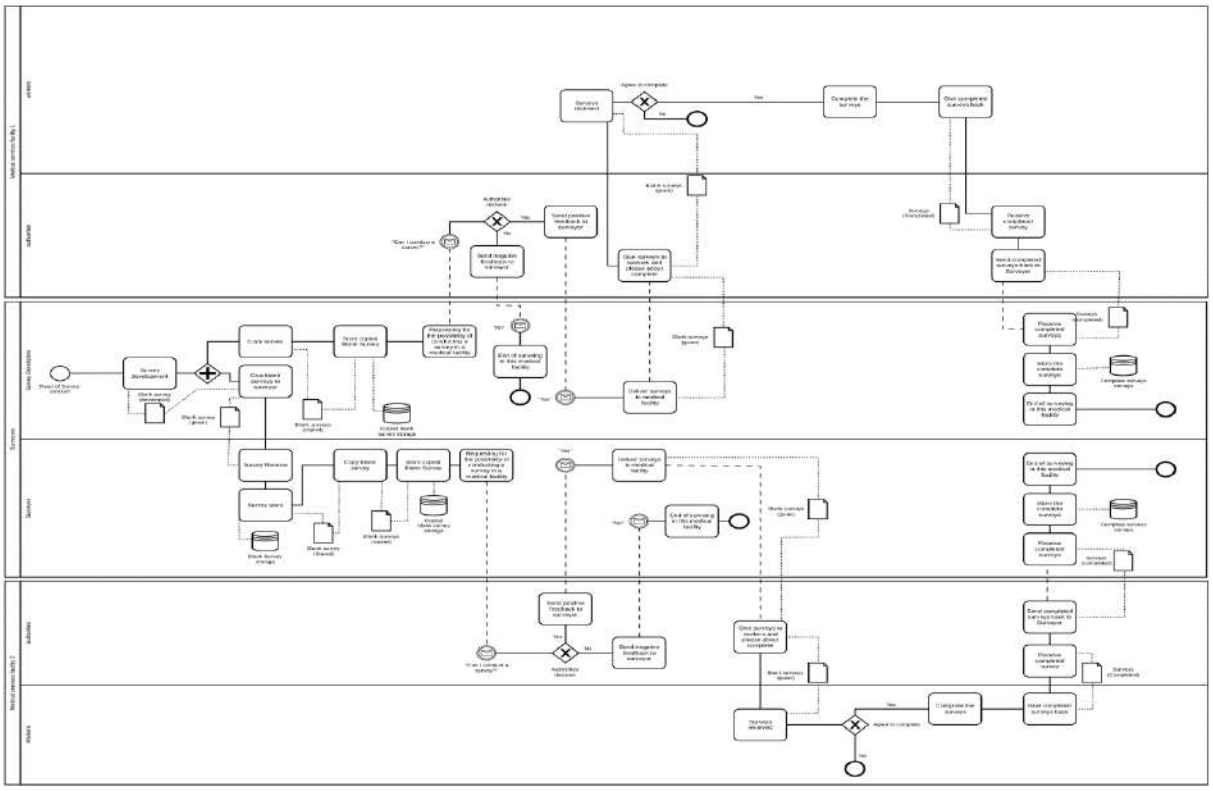


Figure 3. Proposition of further research path in order to created surveys. Source: Author's own work based on the BPMN 2.0 standard.

4. Summary

The article presented above shows the possibility of adopting the SERVQAL method as an important component of examining the quality of PPE for health care workers in Polish medical facilities. Not only give it a possibility to examine it, but also allow us meet health care workers' opinion what is most and less important in created and presented statements. It becomes the basis for carrying out more extensive statistical research allowing to determine and assess the quality level of health care workers' PPE in Polish health care facilities. This is of particular importance in times of the COVID-19 pandemic. Main findings from this paper are:

- the questionnaire based on SERVUQAL method for further researches was created and its parts was shown in tables,
- created questionnaire is useful and can be a part of complex researches on PPE quality level assessment in Polish health care facilities. Due to this, created questionnaire can be helpful to analyze and asses factors and level of quality assurance of health care workers' personal protective equipment (PPE),
- owing to a GAP Method, the 5 gaps in delivering PPE to health care workers were discovered,
- ohis questionnaire can be implicate in broader understood improvement of health care workers' personal protective equipment quality,
- the exampled path of further researches was presented and described.

References

1. Abramov, S.S. (2011). Оценка качества услуг с учетом позиции потребителя. *Вестник Адыгейского государственного университета, 5.1,* 215-221.
2. Banahene, S., Ahudey, E., Asamoah A. (2017). Analysis of SERVQUAL Application to Service Quality Measurement and Its Impact on Loyalty in Ghanaian Private Universities. *Journal of Management and Strategy*, *8.4,* 10.5430/jms.v8n4p18.
3. Chang, Ch., Chen, S., Lan, Y. (2013) Service quality, trust, and patient satisfaction in interpersonal-based medical service encounters. *BMC Health Services Research, 13.22.*
4. Gronroos, Ch. (1988). The six criteria of good perceived Service Quality. *Review of Business, 9, 3*, 10-13.
5. Guerguis, A. (2018**).** *The gaps model of service quality and Customer Relationships in a digital marketing context.* Manchester: University of Salford.
6. Hamrol, A., Manutra, W. (2002). *Zarządzanie jakością. Teoria i praktyka.* Warszawa: PWN.
7. Hizam, S.M., Waqas, A. (2019). A Conceptual Paper on SERVQUAL-Framework for Assessing Quality of Internet of Things (IoT) Services. *International Journal of Financial Research, 10.5.*
8. Hsu, J., Kalesnik, V., Kose, E. (2018). What is Quality? *Financial Analysts Journal, 75, 2*, 44-61, doi:10.1080/0015198X.2019.1567194.
9. Kaldenberg, D., Becker, B.W., Browne, B.A., Browne, W.G. (1997). Identifying service quality strengths and weaknesses using SERVQUAL: a study of dental services. *Health Mark Q*., *15, 2*, 69-86, doi:10.1300/j026v15n02_04.
10. Kar, B. (2018). Service Quality and SERVQUAL Model: A Reappraisal. *Amity Journal of Operations Management, 1.2,* 52-64.

11. Ko, Ch., Chou, Ch. (2020). Apply the SERVQUAL Instrument to Measure Service Quality for the Adaptation of ICT Technologies: A Case Study of Nursing Homes in Taiwan. *Healthcare, 8, 108,* 1-16*,* doi:10.3390/healthcare8020108
12. Lesatri, R., Setyawan, F.E.B. (2018) Medical staff services quality to patients satisfaction based on SERVQUAL dimensions. *International Journal of Public Health Science (IJPHS), 8.1,* 51-57.
13. Parasuraman, A., Berry, L.L., Zeithaml, V.A.F. (1991). Refinement and Reassessment of the SERVQUAL Scale. *Journal of Retailing*, *67.4*, 420-450.
14. Prentkovskis, O., Erceg, Ž., Stević, Ž., Tanackov, I., Vasiljević, M., Gavranović, M. (2018). A new methodology for improving service quality measurement: Delphi-FUCOM-SERVQUAL model. *Symmetry, 10.757*, doi:10.3390/sym10120757.
15. Stasiak-Betlejewska, R., Kaye, M., Dyason, M., Stachová, K., Urbancová, H. (2014). The Services Quality level assessment at the technical university using the SERVQUAL method. *ERIES Journal*, *7.3-4*, 53-58, doi:10.7160/eriesj.2014.070302.
16. Sunindijo, R.Y., Bonaventura, H.W.H. (2014). Modelling service quality in the construction industry. *International Journal of Business Performance Management, 15.3,* 262-276.
17. Tavakoli, N., Yadegarfar, G., Bagherian, H., Ghasri, F. (2019). Assessing the educational services quality of health information technology students. *J. Edu. Health Promot.*, *8,* 168.
18. Urbaniak, A.M. (2013). Zastosowanie metody SERVQUAL do oceny jakości usług rekreacyjnych. *ZNUV, 32,* 29-38.
19. Wolniak, R. (20010). Pomiar oczekiwanej i postrzeganej jakości w usługach medycznych, *Współczesne Zarządzanie, 2,* 128-140.
20. Wolniak, R., Skotnicka-Zasadzień, B. (2009). Wykorzystanie metody SERVQUAL do badania jakości usług w administracji samorządowej. Gliwice: Wydawnictwo Politechniki Śląskiej.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE EYE-TRACKING USAGE FOR TESTING CUSTOMERS' GAZE ON CONFORMITY MARKS PLACED ON PRODUCTS PACKAGES

Bartosz ORZEŁ

Silesian University of Technology, Faculty of Organisation and Management, Department of Economics and Computer Science; bartosz.orzel@polsl.pl, ORCID: 0000-0003-1506-4798

Purpose: The purpose of this article is to perform the idea of eye-tracking method based research, which will allow us to testing the customers gaze on the conformity marks placed on products packages. The aim of this article is to present the possible way of eye-tracking based research method, an experiment the results of which can be used for future research and statistical analyzes.
Design/methodology/approach: To perform the eye-tracking based research, the path and methodology of conducting this research was shown. The basic research method proposed in this paper is experiment, which output should be heat maps with areas, on which people look will be marked. Additionally, the project of short survey, which respondents should complete after eye-tracking examination was presented. The subject of paper is theoretical, but shown methodology, which makes it possible to carry out the same or similar research in reality.
Findings: The main finding of this article is the creation of eye-tracking method based research proposal way, which should allow us to analyze both on conformity marks gazing by customers and other elements of packages. Additionally, the survey conducted after experiment can give researchers an ability to accordance assessment to real conformity marks and other etiquettes/packages marks, on which customers are looking at, and what they think are looking at. It may also allow us obtaining other information, such as: awareness of the types and concept of compliance marks, the voluntary nature of their placement, and also whether consumers care what marks of compliance are marked with the purchased product.
Research limitations/implications: This is the proposition of the way to conduct an experiment. The survey after eye-tracking experiment is created by an author and questions were not prepared with use specific methodology. It is possible to repeat this research with other things placed on products packages and elements of etiquettes.
Practical implications: The practical implication is the ability to develop and use presented path for different things placed on packages, showing on screens etc. It can also leads to conducting other similar researches with usage of this path/way/method.
Social implications: This research may allow us to know, on what conformity and also safety signs customers look most common. These research can also lead to user safety improvement.
Originality/value: Using eye-tracking technique in different researches etc. is well known and is not a new method, but in this paper it is transposed especially to conformity marks gazing in specific and practical way of conduct. Basing on literature review the research problem was stated: there are not many or no studies on the use and technical application of eye tracking to study the perception of conformity marks.

Keywords: eye-tracking, conformity marks, conformity marks observation, oculography.
Category of the paper: research paper, case study.

1. Introduction

1.1. Eye-tracking history

Oculography (in English often called as an "eye-tracking") is the technique based on eye gaze movement (Stolecka-Makowska, and Wolny, 2014). It gives information about changing the position of eye and in effect it gives also information about time, directions and area of "scan" by people gaze. It leads to gathering knowledge about the characteristics of person's visual activity (Stolecka-Makowska, and Wolny, 2018; Poole, and Ball, 2004) The beginnings of eye-tracking technique are dated on year 1879, when Louis Emile Javal noticed that people move their eyeballs when they are reading (www.uxbooth.com). Next, Edmund Huey built the first device, which allowed to track the movement of eyeball. It was based on special lens, that needed to be inserted into eye (Wade, 2010; Mohamed et. al, 2007). Those lens were wired to aluminum indicator. Device was running on, in base of regression coefficient (Jacob, and Karn, 2002). The first non-invasive eye-tracking technique was developed in 1901 by Dodge and Cline (Jacob, and Karn, 2002; Płużyczka, 2018). This kind of early "eye-tracking device" was able to react and record horizontal and vertical eye movements and based on registering light reflects from cornea to optical lens system (Płużyczka, 2018; Kapitaniak et. al, 2015; Wade, and Tatler, 2005). This early device was called Photochronograph and was invented, developed and built with a hope to meet the following criteria as much as possible (Dodge, and Cline, 1901):

- the capability of operating under normal conditions of binocular vision,
- capability of both eyes registration simultaneously,
- measurement unit should be 1 dioptric or less,
- registering device should not have momentum or inertia,
- eyes should not do any additional work during registration process and cannot be exposed, on unusual conditions,
- device should be able to record movements of a large number of eyes without serious inconvenience during and after usage.

The modern eye-tracking systems also uses this or similar kind of "light from cornea to optical camera lens" solution (Wade, and Tatler, 2005; Gao et al., 2012). In the year 1935 Guy T. Buswell conducted an important to eye-tracking history research and published a book titled "How People Look at Pictures: A Study of The Psychology of Perception in Art". In this publication Buswell presented first findings in case of peoples' eye movement while

they looked at complex scenes (Babcock et al., 2002; Buswell, 1935). After 2nd World War, the major researches in gaze detection were conducting in 1947 by Fitts, Jones and Milton. In the end of 1940s they presented technical reports and films connected to aircraft pilots' instruments gazing during landing. It was beginning of head- mount "mobile" eye-tracking systems, which are use commonly in similar researches nowadays (Mohamed, 2007; Fitts et al., 1950; Gomolka et al., 2020). Due to the wearable kind of eye-tracking equipment, the huge amount of such and similar researches were possible to conduct (Ingram, and Wolpert, 2011).

1.2. Eye-trackers types and usage

Nowadays, eye-tracking due to the method of eye movements registering can be listed as: (Duchowski, 2003; Andrychowicz-Trojanowska, 2018; Holmqvist, 2017; He et al., 2014; Kumar, and Krol, 1992):

- electro oculography (EOG)

This method relies on differencies in electric potential around the ocular cavity. This method was especially popular in the 1970s and its application is based on placing electrodes around the eyes. (Young and Sheena, 1975)

- sclerar contact lens/search coil

This method is based on applying a coil of wire to the eye. In the case of human subject, a contact lens or sclerar annulus, which contains the coil. This method is most invasive and requires local anaesthetize of the eye for the experiment duration. Nevertheless, despite of negative effects occurring possibilities after experiment, this is method provides excellent spatial and temporal resolution and also most accurate findings (Murphy et. al., 2001; Robinson, 1963; 1964; Young, and Sheena, 1975; Ditterich, and Eggert, 2001; Eibenberger et al., 2016).

- photo and video-oculography

Video-based eye-trackers are most widely used devices in commercial eye-tracking. It can be invasive or non-invasive. Invasive are in form of head-mounted devices, non-invasive are often called as remote eye-trackers. The image is captured by camera and it will change when eye or eyes move. It is based on lights reflected from cornea and emitted to the camera (Chennamma, and Yuan, 2013; Wierts, 2007; Muczyński, and Gucma, 2013).

Additionally, eye-trackers can be also listed due to its mobility. Mobile eye-trackers can be useful in marketing researches in shops, paying consumers' attention to packages types researches, trademarks awareness and recognizing etc. Stationary eye-trackers can be useful in more advanced scenery recognizing in example: broadcasts, jingles, advertisements (Babcock, 2002; Dowiasch et al., 2019; Carter, and Luke, 2020; Cottrell, 2016). Due to years of eye-tracking devices production, methods of researches and technical development usage of this technique both in researches and in everyday life were invented and developed. Modern, based on infrared LED lights eye-tracking systems are able to communicate with many PC operating systems via HID interface. It opened the gate of using most features and functions

of personal computer equipment systems for people, which were unable to use these devices because of paralyze or suffering from diseases related to the central nervous system diseases. Eye-tracking techniques is also use in industry (i.e. ergonomic, engineering, marketing, road supervising), science (i.e. neurology, psychology, informatics) and military (aviation, military optics) (Pilipczuk, 2014; Wąsikowska, 2015).

1.3. Overview of chosen researches with the eye-tracking technique use in Poland and in the world

Nowadays, both in the world, such as in Poland in the field of Management Studies, eye-tracking technique is often use in marketing research, especially in the field of customers package interest and in the case of their looking at the etiquettes placed on products (Wąsikowska, 2015; Cottrell, 2016,). The other proposal of eye-tracking use in Management Studies is to connect Management and Computer Sciences and try to use eye-tracking method to create computer-assisted economic information interpretation system (Korczak, and Kaźmierczak, 2016). The similar, topic of researches as in this paper in Poland, but connected to durable goods were performed in the following article: "Consumer perception of compliance marks on durable goods. Dilemmas of eye-tracking research" (Michalska et al., 2018). In 2015, there were 15 articles written by Polish authors in journals connected to Business Research and Poland had 0,64% of participation in all articles submitted to these journals. From different journals from Business Research in 2015 most articles were submitted to Marketing Science (5), Journal of Marketing (4) and Journal of Marketing Research (4) (Yang, and Wang, 2015).

2. The Eye-tracking technique based research design for testing customers' gaze on conformity marks

2.1. Conducting an experiment

The process of gaze is built from saccades- very fast eyeballs movement and periods of eyes stabilization- fixations. Parameters, which describe fixations are time, quantity and frequency (Mastalski, 2018).

Performing the 1st stage of research assumes the use of video-based, remote eye tracking system based on infrared light connected to PC computer with accurate software installed. The whole research process is based on "diagnostic" software model with sequence of fixations and saccades video sequence recording ability (Figure 1).

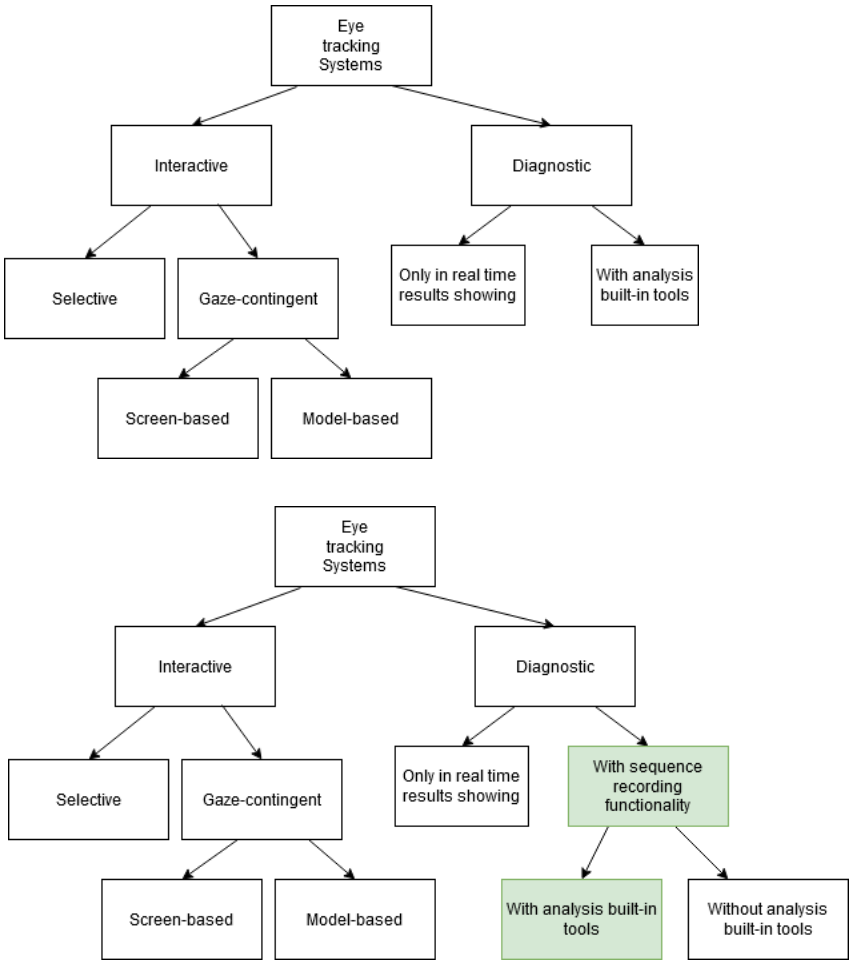


Figure 1. Expanded in base of author's own observations enriched division of eye-tracking software. On the left side original diagram was shown and on the right side with green colour the added type of software use during proposal research was marked. Source: Own work based on: Duchowski, T. (2002). A Breadth-First Survey of Eye Tracking Applications, Copyright 2002 by Behavior Research Methods, Instruments and Computers.

The next step is ask the person, who participate in the research to sit in front of eye-tracker and computer screen. In this moment, a person who operate the computer and eye tracker device should turn on recording and next displays etiquette (Figure 2) or fragment of package in computer screen.

Figure 2. Examples of etiquettes prepared to display during the research with eye-tracking technique based method. Source: own work based on photos taken and prepared by author.

After record 10-20 seconds sequence, the result should be "the course of gaze" in time. On the video clip there should be marked fixations- red points and the "path" of gaze-saccades (green "fields") (Figure 3).

Figure 3. Examples of conducted experiment result. Exampled etiquettes with heat maps marked. Source: own work based on photos taken and prepared by author.

In the next step these heat maps from many research trials can be divided into different types, counted and used for later statistical researches.

2.2. Survey after eye-tracking examination

After these steps a person, who participate in research can be asked to complete the short survey. This survey was prepared not only, to obtain an answer, on which elements customer is looking at, but also awareness of the types and concept of compliance marks, the voluntary nature of their placement and whether consumers care what marks of compliance are placed on the purchased product. Below, the survey table contains listed items was presented (table 1).

Table 1.
The project of survey after an eye-tracking examination

QUESTION	ANSWER	
1. Do You know the term „a conformity/compliance mark"?	YES	NO
2. Are You aware of conformity/compliance marks types appeared on the packaging of the labels, which was shown?	YES	NO
3. Are You aware of the guidelines connected to the necessity and voluntary use of conformity/compliance marks by manufacturers on product labels and packaging?	YES	NO
4. Do You pay an attention to the conformity/compliance marks of the purchased product?	YES	NO

Cont. table 1.

5. What signs of conformity Did you pay a particular attention to, during viewing their photos?	Danger, warning signs	CE sign	Other signs	Etiquette (description placed by producer connected to composition, etc.)	Certification signs	Neither of them
METRICS	**GENDER**		**MALE**		**FEMALE**	
	AGE		Below 20	20-30 | 30-40	4-50	UP TO 50
	EDUCATION		LOWER	MID-SCHOOL	HIGH-SCHOOL	UNIVER-SITY

Source: author's own work.

3. Discussion

The issues related to the use of the eye tracking technique are known both in Poland and in the world. However, the article presents an innovative, from the scientific literature point of view, attempt to define how the consumer looks at the conformity marks placed on product packaging. First, it is necessary to ask what the perception of conformity marks means. A method of sequences recording was proposed, containing heat maps that show the areas, which are most observed. Due to the possibility of using software that allows recording several-second sequences and the time analysis of looking at some elements of the packaging label it is a recommended method of conducting this experiment. The other possibility of usage recording software is choose real-time results showing software. Nevertheless, its only merely a static image without possibility of reproducing the order in which the elements of the label were viewed. The results of the experiment in the form of heat maps allow the broad statistical interpretation based on further statistical researches. The proposed method is based on dividing the types of heat maps according to the viewing time of individual areas of the label and noting the frequency of each of these types in different areas. Exampled statistical researches, which can be taken in base of experiment findings could be:

- Frequency of conformity marks gazing by people.
- Factor analysis for packaging features (requires quantitative data on factors that can influence customers attention).
- Factor analysis for compliance/conformity marks (requires quantitative data on factors that can influence customers attention).

The other part of experiment is survey. Due to this survey it is also possible to obtain data set containing customers' attention paying and awareness of conformity marks information. These all findings can be next use to statistical proceedings. It gives a possibility to conduct next researches connected to previous findings, in example:

- awareness of conformity/compliance mark term among customers,
- awareness of conformity/compliance marks types,
- awareness of necessity and voluntary conformity marks placing by producers.

The other possibility of use findings from experiments and answers from survey is to conduct research for correlation between looking at conformity/compliance marks and users' safety. On the other hand, conducting both eye tracking and survey researches requires a quite large number of participants. This is particularly important when trying to test the correlation between users' viewing of safety signs and their real safety while using products. Nevertheless, many findings can be learned from presented ideas and also they may contribute to researches connected to safety during different products usage.

4. Conclusion

The proposed way of use an eye-tracking technique gives a possibility to gather information about places on etiquettes/packages, on which customers are looking at. Owing to this and findings from survey, which can be conduct after eye-tracking examination it is possible to check, if customers really looked at signs/places, they are thinking. Moreover, such data can be collected in a spreadsheet and serve as the basis for the calculation of various statistics. Exampled path conducted by 1 person was shown below (figure 4).

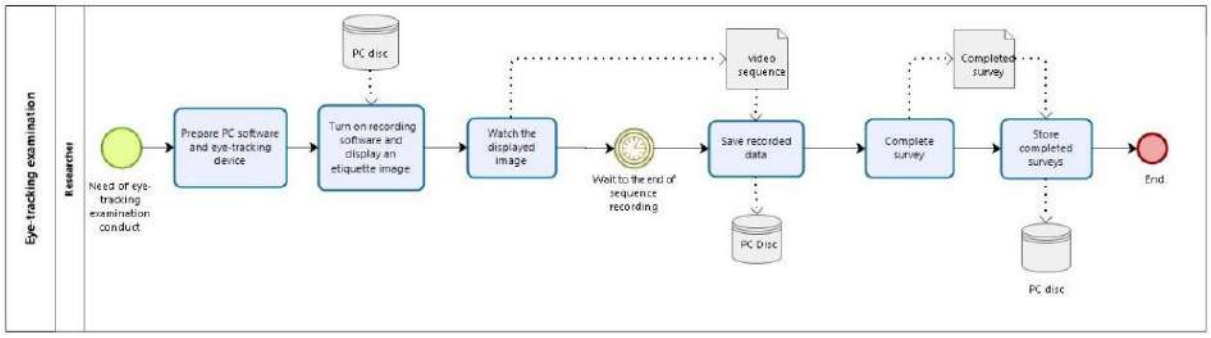


Figure. 4. Exampled path of conducting an eye-tracking self-examination with survey. Source: own work based on BPMN 2.0 methodology.

The path presented in the article is an example and can also be modified and enriched with additional elements. The multitude of possibilities resulting from the eye-tracking method of consumer perception of conformity marks on product packaging makes the use of this method in this scope and context innovative. Also, the use of the results of the experiment itself for various statistical analyzes allowing for a better understanding and determination of the elements that make up the overall perception of the consumer looking at both the product labels and the signs of compliance displayed on them. There are exampled further researches, which can be done:

- correlation between looking at conformity/compliance marks and users' safety.
- awareness of conformity/compliance mark term among customers,
- awareness of conformity/compliance marks types,
- awareness of necessity and voluntary conformity marks placing by producers,
- actor analysis for packaging features (requires quantitative data on factors that can influence customers attention),
- factor analysis for compliance/conformity marks (requires quantitative data on factors that can influence customers attention).

References

1. Abdallahi, M., Perreira Da Silva, M., Courboulay, V. (2008). *A history of eye gaze tracking*, *HAL, hal-00215967.*
2. Andrychowicz-Trojanowska, A. (2018). Basic terminology of eye-tracking research. *Applied Linguistics Papers*, *25(2),* 123-132.
3. Babcock, J.S., Lipps, M., Jeff, B.P. (2002). *How people look at the pictures before, during and after scene capture: Buswell revisited.* Proceedings of SPIE – The International Society for Optical Engineering, 10.1117/12.469552.
4. Buswell, G.T. (1936). *How People Look At Pictures: A Study Of The Psychology Of Perception In Art.* Literary Licensing, LLC, 2012.
5. Carter, B.T., Luke, S.G. (2020). Best practices in eye tracking research. *International Journal of Psychophysiology*, *155*, 49-62.
6. Chennamma, H.R., Yuan, X. (2013) A survey on eye-gaze tracking, techniques. *Indian Journal of Computer Science and Engineering (IJCSE), 4(5)*.
7. Cottrell, D.B. (2016). *Comparing Multiple Methods of Eye Tracking for Packaging,* thesis. Clemson University.
8. Ditterich, J., Eggert, T. (2001). Improving the homogeneity of the magnetic field in the magnetic search coil technique. *IEEE Trans. Biomed. Eng., 10*, 1178-85, 10.1109/ 10.951521.
9. Dodge, R., Cline, T.S. (1901). The angle velocity of eye movements. *Psychological Review, 8(2),* 145-157, 10.1037/h0076100.
10. Dowiasch, S., Wolf, P., Bremmer, F. (2019). Quantitative comparison of a mobile and a stationary video-based eye-tracker. *Behavior Research Methods,* 0.3758/s13428-019-01267-5.
11. Duchowski, A.T. (2002). *A Breadth-First Survey of Eye Tracking Applications.* BRMIC.
12. Duchowski, A.T. (2003). *Eye Tracking methodology: theory and practice.* London: Springer-Verlag, 55-65.

13. Eibenberger, K., Eibenberger, B., Rucci, M. (2016). *Design, simulation and evaluation of uniform magnetic field systems for head-free eye movement recordings with sclerar search coils*. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc., 247-250, 10.1109/EMBC.2016. 7590686.
14. Fitts, P.M., Jones, R.E., & Milton, J.L. (1950). Eye movements of aircraft pilots during instrument-landing approaches. *Aeronautical Engineering Review, 9(2),* 1-6.
15. Gao, D., Yin, G., Cheng, W., Feng, X. (2012). Non-Invasive Eye Tracking Technology Based on Corneal Reflex. *Procedia Engineering, 29*, 3608-3612; 10.1016/ j.proeng.2012.01.539.
16. Gomolka, Z., Kordos, D., Zeslawska, E. (2020). The Application of Flexible Areas of Interest to PilotMobile Eye Tracking. *Sensors*, *20(986),* 10.3390/s20040986.
17. He, J., Siu, Ch, Chaparro, B., Strohl, J. (2014). *Mobile, Eye Tracking in User Experience Design*, pp. 255-290, Elsevier Inc.
18. Holmqvist, K. (2017). *Eye tracking: A comprehensive guide to methods, paradigms, and measures.* Charleston SC, USA: CreateSpace, ISBN-13: 978-1979484893.
19. https://www.uxbooth.com/articles/a-brief-history-of-eye-tracking/, 02.11.2020.
20. Ingram, J.N., Wolpert, D.M. (2011). *Enhancing Performance for Action and Perception, Progress in Brain Research*, *191*, 3-29.
21. Jacob, R.J.K, Karn, K.S. (2002). Eye tracking in human-computer interaction and usability research: Ready to deliver the promises. *The Mind's Eye: Cognitive and Applied Aspects of Eye Movement Research,* pp. 573-605.
22. Kapitaniak, B., Walczak, M., Kosobudzki, M., Jóźwiak, Z., Borkiewicz A. (2015). Application of eye-tracking drivers testing: A review of research. *International Journal of Occupational Medicine and Environmental Health, 28(6),* 941-954.
23. Korczak, J., Kaźmierczak, A. (2016). Poszukiwanie wzorców analitycznego myślenia menedżera z wykorzystaniem eye tracking. *Przegląd Organizacji, 9,* 44-49.
24. Kumar, A., Krol, G. (1992) Binocular Infrared Oculography. *Laryngoscope, 102,* 367-378.
25. Mastalski, A.S. (2018). Modalność percepcji a podstawy kognitywnej wersologii. *Neurolingwistyka Praktyczna, 4.*
26. Michalska, A., Maleszka, A., Opiela, A. (2018). Consumer perception of compliance marks on durable goods. Dilemmas of eye-tracking research. *Marketing i Rynek*, *25(12),* 255-264.
27. Muczyńksi B., Gucma, M. (2013). Application of eye-tracking techniques in human factor research in marine operations. Challenges and methodology. *Scientific Journals Maritime University of Szczecin, 36(108),* 116-120.
28. Murphy, P.J., Duncan, A.L., Glennie, A.J., Knox, P.C. (2001). The effect of scleral search coil lens wear on the eye. *Br. J. Ophthalmol., 85,* 332-335.
29. Pilipczuk, O. (2014). Technologie eye-tracking w analizie danych medycznych. *Roczniki Kolegium Analiz Ekonomicznych. Technologie informatyczne w służbie zdrowia, 35*. *Szkoła Główna Handlowa,* 323-337.

30. Poole, A., Linden, J.B. (2004). *Eye Tracking in Human-ComputerInteraction and Usability Research: Current Status and Future Prospects.* UK: Psychology Department, Lancaster University.
31. Robinson, D.A. (1963). A method of measuring eye movement using a sclerar search coil in a magnetic field. *IEEE Trans. Biomed. Eng., 0,* 137-45, 10.1109/tbmel.1963.4322822.
32. Robinson, D.A. (1964). The measurement of eye-movement using magnetic induction in a contact lens coil. *Biomed. Sci. Instrum.*, *2(97),* 106.
33. Stolecka-Makowska, A., and Wolny, R. (2014). Możliwości zastosowania techniki okulograficznej w ilościowych badaniach marketingowych. *Studia Ekonomiczne, 195.* Uniwersytet Ekonomiczny w Katowicach, 197-205.
34. Wade, N.J. (2010). Pioneers of eye movement research. *iPerception, 1(2),* 33-68.
35. Wade, N.J., Tatler, B.W. (2005). *The Moving Tablet of The Eye: the origins of modern eye movement research.* New York: Oxford University Press.
36. Wąsikowska, B. (2015). Eye tracking w badaniach marketingowych. *Zeszyty Naukowe Uniwersytetu Szczecińskiego-Studia Informatica, 863(36),* 10.18276/si.2015.36-13.
37. Wierts, R. (2007). *Comparison of three eye movement recording techniques for the clinical vestibular practice electrooculography, video oculography and scleral search coils, Master thesis.* Eindhoven University of Technology, Department of Applied Physics.
38. Yang, Y., Wang, Ch.-Ch. (2015). Trend of Using Eye Tracking Technology in Business Research. *Journal of Economics, Business and Management*, *3(4).*
39. Young, R.L., Sheena, D. (1975). Eye-movement measurement techniques. *Am. Psychol., 30(3),* 315-30, 10.1037//0003-066x.30.3.315.
40. Young, R.L., Sheena, D. (1975). Survey of eye movement recording methods. *Behavior Research Methods & Instrumentation*, *7,* 397-429.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

DILEMMAS OF SOCIAL LIFE ALGORITHMIZATION – TECHNOLOGICAL PROOF OF EQUITY

Grażyna OSIKA

Silesian University of Technology, Zabrze; grazyna.osika@polsl.pl, ORCID: 0000-0002-8729-1001

Purpose: The aim of the article is to describe and forecast possible dilemmas related to the development of cognitive technologies and the progressing process of algorithmization of social life.
Design/methodology/approach: Most of the current studies related to the Big Data phenomenon concern the level of efficiency improvement the algorithmic tools or protection against autonomization of machines, in this analysis a different perspective is proposed, namely – thoughtless way of using data-driven instruments, termed technological proof of equity. This study is to try to anticipate possible difficulties connected with algorithmization, which understanding could help to "prepare" or even eliminate the harmful effects we may face which will affect decisions made in the field of the social organization and managing organizations or cities etc.
Findings: The proposed point of view may contribute to a more informed use of cognitive technologies, machine learning, artificial intelligence and an understanding of their impact on social life, especially unintended consequences.
Social implications: The article can have an educational function, helps to develop critical thinking about cognitive technologies and directs attention to areas of knowledge by which future skills should be extended.
Originality/value: The article is addressed to data scientist and all those who use algorithms and data-driven decision-making processes in their actions. Crucial in this considerations is the introduction the concept of technological proof of equity, which helps to "call" the real threat of the appearance of technologically grounded heuristic thinking and it's social consequences.

Keywords: Big Data, algorithmization, data mining, data science, technological proof of equity.

Category of the paper: conceptual work.

1. Introduction

Smith and Harry Shum in the introduction to the publication by Microsoft under the telltale title *The Future Computed: Artificial Intelligence and Its Role in Society* claim: „digital technology powered by the cloud has made us smarter and helped us optimize our time, be more productive and communicate with one another more effectively. And this is just the beginning. Before long, many mundane and repetitive tasks will be handled automatically by AI, freeing us to devote our time and energy to more productive and creative endeavors. More broadly, AI will enable humans to harness vast amounts of data and make breakthrough advances in areas like healthcare, agriculture, education and transportation" (2018, p. 6). Those diagnoses are confirmed also in the reports by Deloitte, called *Tech trends 2020* (2020) and *Deloitte Global Human Capital Trends 2019* (Volini et al., 2019) which clearly emphasize the role of the analytics and cloud in data-driven decision-making processes as well as the increased importance of data management. Those tendencies comply with what James Bridle recognized as computational thinking, which means „the belief that any given problem can be solved by application of computation", but this kind of thinking have a unconscious level – "it internalizes solutionism to the degree that it is impossible to think or articulate the world in terms that are not computable" (Bridle, 2019, p. 4). In Bridle's opinion, the development of digital technologies with all their computational potential requires social actors to develop a critical - i.e. more conscious - attitude towards the way we use them (Bridle, 2019, pp. 4-6). His proposal should largely be treated pragmatically as the recommended actual broadening of the area of our agency which seems crucial from the management perspective. Here, the employed tools supporting the decision-making processes make sense provided they are able to make activities more effective instead of offering a false sense of that. This is why using broadly-taken computational technologies and social life algorithmization, including management, should be accompanied also by a broader, more critical reflection enabling to use those solutions consciously. It is required also because of the natural human proneness to employ cognitive simplifications which are often a source of false judgments. The fact this is not "cultural correctness", but a practical competence requirement, is corroborated by the diagnoses of Deloitte, according to which designing and organization management require conscious use of data management tools nowadays (Bannister, and Golden, 2020, pp. 23-41).

One of the basic concerns we have with respect to the technology as well as the wave of automation and algorithmization connected with it, taking place thanks to the development of the broadly-taken cognitive technologies, including machine learning, neural networks, natural language processing and what we term *artificial intelligence* (AI) (Ford, 2016) is how to protect from the autonomation of machines (Bostrom, 2016; Osika, 2017; Skinner, 2018). This article proposes to consider the opposite situation which seems highly legitimate given the progressing development of the computational thinking, i.e. the emancipation of the technology itself is as

problematic as our thoughtless way of using it, applying a certain technological proof of equity. This is the thesis of those ponderations. Consequently, the objective of this article is the description and prognoses of any dilemmas we may face which will affect highly specific decisions made in the field of the social organization and managing organizations or cities etc.

The analysis will be theoretical. It will be based on the knowledge we already possess, e.g. the cognitive mechanisms recognized by psychologists and collected experiences of researchers in data analytics, enabling to verify the correctness of prediction tools (Schutt, O'Neil, 2014, p. 16). This reflection is to be a support for understanding and solution of future problems associated with the progressing algorithmic processes.

Performance of study tasks stipulated in this analysis requires, first and foremost, description of the algorithmization process itself, i.e. the way to understand it and the indication of mechanisms justifying the possible existence of the so-called technological proof of equity and, secondly, reference to some threats connected with the thoughtless trust to prognosticating and decision-making cognitive technologies.

2. Methods

This study uses critical analysis to identify potential dilemmas associated with the algorithmization of social life. The analysis referred to the mechanisms of heuristic thinking, well recognized in psychological research and accumulated experience of data scientist. Assumed that two aspects were crucial and study questions were formulated for them, namely:

1. Should we "defend" ourselves from the technological proof, i.e. what is the possible degree of threat it can pose?
2. Is it possible to reduce the impact of the technological proof?

3. Results

3.1. Algorithmization and technological proof of equity

Pedro Domingos in *Master Algorithm: How the Quest for the Ultimate Learning Machine will Remake Our World,* which have published in 2015, puts very adequate diagnosis of modern times: „we live in the age of algorithms. Only a generation or two ego, mentioninig the word algorithm would have drown a blank from most people. Today, algorithms are every nook and cranny of civilization. […] Algorithms combine with other algorithms to use the results of the other algorithms, in turn producing results for still more algorithms. Every second billions of

transistors in billions of computer switch billions of times. Algorithms form a new kind of ekosystem – ever growing (Domingos, 2015, pp. 1-5).

Domingos' diagnosis makes us aware of the progressing algorithmization scope which is seemingly unquestionable now, as proved by the widespread use of cognitive technologies, i.e. machine learning, neural networks, robot automation, natural language processing and broadly-taken artificial intelligence which enable to shift from scattered, "impure" data to the structured set of specific steps enabling to obtain optimized results in virtually every area of our life. To put it most generally, those are the processes termed algorithmization. From the observation and stimulation of individual activity possible e.g. thanks to smartwatches, to designing cyber-physical systems popularly termed *smart factories* (Kagerman et al., 2013; Schwab, 2016; Morrar R., et al., 2017; Piccarozzi, Aquilani, Gatti, 2018).

It would not be possible to use algorithms to extract practical and theoretical knowledge or to prognosticate if it were not for what is called big data (BD) and datafication. It must also be mentioned those two phenomena are closely related. BD is about the innovative use of information which helps to understand the reality better, based on large data sets we have thanks to the digital potential of data collection, storage and processing. Three aspects of *big data* seem crucial. Those are the technical ability to analyze immense amounts of data which enables to consider its accuracy less important, the technical ability to organize data and the increased importance of correlations of key importance in *data mining* processes (Brynjolfsson, Mcafee, 2014; Dijk, 2014; Mayer-Schönberger, Cukier, 2014; O'Neil, Schutt, 2014). Datafication is the presentation of a specific phenomenon in a quantified form which may be subsequently listed in tables and analyzed (Mayer-Schoenberger, Cukier, 2013, p. 96; Śledziewska, and Włoch, 2020). Thus datafication refers to the tendency to "format" all areas of life mathematically (Dijk, 2014; Galliers, 2017), i.e. to present them in a quantitative framework (Manovich, 2001, pp. 27-30; Osika, 2015, pp. 72-74; Szpunar, 2019, pp. 11-22).

According to Yuval Noah Harari, the idea of the Turing machine was of key importance in those processes but only its development by computer scientists for many decades led to the contemporary advancement of digital algorithms (2018, pp. 467) which created a technological background enabling to carry out calculation on an unprecedented scale and to develop *data science*. Digitization is a flywheel of the big data, datafication and algorithmization revolution in a sense, as it provides a "language" to translate the real world into the *digital footprint* mathematically (Dijck, 2014; O'Neil, 2016; Schutt, O'Neil, 2014; Rudder, 2014; Jurgenson, 2014, Surma, 2017; Jones, 2019), while the *cloud* technology enables them to communicate and obtain metadata which, once analyzed, become a precious support in the decision-making processes and the new source of values.

In opinion Erik Brynjolfsson and Andrew Mcafee, this is what the second machine era consists in, i.e. "computers and other digital advances are doing for mental power – the ability to use our brains to understand and shape our environments – what the steam engine and its

descendants did for muscle power" (Brynjolfsson, Mcafee, 2014, p. 10). The essence of technical solutions where the algorithms play a key role is supporting or even replacing human intellectual work, with particular emphasis on the decision-making processes which can be performed in real time based on the potential of data collection, storage and processing (Mayer-Schönberger, Cukier, 2014; O'Neil, Schutt, 2014; Yin, and Kaynak, 2015; O'Neil, 2017; Harari, 2018; Zysman, and Kenney, 2018; Śledziewska, and Włoch, 2020). The support it brings into our life, what we call data mining, i.e. extracting information from raw data (Han et al., 2012) is visible in many areas which we often term "smart", including e.g.:

- smart city — connected with the city organization enabling to optimize resource management and increase the quality of life in real time (Kummitha, 2019; Jonek-Kowalska et al., 2018);
- smart factory (Industry 4.0) — facilitating optimization of the production processes and adaptation to the market needs in real time (Kagerman et al., 2013; Schwab, 2016; Morrar R. et al., 2017; Piccarozzi, Aquilani, Gatti, 2018; Sobieraj, 2018, Osika, 2019c);
- smart medicine — supporting anti-pandemic activities, facilitating test performance, all forms of diagnostics, but also coordination of health care activities in real time (Tian et al., 2019);
- smart security — based on innovative technology which enables to improve individual and social security thanks to IoT (Kumar et al., 2019);
- smart ecology — supporting climate changes monitoring and counteracting their progress based on reasonable resource management (Jucevicius, Grumadaite, 2014);
- smart agriculture — optimized breeding and culturing thanks to using information technologies, enabling to coordinate activities in real time (Gębska, 2020; Wąs et al., 2020);
- etc.

Cognitive technologies are effective. This fact may become a trap one day, termed technological proof of equity here. To understand this phenomenon, we need to provide broader context enabling to accept the legitimacy of the proposed approach. Starting from late 20th century, many researchers, including Alvin Toffler, Nil Postman, Peter Drucker, Paul Virilio and Zygmund Bauman, stressed the digital technology introduction resulted in the accelerated growth of the quantity of data and information we have. We may say the world has never been so quantified in real time as it is now and it is e.g. thanks to it that we have a profound sense of our extensive knowledge of it, also in a purely practical dimension, e.g. management. However, a certain paradox is visible „today our knowledge is increasing at breakneck speed, and theoretically we should understand the world better and better. But the very opposite is happening. Our new-found knowledge leads to faster economic, social and political changes; in an attempt to understand what is happening, we accelerate the accumulation of knowledge, which leads only to faster and greater upheavals. Consequently we are less and less able to make sense of the present or forecast the future" (Yuval, Noah, Harari, 2017, e-book).

This means that despite our cognitive capabilities supported by the technology, we live in a state of uncertainty which always promotes use of cognitive mechanisms helping to cope with it. This includes all types of heuristics, i.e. simplified reasoning methods. Psychologists recognize a whole spectrum of heuristic cognitive strategies helping humans to cope with the information overload and uncertainty and enabling to formulate observations as well as to make sufficiently relevant decisions (Kanemen, 2011; Kenrick et al., 2014; Aronson et al., 2014). The pattern of those mechanisms' functioning is quite simple. In the situation of "cognitive" uncertainty we tend to resort to some higher instance which helps us restrain our cognitive dissonance. Sometimes, as in the case of the social proof of equity, we trust to the group infallibility and for the rule of authority this is somebody we trust because of high appraisal of their competences (Cialdini, 2007, pp. 114-166, 208-236) based on the analogy to the previous ones. For the technological proof of equity, it is entrusting thinking to algorithms, based on the rule that the calculations give this or that result (Osika, 2019a, p. 194). According to the studies, the efficiency of the above-mentioned proofs is immense. Historically, mass, unthinking basing on the beliefs of the majority or authority led us to social disasters and the experiments by Stanley Milgram or Solomon Ash confirmed their rules.

On the other hand, it seems obvious that when we have some tools to support us and alleviate our intellectual shortcomings, namely algorithmic models which help us cope with everyday problems, management, climate change prognostication, epidemics course controlling, we will be eager to use them and we will easily trust them to assess the decision accuracy. This is why Bridle encourages us „we don't and cannot understand everything, but we are capable of thinking. […] Technology is and can be a guide and helpmate in this thinking, providing we do privilege its output: computers are not here to give us answers, but are tools for asking questions" (2019, p. 6).

3.2. Technological proof of equity – possible dilemmas

If we think that it is possible to entrust thinking to algorithms unreflectively and, in the light of the above psychological mechanisms, the "entrusted thinking" becomes a realistic threat, its scale and possible consequences are indicated by Domingos again: "when algorithms become too intricate for our poor human brains to understand, when the interactions between different parts of algorithm are too many and too involved, errors creep in, we can't find them, and fix them, and algorithm doesn't do what we want. Even if we somehow make it work, it wings up being needlessly complicated for the people using it and doesn't play well with other algorithms, storing up trouble for later […]. Nevertheless we continue to build our tower of algorithms, with greater and greater difficulty. Each new generation of algorithms has to be built on the top of the previous ones and has deal with their complexities in addition to its own. The tower grows taller and taller, and it covers the whole world, but it's also increasingly fragile, like a house of cards waiting to collapse" (Domingos, 2015, pp. 1-5). Domingos warns us that the more we expand that ecosystem, the more dependent on it we become in our activities.

Algorithmization of certain areas of life enforces other and this, according to Domingos, may lead to the times when, thanks to deep machine learning and artificial intelligence exceeding human intellectual capacities, this system can no longer be controlled by us. It is worth noting that some scientific and business milieus have actually been awaiting it. This is the so-called singularity (Kurzweil, 2016; Bostrom, 2016; Osika, 2017; Skinner, 2018), perceived as a chance to solve the problems we need to cope with now, which Gregg Braden describes as the convergence of critical points and includes climate, population, energy and economic extremes (Braden, 2014; Osika, 2019b, p. 138).

Inevitably, this situation may entail many problems and this is seemingly what Domingos notes when he writes about the consequences of the complication increase and the collapse of that ecosystem. He suggests a solution entailing even more advanced algorithmization, i.e. focusing our activity on discovering/developing a master algorithm, ordering the activities of the other (Domingos, 2015). And even when we consider this perspective the most promising, we must at least try to face prognosticating the consequences of that solution and consider any emerging concerns.

Here, I suggest analyzing two aspects included in two study questions, namely:

1. Should we "defend" ourselves from the technological proof, i.e. what is the possible degree of threat it can pose?
2. Is it possible to reduce the impact of the technological proof?

3.2.1. The premises for "defend" ourselves from the technological proof

When attempting to answer the first question, the observations by Cathy O'Neil in *Weapons of Math Destruction. How Big Data Increases Inequality and Threatens Democracy*. In this work, the American mathematician analyzed the impact of algorithmic models on various aspects of social life, including education, employment, advertising, civic society etc., providing examples of their adverse activity and reminding simultaneously that no algorithmic model contains „all of the real world's complexity or the nuance of human communication. Inevitably, some important information gets left out. […] To create a model, then, we make choices about what's important enough to include, simplifying the world into a toy version, that can be easily understood and from which we can infer important facts and actions. We expect it to handel only one job and accept that it will occasionally act like a clueless machine, one with enormous blind spots" (2016, p. 20). O'Neil described a discriminatory role of the so-called *weapons of math deconstruction* (WMD), stressing how the algorithms or, more specifically, the opinions included in them, the approach and valuation of their creators affect the assessment of students' aptitudes, of the recruitment and selection participants, how they manipulate our choices etc. Algorithmization may contribute to the technological restraint of human freedom, generating the so-called "algorithmic prison" (Kleppman, 2017, p. 534). China and its Social Credit (Strittmatter, 2018) is the best example of that. All that is possible only thanks to the deep belief in the mathematics impartiality justifying the entrusted thinking.

In this context, the technological proof of equity may be an additional threat connected with a psychologically-founded sense of certainty where we have just higher or lower probability. Some researchers point to the existence of specific data interpretation conventions which is why its correct exploration requires analysis of both what we consider data in a given experiment and what interpretation methods we use to do it (Jones, 2019, pp. 6-12; Gitelman, Jackson, 2013). In the algorithmization framework, certain data use patterns can be recognized which should limit the trust to the result, e.g. Data decontextualization, i.e. using it in different context than the ones for which it was collected and processed; using quantitative data as substitute measures for complex phenomena; strategic and selective use of data to pursue particular interest; legitimation of the requested information based on the original data legitimation (Galliers el al., 2017, pp. 187-188).

One of the earliest examples of the technological proof may be the crises of 2008 when the employed algorithms "failed" and the unwavering belief in their risk assessment efficiency contributed to the financial market collapse (Brown, Whittle, 2020, pp. 70-75). Poorly developed algorithms are often blamed for that, but our belief in their reliability was equally if not more problematic. Just as for any type of heuristics, the absence of the critical/realistic reference to the grounds justifying the possible degree of certainty generates even greater uncertainty and a whole spectrum of adverse social and economic consequences, just like in 2008. Reducing our uncertainty with the "entrusted thinking", we contribute to its exponential growth and this should be deemed a conclusion related to the first study question.

3.2.2. Possible proposals to reduce the impact of the technological proof

As already mentioned, unreflective trust to the computational technology increases the risk level so we should rather focus on more conscious use of it. The fact that certain processes are not legible, which refers in particular to deep machine learning, does not mean we should ignore them, considering them to be "magical". This is why a correct data science experiment, i.e. grouping, organization into patterns and significant correlation (Mcllwraith et al., 2017) assume the participation of experts who are able to assess the legitimacy of data selection, models used and correlation. This requirement is not always respected (Galliers et al., 2017, pp. 187-188), but it is necessary. For those reasons, it seems it is impossible to eliminate the so-called "human factors" due to the intellectual flexibility and the ability to perceive dependencies in broad contexts which are considered characteristic of the human way of thinking (Harari, 2018) for the time being.

A valuable proposal is also to introduce new jobs, the so-called data translators or "datanauts" which observing the data "space" and explaining the meanings extracted from data to ensure their better use (*Translatorzy* 2018) but, first and foremost, helping to understand the essence of the processes taking place. This is again a "cumulated approach" to the *data scientists'* and experts' knowledge. It should be mentioned work devoted to such models has been initiated again and again (Kwiliński, 2019; Kuzior, 2019).

It is also necessary to ensure an in-depth approach to the so-called media education which is considered one of key competences nowadays (Bakhshi, 2017; Leopold, 2018). The very knowledge of the applications and their technical operation is not sufficient as the approach "I have an application and do not have to think anymore", being the essence of the so-called computational thinking, is problematic (Bridle, 2019). A digital tool must be selected in connection with the awareness of what process is automated and what model is used to explore data, which requires improving data mining competences. This is particularly important when we know algorithms "skip" from one area to the other (O'Neil, 2016; Galliers et al., 2017, pp. 187-188). For example, epidemic-related algorithms are used to calculate viewing figures in the streaming services. Even if the social harm caused by it may seem negligible, the very existence of this practice entails the risk of inadequacy and unaware uselessness. Trusting the technology, we feel we are offered support in decision-making processes though actually the model examines a parameter of no importance in a given context. Control and actual efficiency can be obtained when the reason why we can afford the luxury of "thinking less" becomes clear, i.e. when we use tools suitable for a given situation and the employed model considers the vision and estimation-related values as much as possible. To understand the future, we do not need any *predictive analytics* and *prescriptive analytics*, but the adequate instruments where we know "what the data is about" and what contexts (variables, indexes) it considers, what opinion on the world in the mathematical language it contains (O'Neil, 2016). Concisely speaking, to be able to think less we need to think more which is the opposite of the technological proof of equity.

4. Discussion

One of the consequences of the emergence and widespread use of digital technology was the awareness of the amount of data that is generated, recorded and processed during its use, this phenomenon was defined as Big Data. This fact has allowed us to revive the ever-existing tendency to quantify reality, which involves a better understanding of the world, more influence on its shape (Brynjolfsson, Mcafee, 2014; Dijk, 2014; Mayer-Schönberger, Cukier, 2014; O'Neil, Yin, and Kaynak, 2015; O'Neil, 2017; Harari, 2018, Zysman, and Kenney, 2018, Śledziewska, and Włoch, 2020). Nowadays we are dealing with a similar situation, on the basis of the data collected through automated algorithmic processing we are trying to draw concrete conclusions about the functioning of reality, thus creating tools for "acting in the world", it concerns every aspect of our lives, in this sense we can talk about the progressing algorithmic processes (Dijck, 2014; O'Neil, 2016; Schutt, O'Neil, 2014; Rudder, 2014; Jurgenson, 2014, Surma, 2017; Jones, 2019, Manovich, 2001, pp. 27-30; Osika, 2015, pp. 72-74; Szpunar, 2019, pp. 11-22). Fascinated by the effectiveness of these instruments, we focus mainly on their

"bright side" (Brynjolfsson, Mcafee, 2014; Schönberger, Cukier, 2014; Yin, and Kaynak, 2015; Kwiliński, 2019; Kuzior, 2019), but we need also critical thinking about this problem (Gitelman, Jackson, 2013; O'Neil, 2016; Galliers et al., 2017; Kleppman, 2017; Bridle, 2019, Osika, 2019a; Jones, 2019), allowing us to expose potential threats according to the simple rule that each "there are two sides to every story". The proposed technological proof of equity poses the questions of the consequences of the unreflective use of algorithms as a form of entrusted thinking. This way of addressing the problem is justified by the current psychological knowledge, but the study of its real impact requires in-depth analyses, including empirical ones. As it seems, empirical research should address more specific issues, helping to reveal the impact of the operation of technological proof of equity in such areas where we can already speak of the expanding influence of automated decision-making processes, for example in e-HRM (Volini et al., 2019). But also among data scientist to explore their level of awareness about the social implications of using their analytical tools. Perhaps this type of cognitive technology should be given similar descriptions as medication, in which users are made aware of the negative consequences of their use.

5. Summary

The development of machine learning, neural networks, natural language processing and AI make up processes connected with the social life algorithmization, i.e. using computational technologies for the so-called *data mining* which allows to go from the scattered, raw data to the organized set of specific steps enabling to predict risk and optimized future activities.

A condition of the effective use of those tools is their conscious use, i.e. understanding "what they do" and why they were used. However, this is not obvious due to the complexity degree of computational instruments. This complexity makes us assume more often than we know. This article proposes to consider the effects of the so-called computational thinking i.e. unreflective method of using computational technologies to which we ascribe high reliability degree without any grounds. The objective of this article is to describe any dilemmas we may face and which may have a highly practical dimension as they refer to the decisions connected with the society organization and management of organizations, cities etc.

This analysis was theoretical. Such terms as algorithmization and the technological proof in analogy to the social proof were defined. In the final section, an attempt at answering the questions if we should "defend" ourselves from the technological proof of equity, i.e. what the possible degree of threat it can pose is and if it is possible to reduce the impact of the technological proof was made. The answer to the first question was positive while the forms of defense were the need to apply expert intervention and the broadly-taken education within computational technologies.

References

1. Aronson E. et al. (2014). *Pearson New International Edition. Social Psychology*. London: Pearson.
2. Bakhshi H. et al. (2017). *The Future of the Skills. Employment in 2030*. London: Pearson and Nesta.
3. Bannister, C., Golden, D. (2020). *Ethical Technology and Trust. In Tech Trends 2020*, Deloitte Development LLC, pp. 23-41.
4. Bostrom, N. (2016). *Superinteligencja. Scenariusze, strategie, zagrożenia*. Gliwice: Helion.
5. Braden, G. (2014). *The Turning Point. Creating Resilience in Time of Extremes*. Carlsbad-New York-London: Hay House.
6. Bridle, J. (2019). *New Dark Age: technology and the End of Future*. London-New York: Verso.
7. Brown, R., Whittle, R. (2020). *Algorithms, blockchains, cryptocurrency: Implications for the Future of the Workplace.* Bingley: Emerald Publishing Limited.
8. Brynjolfsson, E., Mcafee, A. (2014). *The Second Machine Age. Work. Progress, and Prosperity in a Time of Brillant Technologies*. New York-London: W.W. Norton & Company.
9. Cialdini, R. (2007). *Influence: the Psychology of Persuasion*. New York: HarperCollins.
10. Dijck, J. (2014). Datafiction, dataism and dataveillance: Big Data between scientific paradigm and secular belief. *Surveillance & Society*, *12(2),* p. 197-208, Retrieved from: https://dare.uva.nl/search?identifier=eae3e10f-6cad-440b-8b0e-f623b9bdda9f.
11. Domingos P. (2015). *Master Algorithm: How the Quest for the Ultimate Learning Machine will Remake Our World*. New York: Basic Books.
12. Ford, M. (2016). *Świt robotów. Czy sztuczna inteligencja pozbawi nas pracy*. Warszawa: Ccdp.pl.
13. Galliers, R.D. et al. (2017). Datafication and its human, organizational and societal effects: The strategic opportunities and challenges of algorithmic decision-making. *Journal of Strategic Information System, 26*, pp. 185-190.
14. Gębska, M. (2020). Big Data in the Modern Farm Management. In: J. Paliszkiewicz (Ed.), *Management in the era of Big Data: Issues and Challenges* (pp. 97-114). London-New York: Taylor & Francis Group.
15. Gitelman, L., Jackson, V. (2013). Introduction. In: L. Gitelman (Ed.), *Raw Data. Is an Oxymoron* (pp. 1-14). Cambridge: MIT Press.
16. Han, J., Kamber, M., Pei, J. (2012). *Data Mining: Concepts and Techniques*. Amsterdam-Boston-Heidelberg-London-New York-Oxford-Paris-San Diego-San Francisco-Singapore-Sydney-Tokyo: Elsevier.

17. Harari, Y.N. (2017). *Homo Deus: A Brief History of Tomorrow.* Sydney-Toronto-Auckland-London-New York: HarperCollins (e-book).
18. Harari, Y.N. (2018). *21 Lessons for the 21st Century*. London: Jonatan Cape.
19. Jonek-Kowalska, I., Kaźmierczak, J., Kramarz, M., Hilarowicz, A., Wolny, M. (2018). *Introduction To The Research Project Smart City: A Holistic Approach*. Retrieved from: https://www.sgemsocial.org/index.php/jresearch-article?citekey=Jonek-Kowalska201819101112.
20. Jones, M. (2019). What we talk about when we talk about (big) data. *Journal of Strategic Information Systems, 28*, pp. 3-16.
21. Jucevicius, G., Grumadaite, K. (2014). Smart development if innovation ecosystem. *Procedia – Socila and Behavioral Sciences*, *154*, pp. 125-129.
22. Kagerman H. et al. (2013). *Recommendation for implementing the strategic initiative Industrie 4.0. Final report of the Industrie 4.0 Working Group.* Retrieved from: https://www.din.de/blob/76902/e8cac883f42bf28536e7e8165993f1fd/recommendations-for-implementing-industry-4-0-data.pdf.
23. Kahneman, D. (2011). *Thinking Fast and Slow.* New York: Farrar, Straus and Giroux.
24. Kenrick D. et al. (2014). *Social Psychology: Goals in Interaction.* London: Pearson Education.
25. Kleppman, M. (2017). *Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable and Maintainable Systems.* Beijng-Boston-Farnham-Sebastopol-Tokyo: O'REILLY.
26. Kumar, P.M. et al. (2019). Intelligent face recognition and navigation system using neural learning for smart security in Internet of Things. *Cluster Computing, 22*, pp. 7733-7744.
27. Kummitha, R.K.R. (2019). Smart cities and entrepreneurship: An agenda for future research. *Technological Forecasting & Social Change, 149*, pp. 1-10.
28. Kurzweil, R. (2016). *Nadchodzi osobliwość. Kiedy człowiek przekroczy granice biologii*. Warszawa: KURHAUS Publishing.
29. Kuzior, A. et al. (2019). Sustainable Development of Organizations Based on The Combinatorial Model of Artificial Intelligence. *Entrepreneurship and Sustainably Issues, 7(2)*, pp. 1353-1376.
30. Kwiliński, A. et al. (2019). Transparent cognitive technologies to ensure sustainable society development. *Journal of Security and Sustainability Issues, 9(2),* pp. 561-570. DOI: 10.9770/jssi.2019.9.2(15).
31. Leopold, A.T. et al. (2018). *The Future of Jobs Report 2018*. Geneva: World Economic Forum.
32. Mayer-Schönberger, V., Cukier, K. (2014) *Big data. Rewolucja, która zmieni nasze myślenie, pracę i życie*. Warszawa: MT Biznes (e-book).
33. Morrar, R. et al. (2017). The Fourth Industrial Revolution (Industry 4.0): A Social Innovation Perspective. *Technology Innovation Management Review, 7/11*, pp. 12-20.

34. Osika, G. (2015). Hiperczytanie jako struktura poznawcza. *Lingua ac Communitas*, *vol. 25,* pp. 63-78.
35. Osika, G. (2017). Czekając na osobliwość. O Modelach interpretacji techniki. *Filo-Sofija. Z problemów Współczesnej Filozofii. Człowiek i maszyna, 391/1*, pp. 65-78.
36. Osika, G. (2019a). Algorytmiczne narzędzia analizy zawartości mediów. Metametodologiczne refleksje. In: I. Hofman, D. Kępa-Figura (eds.), *Współczesne media. Problemy i metody badań nad mediami, tom 2* (pp. 181-194). Lublin: Wydawnictwo UMCS.
37. Osika, G. (2019b). On Hoping for Hope: The Search for *homo esperans. Ethos, 32, no. 4(128),* pp. 135-153. DOI 10.12887/32-2019-4-128-08.
38. Osika, G. (2019c). Social Innovation as Support for Industry 4.0. *Scientific Papers of Silesian University of Technology, Organization and Management Series*, *no. 141*, pp. 289-301.
39. Piccarozzi, M., Aquilani, B., Gatti, C. (2018). Industry 4.0 in management Studies: A Systematic Literature Review. *Sustinability*, *10*, 3821, https://www.mdpi.com/journal/sustainability, 3.07.2020. DOI:103390/su10103821.
40. Rudder, Ch. (2014). *Dataclysm. Love, Sex, Race, and Identity. Who we are* (When We Think No one's Looking). New York: Crown.
41. Schwab, K. (2016). *The Fourth Industrial Revolution*. Cologny-Geneva: World Economic Forum, Retrieved from: https://luminariaz.files.wordpress.com/2017/11/the-fourth-industrial-revolution-2016-21.pdf.
42. Śledziewska, K., Włoch, R. (2020). *Gospodarka cyfrowa. Jak nowe technologie zmieniają świat.* Warszawa: Wydawnictwo Uniwersytetu Warszawskiego.
43. Smith, B., Shum, H. (2018). *Foreword. The Future Computed: Artificial Intelligence and its role in society.* Redmond-Washington: Microsoft Corporation.
44. Strittmatter, K. (2018). *Chiny 5.0. Nowe oblicze dyktatury.* Warszawa: Grupa Wydawnicza Foksal, MMXX.
45. Surma, J. (2017). *Cyfryzacja życia w erze big data. Człowiek. Biznes. Państwo.* Warszawa: PWN.
46. Szpunar, M. (2019). *Kultura algorytmów*. Kraków: Wydawnictwo ToC.
47. Tian, S. et al. (2019). Smart healthcare: making medical care more intelligent. *Global Health Journal, 3*, pp. 62-65.
48. Translatorzy, datanauci i samuraje danych (2018). Digital & More. Retrieved from https://digitalandmore.pl/translatorzy-datanauci-i-samuraje-danych/.
49. Volinim E. et al. (2019). *Global Human Capital Trends 2019 Deloitte,* New York: Deloitte Insights (pdf).
50. Wąs, A. et al. (2020). Use of Big Data for Assessment of Environmental Pressures from Agriculture Production. In: J. Paliszkiewicz (Ed.), *Management in the era of Big Data: Issues and Challenges* (pp. 137-152). London-New York: Taylor & Francis Group.

51. Yin, S. and Kaynak, O. (2015). Big Data for Modern Industry: Challenges and Trends. *Proceedings of The IEEE, Vol. 103, No. 2*, pp. 143-146.
52. Zysman, J., and Kenney, M. (2018). The Next Phase in the Digital Revolution: Intelligent Tools, Platforms. *Growth, Employment*, *Communication of The ACM, 61*, pp. 54-63.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

RISK MANAGEMENT ELEMENTS IN THE PRODUCTION OF A SELECTED AUTOMOTIVE PRODUCT

Andrzej PACANA[1*], Karolina CZERWIŃSKA[2], Paulina ZWOLENIK[3]

[1] Rzeszow University of Technology; Faculty of Mechanical Engineering and Aeronautics, Rzeszow, Poland; app@prz.edu.pl, ORCID: 0000-0003-1121-6352
[2] Rzeszow University of Technology; Faculty of Mechanical Engineering and Aeronautics, Rzeszow, Poland; k.czerwinska@prz.edu.pl, ORCID: 000-0003-2150-0963
[3] Ignacy Lukasiewicz Energy Policy Institute, Jasionka, Poland; 153281@stud.prz.edu.pl, ORCID: 0000-0001-6154-2194
* Correspondence author

Purpose: The study aimed to locate and identify weak areas in the technological process of the aluminium piston, where the occurrence of events with significant risk could interfere with its proper course and meet the customer's requirements.
Design/methodology/approach: One of the production lines on which the aluminium pistons are produced was chosen for the test. Risk identification within the process was carried out through the implementation of a simplified SWOT analysis, development of the process risk structure taking into account the identified opportunities and threats and development of a matrix for responding to key risks identified in the risk structure.
Findings: The three most significant risks were identified: failure to meet customer requirements, delays in delivery of castings, forgings, components and errors in monthly production plans, as well as increased process costs. The most effective actions concerning the risks under consideration turned out to be: drawing up detailed records in the description of the subject of the contract, as well as additional supervision and inter-operational controls and performing detailed analysis of the documentation before the beginning of the contract.
Research limitations/implications: In order to reduce the risks as part of the technological process, remedial actions and a response plan are proposed.
Practical implications: Future research will be carried out within the remaining technological processes within the company. The methodology presented should be applied to companies that are committed to responsible risk management.
Originality/value: The study is a useful material for manufacturing companies indicating a comprehensive methodology for identifying key risks within technological processes.

Keywords: SWOT analysis, response matrix, risk management, quality engineering, mechanical engineering.

Category of the paper: research paper and case study.

1. Introduction

The automotive industry is not officially classified according to PKD. Nevertheless, it is a separate branch, defined as a consequence of the automotive industry, considered to be as development. The automotive framework does not only include car manufacturing companies, but also organisations that create components for cars. According to the reports, this is an industry that is constantly developing and, like any other business, is subject to risks (Merkisz, 2009; Dąbrowski, Skrzypek, 2016; Wolniak, 2019; Sułkowski, Wolniak, 2013).

Despite its negative overtones, the word "risk" means a random event that can both weaken and strengthen the benefits of the process (Pacana, 2013; Czerwińska, Pacana, 2018). In the context of a manufacturing company it is referred to as a loss-making factor (Wolniak, 2015). Originally, risk studies were only aimed at determining the measure of uncertainty, together with an analysis of the probability of random events. Potential risks have been addressed through the use of redundancy, linked to increased costs. Examples of such a solution include increasing the dimensions of machine elements and engineering structures, increasing stockpiles or increasing the time reserve for task execution (Szomański, 2012; Serafin, 2013).

Risk management is treated in different ways. These include the division of duties and responsibilities of those involved in the production process, the establishment of rules for responding to adverse reactions and the definition of steps to eliminate or minimise the risk and consequently its effects. An extremely important aspect is to determine the probability of a risk occurring and its consequences through an analysis which includes a risk management matrix (Topczak, Patalas-Maliszewska, 2019).

The aim of the study was to locate and identify sensitive areas in the technological process of the aluminium piston, where the occurrence of events with significant risk could interfere with its proper course and meet the customer's requirements.

2. Risk management in the technological process

In the analysis of decision-making situations, taking into account the occurrence of risk, a result is obtained that is dependent on variables. The effect is not clear, but there is usually an indication of probable outcomes. From the point of view of the company and its activity, many risk categories can be distinguished (Wolniak, Skotnicka-Zasadzień, 2010). However, the most important ones concern financial, systemic and developmental areas of the organization. (Tarczyński, Mojsiewicz, 2001; Wolniak, 2011).

The current way of preventing and reducing the negative effects of risks is an activity that is called risk management. This solution reduces the possibility of adverse events by implementing preventive measures by prepares the necessary measures and establishes corrective methods to minimise the adverse effects of the peril. Risk management is one of the management techniques that rationalises decision making in case of uncertainty. This approach is considered to be the most effective – it minimises the economic expenditure of the company by reducing the probability of errors (Serafin, 2013; Pacana, 2018).

Risk management is a standardised technique, which is described in ISO 31000:2018. It refers to the organisation as a whole, but additionally discusses the processes implemented in it. The standard presents an iterative approach to risk management. The introduction of a process loop is aimed at an in-depth risk analysis which, through the skills and experience acquired, allows for revision of the process elements and controls at each stage. Repeated repetition of the technique allows to obtain the desired effect (Serafin, 2013; PN-ISO 31000:2018).

In standard 31000:2018, both the internal and external context of the organization are important, as well as the stakeholder who is equal to the participants in the organization. The parties include companies and individuals who work with the company and who are key to risk management by providing information, views or consultations. Communication at this level allows for the acquisition of the relevant information needed to make decisions (PN-ISO 31000:2018; Topczak, Patalas-Maliszewska, 2019).

Standardised risk management is based on three spaces. The first area concerns principles that include integration, structuring and comprehensiveness, customization, inclusion, dynamism, having the best information, paying attention to the human and cultural factor, also continuous improvement, through iteration. These provisions are intended to reflect the rationale behind risk management in an organisation. Another area for developing an informed understanding of danger is the risk management framework. These include a cycle that starts with risk surveillance and then goes on to design solutions, implement, evaluate and improve actions. The final space refers to the identification of the different stages of risk management (PN-ISO 31000:2018; Ząbek, 2019):

- establishing the context and extent of risks,
- risk identification,
- risk analysis,
- risk assessment,
- risk elimination,
- registration and reporting,
- communication and consultation,
- monitoring and review.

The risk management steps should be carried out systematically and iteratively, using stakeholder knowledge resources. It should contain information, supplemented by additional inquiries. The main purpose of identifying risks that may result in an organisation's inability to achieve its objectives is to find, identify and describe them (Kokot-Stępień, 2015; Topczak, Patalas-Maliszewska, 2019).

The main objective of risk assessment is to support the decision-making process by comparing the results of the analysis with established criteria in order to obtain areas for action. The occurrence of risk sometimes needs to be remedied, which is the process of dealing with peril. This process includes iterative formulation and selection of risk corrections, as well as planning and implementation of corrective actions, with appropriate assessment and decision making on the next steps. Important aspects that should be taken into account when undertaking risk repair are costs, inputs and potential dangers, which include eliminating the current danger in favour of a new irregularity. The following ways of correction can be distinguished (Majewska, 2011; Topczak, Patalas-Maliszewska, 2019):

- minimise risk-causing activities – avoid the risk,
- take or increase the risk,
- eliminate the source of the risk,
- update the probability and/or consequences,
- share the risk,
- decide to leave the risk.

An important element of risk management is monitoring and reviewing activities. Their purpose is to strive for process excellence, through supervision, reporting and communication with stakeholders. The information obtained allows for effective decision making, as well as control of actions, together with monitoring of management progress (Małyszek, 2015; Topczak, Patalas-Maliszewska, 2019).

The use of risk management models and techniques in firms must comply with the normative acts. The methods used in this solution are divided into quantitative (e.g. SWOT analysis) and qualitative (cataloguing risk factors) (Górski, Skorupka, 2011; Topczak, Patalas-Maliszewska, 2019).

3. Description of the analyzed technological process

The technological process is an essential part of the production process, which is directly related to changing the dimensions, shape, surface quality and physico-chemical properties of the processed product or determining the mutual position of units or parts in the product (Wodecki, 2011; Feld, 2009; Muhlemann et al., 2005). From this definition results the function of the technological process, which is to change the condition of the workpiece from the initial

state (semi-finished product or input material) to the final state – finished product (Szatkowski, 2008).

The technological process analysed refers to the technical operations necessary to produce an aluminium piston intended for light diesel vehicles. The input material of the technological process is aluminium alloy together with various alloying additions. The acceptance operation, i.e. inspection, is the basis for verifying the piston in terms of quality. The material structure, the appropriate properties and the shape of the workmanship or the dimensional accuracy of the product's surface are a prerequisite for its reception and correct installation in the engine crank system. Table 1 shows a shortened technological process, i. e. technological operations in which there is a change of physicochemical properties, shapes, the external appearance of the processed material to produce a diesel engine piston.

Table 1.
Shortened technological process of the piston in question

Operation number	Name operation	Device characteristics/station	Treatments
10	Casting	Semi-automatic position	- melting and finishing of the alloy - casting liquid alloy
20	Cleaning castings	Manual position	- removal of the gating system - rough cleaning - thorough cleaning
30	Heat treatment	Furnace	- heat treatment of castings
40	Turning	Okuma Lu15	- stamp the pistons coat and bottom
50	Extrusion	Varmo Clement	- coarse extrusion of the pin hole
60	Turning	Okuma Lcc15-2s	- turning the combustion chamber
70	Milling	Ernault ID2000	- valve milling
80	Turning	Cost	- turning of sealing channels - base turning
90	Extrusion	Frontor C1 FB	- extrusion of the pin hole on the finished
100	Chemical treatment	Tubalex i Dubuit	- phosphating process - graphitization process
110	Control	Checkpoint	- interoperable control - receiving control - final control
120	Installation	Mounting station	- seger and pin assembly - installation of sealing rings

Source: documents provided by the Federal Mogul Gorzyce. Unpublished materials, Gorzyce, 2014.

From the information contained in Table 1 concerning the course of the technological process, it results that the process of manufacturing the aluminium piston consists of 12 main technological operations under which appropriate technological operations are carried out. The illustrative presentation of the manufacturing process does not include inter-operational transport, quality control and storage.

4. Research methodology

Risk management provides an opportunity to assess the risk of production processes by identifying and categorising risk factors. The risk assessment of risk factors in the methodology was carried out according to the following steps:

Stage 1: development of a simplified SWOT analysis for the implementation of the technological process in the context of achieving a specific objective.

Stage 2: identification of opportunities and threats occurring within the implementation of the production process.

Stage 3: development of the process risk structure taking into account the identified opportunities and threats.

Stage 4: development of a response matrix to key risks identified in the risk structure.

Stage 5: development of a response plan.

Stage 6: monitoring of the process.

Stage 7: launch of a response plan.

Stage 8: assessment of risk management.

The presented next steps of the undertaken methodology will allow to improve the production process of aluminium pistons.

The survey was carried out in the fourth quarter of 2019 in one of the automotive companies based in the south-eastern part of Poland. One of the production lines on which the aluminium pistons intended for dogs' cars are produced was selected for the test. The tested production line operates in a 3-shift system.

5. Strategic process analysis of aluminium pistons

The risk management study was used to identify critical events with significant risk, which may disrupt the achievement of the main objective, which is to produce the pistons compliant with the client's requirements in the planned quantity on time.

In order to identify risk factors, a team of experts (composed of a production manager, a quality manager, a quality controller and a technologist) developed a simplified SWOT analysis for the implementation of the technological process in terms of achieving a specific objective – timely production of pistons, in the planned quantity and accordance with customer requirements (Table 2). The analysis made it possible to highlight the main internal strengths and weaknesses of the process, as well as its external sphere in the form of opportunities and threats. Based on the analysis, it was possible to identify internal opportunities and threats to the process implementation.

Table 2.
Simplified SWOT analysis

Strengths	**Weaknesses**
Knowledge of production processes	Large production area
Experienced staff	Underutilisation of production capacity
Versatility of employees	Large number of machine retooling within the process
Several decades of experience in piston production (Know How)	Poor communication between support departments
Involvement of employees (Kaizen)	Sudden increase in production plan
Standardisation of production (5S)	
Quality stability	
Continuous improvement (SPC, Kaizen, 5S)	
Opportunities	**Threats**
Reducing deficiency levels	High turnover of employees
Reduced cycle times	Delays in the production plan
Reduction of changeover times (SMED)	
Improving productivity through automation	Increased deficiency levels
Flexibility of production	Breakdowns
Improving employee awareness through internal and external training	Possible lack of crew
	Random events
Opportunities to launch new projects	Delays in the delivery of inputs
Increase in OEE	Disappearance/lack of media

Analysing the results of a simplified SWOT analysis, one can notice that the production process has more strengths than weaknesses, and there are more opportunities than threats in its environment. In this situation, process managers should build on their strengths to maximise the externalities of the process environment and make efforts to reduce or eliminate weaknesses in the process and prevent risks. Based on simplified SWOT analysis, a risk structure for the process was developed (Figure 1). This includes an element such as material resources/equipment, human resources/knowledge/training/skills, process input and output element and process indicators against which potential risks have been identified. The risk structure of the technological process also includes documents regulating its implementation.

In the risk structure, several risks were identified about the separate planes in the analysis, as well as the three most serious risks, which were: failure to meet customer requirements, delays in the delivery of castings, forgings, components and errors in monthly production plans, as well as an increase in process costs. The common feature of the presented threats is their high probability. This means that the specified qualitative, timing and cost risks also generate a high level of risk.

It is impossible and inefficient to include all identified activities in a risk management plan at the same time - mainly for time and financial reasons. Appropriate measures should therefore be taken which are most effective under the circumstances. To this end, risk response matrices should be used (Pritchard 2002).

<table>
<tr><td></td><td colspan="2">Risk</td><td></td></tr>
<tr><td>Material resources/devices</td><td rowspan="2">- Machine and equipment failures - Inappropriate tooling
- Quality/ quantity of castings/components
- Quality capacity of machines</td><td rowspan="2">- Staff qualifications
- Absence of employees
- Staff turnover</td><td>Human resources/ knowledge/training/skills</td></tr>
<tr><td>- Machinery
- Measuring and control equipment
- Castings, forgings, components
- Auxiliary materials
- Processing equipment
- Tools
- Media</td><td>- Staffing according to the skills matrix
- Staff experience and knowledge
- Training plan</td></tr>
<tr><td>Entrances</td><td colspan="2" rowspan="2">- Failure to meet customer requirements
- Delays in the delivery of castings, forgings, components
- Errors in monthly production plans
- Increase in process costs</td><td>Outputs</td></tr>
<tr><td>- Production plan
- SAP
- Replacement orders
- Production orders
- Control plan
- Customer requirements
- Castings, components
- Legal requirements
- Continuous improvement
- Shipping plans</td><td>- Customer requirements
- Continuous improvement
- Compatible pistons
- Customer satisfaction</td></tr>
<tr><td>Process indicators</td><td rowspan="2">- Exceeded execution and delivery deadlines
- Exceeded ratio of non-compliant products
- Customer complaint
- OEE ratio below target</td><td rowspan="2">- Outdated inspection plans/instructions
- Availability of CSR
- Availability of inspection plans, instructions, technical documentation</td><td>Documents/procedures/ instructions</td></tr>
<tr><td>- Timely implementation of the monthly plan
- Lack of working capacity indicator
- Number of pistons advertised (ppm)
- OEE</td><td>- Inspection plan
- Work instructions
- System procedures
- Visualisations
- Customer requirements
- Technical documentation
- Guides</td></tr>
</table>

Figure 1. The structure of the risks in relation to the individual elements of the piston process.

Figures 2-4 present matrices prepared based on the above analyses of threats to the implementation of the technological process of the aluminium piston and possibilities of counteracting them. The matrix in Figure 2 refers to threats that result in a qualitative risk, the matrix in Figure 3 to those that generate a scheduled risk, while the matrix in Figure 4 refers to those that generate a cost risk. In the columns of the matrix, there are presented actions allowing to limit the frequency of events generating the most significant risks – rows of the matrix. The plus (+) or minus (-) marking occurs at the intersection of columns and rows depending on whether the measure under consideration has a positive or negative effect on the risk factor under consideration.

Responsiveness / Threat	Additional supervision and inter-operational checks	Detailed provisions in the description of the subject of the contract	Detailed analysis of the documentation before starting the works	Frequent maintenance of machines and equipment	Repairs, maintenance	Course trening
Errors in technological documentation	+	+	+			+
Quality of castings and components	+	+	+	+	+	+
Number of castings and components	-	-	-	-	-	
Incompatible materials and component damage	+	+	+			
Incorrect machine tooling	+	+	+			+
Extension of the time for the execution of post-secondary technological operations	+	+	+	+	+	
Low level of reproducibility and repeatability of individual technological operations	-			-	-	-
The quality capacity of the machines				+	+	
Machine and equipment breakdowns				+	+	

Figure 2. Matrix for responding to quality risk in the piston process.

The presented analysis of the quality risk in the technological process indicates that the most effective measures to reduce this risk would be additional supervision and inter-operational controls, drawing up detailed records in the description of the subject of the contract and carrying out detailed analysis of the documentation before starting the contract.

Responsiveness / Threat	Additional supervision and inter-operational checks	Detailed provisions in the description of the subject of the contract	Detailed analysis of the documentation before starting the works	Frequent maintenance of machines and equipment	Repairs, maintenance	Training courses	Bonuses, awards
Errors in technological documentation	+	+	+			+	
Number of castings and components	-	-	-	-	-		
Incompatible materials and component damage	+	+	+				
Incorrect machine tooling	+	+	+			+	
Extension of the time for the execution of post-secondary technological operations	+	+	+	+	+		
Delays in the supply of materials		+	+			+	
Machine and equipment breakdowns				+	+		
Machine collisions	+	+	+			+	
Absence of employees						-	-
Staff turnover						-	-

Figure 3. Timetable risk response matrix in the pigging process.

Concerning the scheduling risk (Figure 3), it has been noted that the most important contribution to preventing the risks is made by drawing up detailed records in the description of the subject of the contract and carrying out a detailed analysis of the documentation before starting the contract. On the other hand, the most effective way to reduce the cost risk in the technological process (Figure 4) was to draw up detailed records in the description of the subject of the contract, as well as additional supervision and inter-operational controls and detailed analysis of the documentation before starting the contract.

Responsiveness / **Threat**	**Additional supervision and inter-operational checks**	**Detailed provisions in the description of the subject of the contract**	**Detailed analysis of the documentation before starting the works**	**Frequent maintenance of machines and equipment**	**Repairs, maintenance**	**Training courses**
Errors in the technological documentation	+	+	+			+
Number of castings and components	-	-	-	-	-	
Incompatibility of materials and damage to components	+	+	+			
Incorrect equipment of machines	+	+	+			+
Extending the time of execution of individual technological operations	+	+	+	+	+	
Failure of machines and equipment				+	+	
Collisions of machines	+	+	+			+
Change in the scope of the customer's order		+				

Figure 4. Piston process cost risk response matrix.

The response plan relating to the riskiest events (quality risk event: failure to meet the customer's quality requirements, schedule risk: delays in the delivery of castings, forgings, components and errors in monthly production plans, cost risk: an increase in process costs) has carefully defined responsibilities and specific actions. The most effective actions concerning the risks under consideration turned out to be: drawing up detailed records in the description of the subject of the contract, as well as additional supervision and inter-operational controls and performing detailed analysis of the documentation before the beginning of the contract. In addition, the corrective action in the scope of failure to meet the quality requirements of the customer is to consider the complaint, compensation and delivery of quality compliant products. In the event of errors in monthly production plans, the production plan should be immediately corrected in terms of adequacy to the production situation and the delivery schedule and possibly corrected. In case of delays in the delivery of piston components, it is necessary to use the emergency stock of components and change the supplier.

As a precautionary measure against the most serious risks in the aluminium piston technological process, it was recommended to perform additional checks on the compliance of the variables taken into account with the actual state of affairs and their correctness. To ensure that the quality requirements of the customers are met, it is recommended to use job instructions and continuous monitoring of the process within the workstations and, in justified cases, to use quality management instruments following the procedures operating in the company. To prevent delays in the delivery of piston components, periodic supplier evaluations should be used.

6. Conclusion

The concept of risk within the implementation of technological processes is most often used in the aspect of risk management, which involves taking actions to reduce the probability of its occurrence, i. e. to protect against possible negative effects. The process risk analysis presented in the study makes it possible to identify, classify, measure and define methods of responding to situations with significant risk.

The study aimed to locate and identify weak areas in the technological process of the aluminium piston, where the occurrence of events with significant risk could interfere with its proper course and meet the customer's requirements. The analysis of the risk estimation made it easier to identify and at the same time to determine the size of losses in case of their occurrence. Reducing the risk associated with disruption of the process is possible thanks to effective risk management in the company, within the scope of which it is necessary to distinguish identification, planning, decision making and controlling the level of risk so that it is at an acceptable level. Therefore, the identification of actions to prevent the occurrence of the most serious risks can be considered the most important stage of risk reduction, which is made possible by the implementation and analysis of the response matrix. In the study, the most effective actions with regard to the risks under consideration turned out to be: drawing up detailed records in the description of the subject of the contract, as well as additional supervision and inter-operational controls and performing detailed analysis of the documentation before starting the contract.

The risk assessment should be carried out once or twice a year. This would allow for the identification of new forms of threats and the maintenance of an acceptable level of risk within individual processes carried out in the company.

References

1. Czerwińska, K., Pacana, A. (2018). Porównanie dokładności określania poziomu ryzyka zawodowego na stanowisku przemysłowym. *Zeszyty Naukowe. Quality. Production. Improvement, No. 1(8)*.
2. Dąbrowski, K., & Skrzypek, K. (2016). Wykorzystanie zintegrowanych systemów informatycznych w polskich przedsiębiorstwach produkcyjnych z branży metalowej i automotive. *Zarządzanie Przedsiębiorstwem, 19(4).*
3. Dokumenty udostępnione przez Federal Mogul Gorzyce (2014). Materiały niepublikowane. Gorzyce.
4. Feld, M. (2009). *Podstawy projektowania procesów technologicznych typowych części maszyn.* Warszawa: WNT.
5. Górski, M., & Skorupka, D. (2011). Wybrane metody identyfikacji czynników ryzyka na tle cyklu życia projektu i budowlanego procesu inwestycyjnego. *Zeszyty Naukowe*. Wyższa Szkoła Oficerska Wojsk Lądowych im. gen. T. Kościuszki.
6. Kokot-Stępień, P. (2015). Identyfikacja ryzyka jako kluczowy element zarządzania ryzykiem w przedsiębiorstwie. *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia (74, T. 1, Rynek kapitałowy, wycena przedsiębiorstw, inwestycje)*.
7. Majewska, J. (2011). Analiza wpływu obserwacji ekstremalnych na pomiar ryzyka. *Modelowanie Preferencji a Ryzyko, '11*.
8. Małyszek, E. (2015). Wybrane aspekty ryzyka w zarządzaniu łańcuchem dostaw. In: R. Knosala (ed.), *Innowacje w zarządzaniu i inżynierii produkcji*.
9. Merkisz, J. (2009). The automotive market in the time of global economic crisis. *Silniki Spalinowe, 48*.
10. Muhlemann, A.P., Oakland, J.S., Lockyer, K.G. (2005). *Zarządzanie. Produkcja i usługi.* Warszawa: PWN.
11. Pacana, A. (2013). *Wdrażanie, auditowanie i doskonalenie systemów zarządzania bezpieczeństwem i higieną pracy zgodnych z PN-N-18001.* Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
12. Pacana, A. (2018). Supervision of measuring equipment based on risk management and ISO 9001. *Production Engineering Archives, 21(21).*
13. Pałubicki, S., & Kukiełka, K. (2017). *Zarządzanie jakością w wybranym procesie produkcyjnym z zastosowaniem metody FMEA*. Autobusy: technika, eksploatacja, systemy transportowe.
14. PN-ISO 31000: 2018 – Zarządzanie ryzykiem – Zasady i wytyczne.
15. Pritchard, C.L. (2002). *Zarządzanie ryzykiem w projektach. Teoria i praktyka.* Warszawa: WIG-PRESS.

16. Serafin, R. (2013). Koncepcja systemu adaptacyjnego zarządzania ryzykiem dostaw w procesach produkcyjnych. *Zarządzanie przedsiębiorstwem, 16(3)*.
17. Sienkiewicz, P. (2005). Analiza ryzyka w zarządzaniu projektami systemów. *Problemy techniki uzbrojenia, 34*.
18. Sułkowski, M., Wolniak, R. (2013). Przegląd stosowanych metod oceny skuteczności i efektywności organizacji zorientowanych na ciągłe doskonalenie. *Zeszyty Naukowe. Organizacja i Zarządzanie, z. 67*. Politechnika Śląska.
19. Szatkowski, K. (2008). *Przygotowanie produkcji*. Warszawa: PWN.
20. Szomański, B. (2012). *Znaczenie zarządzania ryzykiem*. Materiały III Ogólnopolskiej Konferencji pn. Dobre praktyki doskonalenia zarządzania – zarządzanie ryzykiem.
21. Tarczyński, W., & Mojsiewicz, M. (2001). *Zarządzanie ryzykiem: podstawowe zagadnienia*. PWE.
22. Topczak, M., & Patalas-Maliszewska, J. (2019). Model oceny poziomu ryzyka w przedsiębiorstwie produkcyjnym. *Zarządzanie Przedsiębiorstwem, 22(4)*.
23. Wodecki, J. (2011). *Podstawy projektowania procesów technologicznych części maszyn*. Gliwice: Wydawnictwo Politechniki Śląskiej.
24. Wolniak, R. (2007). Unikanie niepewności a wdrażanie koncepcji zarządzania jakością. *Problemy Jakości, Nr 5*.
25. Wolniak, R. (2013). NW kierunku ISO 9001:2015. *Problemy Jakości, T. 45, Nr 02*.
26. Wolniak, R. (2019). Downtime in the automotive industry production process – cause analysis. *Quality, Innovation, Prosperity, 2*, pp. 101-118.
27. Wolniak, R., Skotnicka-Zasadzień, B. (2010). *Zarządzanie jakością dla inżynierów*. Gliwice: Wydawnictwo Politechniki Śląskiej.
28. Ząbek, J. (2019). The role of the organization's leadership in risk management according to norm ISO 31000: 2018. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 3(43)*.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

COOPETITION AS A BUSINESS STRATEGY THAT CHANGES THE MARKET STRUCTURES: THE CASE OF LONG-DISTANCE PASSENGER TRANSPORT MARKETS IN POLAND

Andrzej PESTKOWSKI

Wrocław University of Economics and Business, Faculty of Management, Computer Science and Finance;
andrzej@pestkowski.pl, ORCID: 0000-0002-5778-8420

Purpose: This paper concerns the phenomenon of two-way causality effect between market structures and coopetition occurrence. It is assumed that certain characteristics of an existing market structure implicate the decision to deploy the strategy of coopetition by companies. Moreover, the opposite effect might be expected, that is coopetition between market rivals changes the market structure on which it was implemented in the first place. In the paper various aspects and approaches of the abovementioned phenomena have been considered.
Design/methodology/approach: The author investigates the events, motives and values that lead companies to deploy the coopetition strategy. Furthermore, the theoretical and conceptual bases for the effect of the coopetition impacting the change of market structures have been provided. A wide analysis of managers' decision resulting from the occurrence of certain strategic events has been conducted with the use of comparison matrixes. Finally, in the last part of the study the author's empirical research on two passenger transport relevant markets has been presented.
Findings: Certain market strategies characteristics affected companies to deploy the coopetition strategy and the other way round, the strategy changed the market structure in the result of competitors' decision. Taking into consideration all of the theoretical, conceptual and empirical aspects raised throughout the course of the research, both hypotheses have been confirmed.
Research limitations/implications: The author has used mostly qualitative methods such as observation, conceptualization or cause and effect analysis in which the natural existence of errors might occur. To test the hypotheses the researcher had to create assumptions and models that represent what should happen if every aspects successfully appear. It might be expected that some other variables affected the market structures during the research that the author was not aware of. Thus, one should interpret the results with the inclusion of the ceteris paribus.
Practical implications: Instead of applying the high cost strategies such as price wars or demand seeking, one might use the coopetition to create added values with little or even zero cost. What is more, this strategy may result in higher pricing power, higher market size or better level of innovation**.**
Originality/value: The publication discusses the coopetition phenomenon from the innovative perspective of two-way causality (influence) between market structures and coopetition itself while most of the studies concern only one-way cause and effect between those variables. Conclusions drawn from this paper can be useful for entrepreneurs and their decision making process.

Keywords: coopetition, market structure, business strategy, competitive strategy, passenger transport.

Category of the paper: Research paper, Viewpoint.

1. Introduction

The main purpose of management science is to provide entrepreneurs with information on how to run their companies or firms they are in the lead of more effectively (Drucker, 1955). One of the most useful concepts from the business owners perspective is business strategy (Jarzabkowski, 2005, pp. 29-31). Much research has been carried out in this area with the effect of at least dozens of different business strategies (Chrisman et al., 1988; Peng, 2000, pp. 15-20). Yet over the years, the most recognizable competitive strategies have been narrowed down into three main approaches. One approach has been established on the basis of price or non-price competition which result in corresponding competitive advantages (Belleflamme, 2010, pp. 31-34). Another popular theory was advanced by Porter (1998) with his groups of generic strategies that include: differentiation, overall cost leadership and focus strategy. On the other hand one might observe the group of strategies based on the pressure of each competitor on the level of competition rivalry (Grimm et al., 2006, pp. 44-47). More precisely, companies might act in three different ways depending on the competitive intensity. Firstly, firms can compete in full manner in almost every possible way. Secondly, they might create reciprocity cooperation in some parts of the business and maintain competition in the other ones. Finally, a company's strategy can be settled on full cooperation switching the competitive rivalry to the partnership agreements. This paper concerns the last two of the abovementioned approaches and in the final section it analyses them on the example of long-distance passenger transport markets in Poland. It investigates the case when companies decide to sign cooperation agreements in the fields that are normally within the scope of rivalry. Resulting from these decisions the specific business strategies of coopetition might be observed. Firms decide to cooperate instead of compete to achieve both-sides added value especially when it comes to the customers perception of their products (Fernandez et al., 2014). Due to the possible risks of cooperation with market rivals the strategy of coopetition seems to be a rather rare choice of business strategy. In this paper an attempt is made to shed a new light on that approach by examining the real markets evidence of using this kind of strategy despite the risk it might entail. It is also of key importance to determine the possible results of adopting this strategy especially for the market structure and the intensity of the competition. The coopetition concept shall be dealt with in more details in two sections: the theoretical one with an emphasis on the comparison of business strategies as well as the empirical one in which the research outcomes concerning competitive strategies within long-distance passenger transport markets will be demonstrated.

2. Theoretical background and hypotheses

This section will broaden the deliberations about business strategies presented in the introduction. The focus shall be put on the theoretical issues that might bring the better understanding of the coopetition examples which are included in the empirical part. Firstly, it is necessary to properly characterize the concept of coopetition, which is why various approaches and definitions will be presented. The author also concentrates on the coopetition comparison to the similar strategies based on the partial cooperation. Basic characteristics and conditions to apply coopetition on determined markets shall be presented as well. In this section the author of this paper puts forward an innovative conceptualization of two-way causality between market structures and coopetition where both phenomena affect each other before and after each of them occurs.

2.1. To rival or to cooperate: coopetition among the partnership forms of company competition

Constantly changing business environments with high intensity of industry rivalry has led the strategy and management scholars to establish within the years a completely new business strategy of coopetition. However, due to the high popularity of this concept on the real markets, much discrepancy in the definitions, characteristics, conditions and models has been observed.

The first well-known evidence of business usage of coopetition as well as the first coining of the term are assigned to Ray Noorda when he was working for Novell company in the 1980s (Walley, 2007). He has described the cooperation between Novell and 3Com as an alliance among two technology competitors that develops common standards to grow the overall market for their products (Bouncken et al., 2015). Through several years the concept has evolved in the domain of game theory. Consequently, Brandenburger and Nalebuff (1996) have presented groundbreaking research on coopetition that led to their best-selling book and widely cited publications. Their view on the coopetition is based on value-net game theory where players aim to create a larger market size by cooperating to increase benefits for all players involved in the partnership and subsequently divide the larger market among the players by competing. Thus, rivals decide to cooperate in the part of increasing demand volume and at the same time they compete in the part of dividing the supply understood as sales value. The abovementioned theory has been recognized as the *actor school of thought* due to the much focus on players (actors), rather than on acts. Yet another approach was presented by Bengtsson and Cock (2000) who proposed the refreshed research on coopetition which is known as the *activity school of thought*. In their understanding coopetition is a dyadic and one to one relationship between a pair of firms, meaning that firms cooperate in activities far from their customers, while simultaneously competing in activities close to the customers. Furthermore, various discussions appeared from both schools' perspective resulting in at least twenty new definitions and

hundreds of empirical evidences (Bengtsson and Raza-Ullah, 2016; Gnyawali and Charleton, 2018; Ritala, 2012). For the purpose of this paper the author uses these definitions of coopetition that focus on the business use case and strategic management. One of the recent most cited studies on the *actor school of thought* is the work of Pathak, Wu and Johnston (2014). From their perspective firms (actors) collaborate in a supply network where they develop relational strategic games in which cooperation and competition between one another occurs. Their relative force in the network affects the level of cooperation and rivalry in the network. However, much more studies that indicate the coopetition as a business strategy on the real industry cases have been conducted in the domain of activity school of thought. Various views (Fernandez et al., 2014; Gnyawali, and Park, 2011; Ho, and Ganesan, 2013; Raza-Ullah et al., 2014) emphasize coopetition as a strategy that indicates simultaneous cooperation and competition between two or more firms with an aim to provide more valuable product from the customer's perspective. This strategy, in turn, causes higher revenue for each cooperating rival comparing to the strategy based only on competition (Ritala, 2012). With regard to the presented approaches the author assumes that whenever the term 'coopetition' is used, it shall be understood as the business strategy in accordance with the facets of the *activity school of thought*.

One may observe other forms of reciprocity cooperation in competition environments. The importance of such an overview is to establish the differences between coopetition and other partnership forms of rivalry to avoid any misconceptions. Thus, it is essential to consider such covenants as companies: cooperation agreement, alliance and merge and how they are related to the concept of coopetition.

To begin with, companies may establish a simple cooperation agreement on any segment of their business, i.e. R&D, logistics, production, fully preserving their corporate identity. In line with that, cooperation occurs when two or more firms voluntarily arrange common processes between them involving exchange, share, or development of products, technologies, or services (Gnyawali, and Charleton, 2018). This kind of cooperation might evolve in more complex directions by creating a separate joint-venture entity that brings added value to both sides of the agreement. In such a case the form of alliance is enacted (Varadarajan, and Cunningham, 1995). Nevertheless, a joint-venture company is not the only kind of alliance. As for alliances, the other most cited variations are: equity strategic alliance, outsourcing or product licensing (Das, and Teng, 2000; Galloway et al., 2017). Therefore, the majority of alliances involves the shared equity meant by capital investments for the specific purpose of cooperation. The cooperators usually maintain the competition intensity on a regular basis. Thus, one might define strategic alliance as an interorganizational cooperative strategy that connects specific resources and skills by the cooperating organizations in order to achieve common goals, as well as goals specific to the individual partners, with the investment of shared capital especially via joint corporation (Varadarajan, and Cunningham, 1995). When, in turn, the cooperation requires high amount of capital investments or it is essential to create "less risk

bond", the merger might occur (Das, and Teng, 2000; Antelo, and Peón, 2019). This type of strategic partnership is the final step of cooperation between two or more competitors when the rivalry on the market ceases. As a result, merged companies connect their resources as well as customer base, or in other words their market share, into one business entity. Taking into account the abovementioned types of cooperation agreements one could indicate the correlations between them and characterize the coopetition itself. As pointed out earlier, coopetition often appears in the form of strategy that integrates business processes of two or more competitors to create a new, higher value. Competition in these processes is no longer in existence. However, the rest of business is kept in an unchanged state (Bengtsson, and Kock, 2014). Thus, coopetition cannot be implemented in the form of any merger or collusion via separate equity joint-venture partnership because of the mutual exclusion of rivalry and cooperation (Antelo, and Peón, 2019; Bouncken et al., 2016). Therefore, whenever companies decide to create a new entity with one shareholding or an ownership structure to compete on the market one shall not consider it as coopetition but rather a strategy of full cooperation or strategic collusion (Gnyawali, and Charleton, 2018; Grimm et al., 2006; Hamel, 1991). Nevertheless, coopetition might exist in many legal forms of cooperation such as alliances, partnership agreements or joint venture on the condition that such partnership maintains some intensity of competition especially by disengagement of shareholding within parent companies (Bouncken et al., 2016). As a result a company receives pure strategic engagement of coopetition with a high level of liberality for each partner as well as the added values that will be considered in the following section.

2.2. Coopetition between rivals impacts their value chains

Much interesting research with empirical evidences has been carried out in the area of value-added theory as a result of implementing the coopetition strategy. It is widely accepted by many researchers that through coopetition partners receive the exchange of technological, financial, marketing, or other managerial skills (Bengtsson, and Kock, 2014; Pathak et al., 2014; Song, and Lee, 2012; Gnyawali, and Park, 2011; Brandenburger, and Nalebuff, 1996; Niemczyk, and Trzaska, 2020). What is more, the specialization of a certain part of the business has been observed (Gnyawali, and Park, 2011; Mariani, 2016; Rusko, 2011; Tether, 2002; Wu, 2014; Yami and Nemeh, 2014). This is possible due to the access to new resources that create new availabilities to run business more efficiently in at least one of the following aspects: costs, production efficiency, know-how, R&D or soft skills like marketing, HR, PR (Das, and Teng, 2000). Furthermore, it has been established that these aspects are frequently of simultaneous occurrence, which allows companies to obtain a very desirable effect of synergy. These approaches also highlight the fact of sharing the business risk between the partners of cooperation (Quintana-Garcia, and Benavides-Velasco, 2004). The phenomenon of value creation within the cooperating companies might be presented in Porter's concept of value chain (1998, pp. 48-52). The value chain, depicted in Figure 1, disaggregates a firm into its essential

strategic activities in order to acknowledge the distribution of costs and the existing and potential sources of differentiation. A company may achieve competitive advantage by performing these activities more cheaply, quickly or qualitatively better than its competitors.

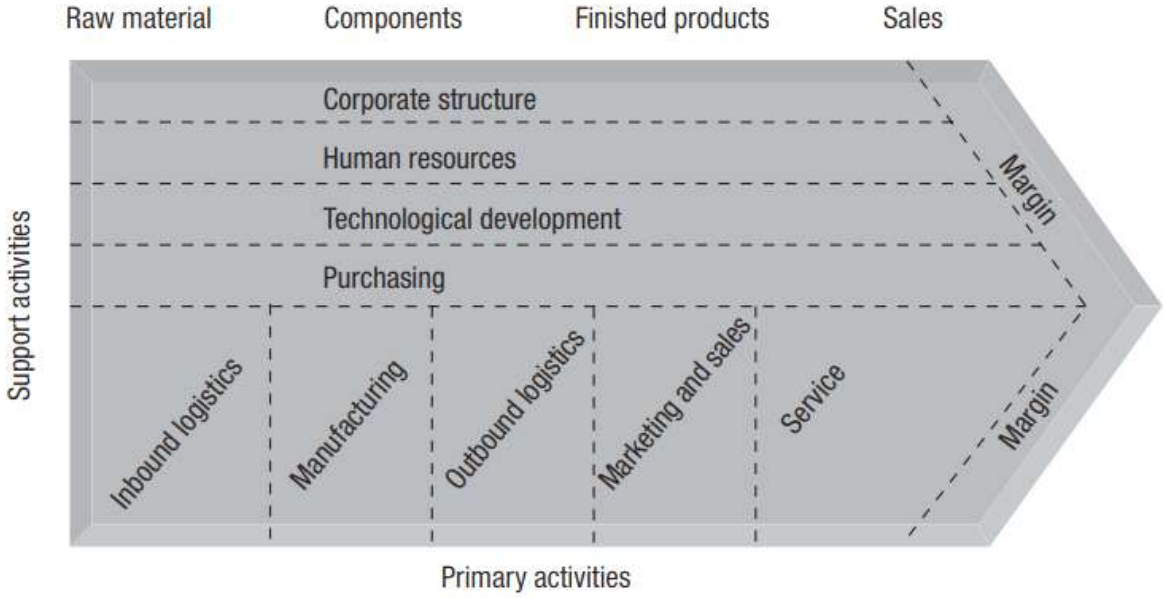


Figure 1. The value chain model. Source: (Karlöf, and Lövingsson, 2005, pp. 389-391).

This simple and yet very accurate model illustrates where the margin comes from in most of the businesses. One should examine the phenomenon of coopetition strategy in line with this approach by analyzing the possible impact on each of the activities within the value chain. Moreover, it may provide the answer to the question whether coopetition brings any added value to its members. It is assumed that through the established coopetition either a product's final unit cost will be lower or the quality or effectiveness of value chain activities will rise (Bouncken et al., 2015; Brandenburger, and Nalebuff, 1996). These effects might occur by exchange of one or more of the following resources: human, financial or physical capital, rare materials or components, knowledge, innovations (patents, know-how) or unique, effective processes (Kotler, and Keller, 2012, pp. 221-244; Grimm et al., 2006, pp. 44-48). However, to make it happen, the basic rule of coopetition strategy, that is the rivalry suspension, must be established (Bengtsson, and Kock, 2014). The lack of competition in gathering of some of the indicated resources may result in a better performance of each partner considered as higher margin. Increasing the level of margin is possible by virtue of greater effectiveness in resources processing.

2.3. Two-way causality between market structures and coopetition

This section concerns the theoretical aspects of the issue mentioned in the title, namely the causes and effects of coopetition on the market structures. The author assumes that between these two variables one may observe the effect of two-way causality. It is a term used to define certain economic correlations or relationships and it occurs when a predictive variable is

dependent on the variable of prediction (Pearl, 2000; Schmit, and Phelps, 1985). An accurate illustration of two-way causality is the relationship between demand and price meant as a function of price. According to the assumptions it is in fact a two-way relationship for the reason that price is also a function of demand, that is to say, price (P) is a function of demand: P = f(D); and demand (D) is a function of price; D = g(P). In the light of the aforementioned findings the same relationship might be observed within market structures and coopetition. Therefore, two main hypotheses of the following research can be formulated:

H1) Certain characteristics of an existing market structure implicate the decision to deploy a coopetition strategy by companies operating in this market.

H2) The occurrence of the coopetition strategy implicates another effect in the opposite way; coopetition between market rivals changes the market structure on which it was implemented in the first place.

Thus, such two events, represented by hypotheses H1 and H2, that appear one from another and one after another demonstrates the two-way causality phenomenon. Due to the lack of calculable variables these hypotheses are not presented with a mathematical equation, but instead they are illustrated with a model created by the author of this paper (Figure 2).

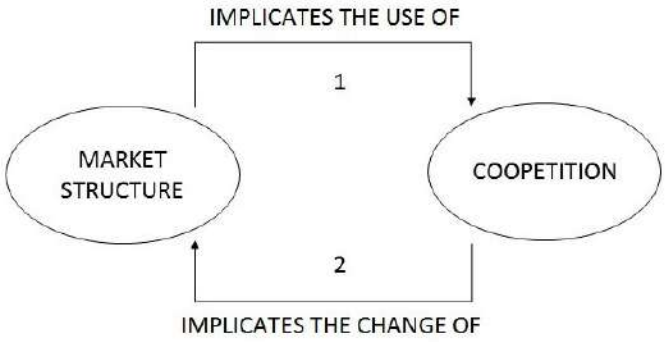


Figure 2. Two-way causality model that represents the research hypotheses. Source: Author's work.

3. Methodology and data

The research methodology is based mainly on the pragmatist approach with a focus on the operationalization of many concepts introduced in the paper. The methodology of non-participant observation as well as strictly defined cause and effect relationship analysis has been used as well. The empirical qualitative study with the support of numerical data has been conducted by the methods of nonprobability sampling, systematic reviews and systematic data collection.

3.1. Study aims and objectives

The possible reasons to deploy coopetition strategy from the perspective of particular market structures and its characteristics shall be dealt with in the following sections. It is also of key importance to establish the presupposed factors of influence of market structures on deploying the coopetition strategy and contrarily the influence of coopetition strategy on changing the market structures. It is also crucial to discover and test these assumptions on the empirical evidence. Thus, the aims of the study as well as the methods of explanations are multithreaded. Firstly, the study attempts to identify and describe the characteristics of market structures that might have an impact on deploying the coopetition strategy. Secondly, these characteristics will be cross-checked with certain strategic events that may also lead to occurrence of coopetition strategy within indicated market structures. Moreover, the model's assumptions of coopetition influencing the market structures will be considered. On top of that, the author provides an empirical study in which the attention is especially focused on the presupposition formulated in the previous steps of the study. Therefore, the data section includes the author's six-year long research on coopetition occurrence within relevant markets of long-distance passenger transport markets in Poland as well as in the whole industry.

3.2. Particular market structures as a requirement for coopetition occurrence

In management sciences the causes and motives of deploying the coopetition strategy between companies have already been concerned in various studies (Belleflamme, 2010, p. 65; Besanko, 2013, p. 33; Niemczyk, and Trzaska, 2020; Rusko, 2011). One might get acquainted with such theories as mentioned earlier in the paper: value-added with regard to the firm's value chain or a resource-based view. Additionally, the research has also demonstrated that companies decide to deploy the coopetition strategy because they are willing to expand their market position meant as the size of their customer base (Ann Peng et al., 2018). To do so, companies try to improve their production or distribution or marketing processes. In the result of coopetition the effects of i.e. wider products distribution, faster production or better brand awareness might be expected (Gnyawali, and Charleton, 2018). In that, the purpose of increasing the market size might be achieved (Certo et al., 2006). These arguments are undoubtedly valid and the author uses them to support his hypotheses. However, it is not the only approach one should to consider. The author suggests to investigate the issue of coopetition strategy not only from the perspective of research in management sciences but also from the ones in the domain of economics. This approach is certainly needed to properly consider the two-way causality effect between market structures and coopetition for the reason of the origination of the market structures theories in the science of economics. Economists have carried out an exceptional work on the characteristics of each market structure especially in the terms of product standardization, number of competitors, price fixing, intensity and types of competition and last but not least the market share of largest firms (Bernanke et al., 2009;

Besanko, 2013, pp. 50-120; Krugman, and Wells, 2013, pp. 30-65). The author will make use of these concepts, precepts and interrelations to describe the abovementioned two-way causality in more details, from the perspective of two sciences: management and economics. To establish the most important factors to be analysed within the market structures theories one might first look for the reasons that companies change their business strategy (Hitt et al., 2015, pp. 321-356; Arora et al., 2004; Yip, 2004). The answers have been deducted by the management sciences and the most cited individual motives are: (1) the strategic objectives are not achieved in the certain amount of time (i.e. increasing companies value, widening the market size, launching exact amount of new products); (2) demand is not satisfactory or it is decreasing; (3) margin is decreasing, that is to say, the price of the product goes down or the unit cost of product rises with no implication on the price increase; (4) the level of innovation is not satisfactory; (5) the competitive advantages start to disappear; (6) the intensity of competition is too high. According to these motives, one shall devote closer attention to the following aspects of market structures: (1) competition intensity measured by the degree of monopoly (pricing) power; (2) typical number of competing firms; (3) level of product differentiation; (4) basic type of the competition (price or non-price); (5) level of boundaries to enter the market for potential competitors.

Taking into consideration both approaches the author has carried out an analysis of the theoretical possibility to deploy the coopetition strategy between companies operating within a particular market structure facing strategic events as indicated earlier. First of all, the comparison matrix (A) of important market structures characteristics has been conducted (Table 1), on the basis of the literature review, the matrix (B) of coopetition occurrence in the face of specific strategic events has been established (Table 2).

Table 1.
Comparison matrix (A) of important market structures characteristics

Characteristic / **Market type**	**Monopoly**	**Oligopoly**	**Monopolistic competition**
Degree of monopoly (pricing) power	Very high	High	Low to medium
Typical number of competing firms	1	2-6 Depending on HHI index	>6, Mostly big number of small companies
Level of product differentiation	Unique product without close substitution	Differentiated	Differentiated
Basic type of competition	High by price (mostly as entry barriers) Low by non-price	High by price, Medium by non-price	Medium by price, High by non-price
Level of boundaries to enter the market	Very high	High	Low to medium

Source: author's work based on (Bernanke et al., 2009, pp. 55-76; Krugman, and Wells, 2013, pp. 44-65; Varian, 1992, pp. 23-32; Dixit, and Stiglitz, 1977; Stigler, 1964).

Table 2.
Matrix (B) of coopetition occurrence in the face of specific strategic events

Strategic event	Coopetition occurrence	Coopetition occurrence in monopoly conditions	Coopetition occurrence in oligopoly conditions	Coopetition occurrence in monopolistic competition conditions
Strategic objectives are not achieved in the certain amount of time		POSSIBLE	POSSIBLE	NOT POSSIBLE
Demand is not satisfactory or it is decreasing		NOT POSSIBLE	VERY POSSIBLE	VERY POSSIBLE
Margin is decreasing (high cost or lower prices)		NOT POSSIBLE	VERY POSSIBLE	POSSIBLE
The level of innovation is not satisfactory		POSSIBLE	VERY POSSIBLE	NOT POSSIBLE
The competitive advantages are getting lost		NOT POSSIBLE	POSSIBLE	NOT POSSIBLE
The intensity of competition is too high		NOT POSSIBLE	VERY POSSIBLE	POSSIBLE

Source: author's work based on (Besanko, 2013; Hitt et al., 2015).

According to the characteristics presented in Matrix (A) the possible impact of each variable on the possibility of coopetition occurrence should be considered. The basic and first assumption is to verify whether any characteristic of market structures puts a pressure on managers to look for changes in their business strategy with the special focus on coopetition. This method is used regardless of the abovementioned approach from the management sciences. Undoubtedly, these established consequences of strategic events usually guide companies to change their business strategy but the question posed in this paper is whether the market structure characteristics affect these choices too (Peng, 2000; Yip, 2004). This phenomenon is still not clear due to the lack of such cross-check studies in the literature even if it is necessary to properly consider the occurrence of coopetition in a result of certain strategic events (Bengtsson, and Raza-Ullah, 2016; Besanko, 2013; Johnson et al., 2009). Thus, the author has performed such an analysis with the result of matrix (B) with three available answers: NOT POSSIBLE; POSSIBLE; VERY POSSIBLE. The answers have been given on the dyadic presumptions in which companies, by managers' decision, face the crucial strategic issues and that they simultaneously act on particular market structure: monopoly, oligopoly or monopolistic competition. The perfect competition market structure has been left aside in this research due to a very low business use case.

3.3. The future impact of coopetition on market structure

Assuming that only two competitors operating on the particular of the aforementioned market structures apply the business strategy of coopetition, the change of the market structure within which they operate might be expected. In this case the issue of change should be considered especially as the differentiation in terms of: (1) the number of actual competitors operating in the market; (2) price power of each competitor. By examining the change of any of those two variables it is possible to analyse the actual change of whole market structure (Besanko, 2013, pp. 233-236). Thus, there is some probability that due to occurrence of coopetition strategy between two rivals or one rival and a potential competitor, the market structure will change towards a different market structure (i.e. oligopoly into monopoly or contrarily monopoly to oligopoly). This kind of approach in the paper has been established on the basis of economics theories particularly the competition theories originated from the game theory (Bernanke et al., 2009, pp. 231-255; Besanko, 2013, pp. 101-132; Hitt et al., 2015, pp. 231-245). The theories of competition have brought up tremendous contribution to the possible explanations of companies moves fulfilled by managers' behaviour in the result of appearance of crucial strategic event. Thus, the object of the analysis are the companies operating on the market with the focus on two rivals that has deployed the coopetition strategy. Therefore, the analysed event (action) is the strategic move of these two companies and the analysed effect (reaction) is the final decision to abandon or expand the competition between them. The managers reaction that are considered in the study are as follows: (1) decision to maintain the long-term coopetition and by that the rivalry too; (2) decision to switch from coopetition to almost full cooperation so that the actual competition is abandoned; (3) decision to change the relevant market or industry due to high intensity of rivalry in spite of the coopetition occurrence. In the result of such cause and effect analysis the comparison matrix (C) has been prepared (Table 3). The strategic events that have been revealed during the process of literature review appeared in this matrix as a hot-spot to deploy the coopetition strategy as it was concerned in matrix (B). However, in that part answers represent the possible long-term effect meant as a significant change to the market structures resulting from coopetition occurrence between two rivals (potential rivals in case of monopoly).

Table 3.
Matrix (C) of various long-term effects of coopetition occurrence on the market structures

Two rivals (or potential rivals) deploy coopetition due to strategic event of:	Within the market structure of:	Monopoly	Oligopoly	Monopolistic competition
		With the long-term effect (change) to market structure of:		
Strategic objectives are not achieved in the certain amount of time		POSSIBLE DUOPOLY CREATION	HIGHER PRICING POWER	NONE
Demand is not satisfactory or it is decreasing		NONE	MINUS 1 COMPETITOR	HIGHER PRICING POWER
Margin is decreasing (high cost or lower prices)		NONE	MINUS 1 COMPETITOR	HIGHER PRICING POWER
The level of innovation is not satisfactory		HIGHER PRICING POWER	HIGHER PRICING POWER	NONE
The competitive advantages are getting lost		NONE	HIGHER PRICING POWER	NONE
The intensity of competition is too high		NONE	MINUS 1 COMPETITOR	MINUS X COMPETITORS

Source: author's work.

4. Data

This section sheds a new light on the issue of two-way causality by examining the hypotheses from the perspective of real evidence of coopetition strategy occurrence. The objects of author's analysis are long-distance passenger transport relevant markets in Poland as well as the industry itself. The author presents data collected for two relevant markets in the period of a six-year study in the characteristics of: (1) average prices of one-way journey for each competitor; (2) number of competitors operating in each year of study; (3) type of market structure identified in the course of research; (4) exact time and length of coopetition strategy occurrence on these markets; (5) market size estimated from supply side method. Passenger transport relevant markets have been delineated partially on the basis of detailed methods such as cross-price elasticity and correlation of price developments and partially on the method named as O&D (*Point of Origin – point of Destination)*. According to this approach, every passage combination with the same point of origin and point of destination should be considered as separate market from the customers' viewpoint. Many studies in the area of passenger transport relevant markets have been carried out by the European Commission in which we can find the following explanations of O&D approach: the Commission looks at the different transport possibilities in the market, that is, all direct and in-direct transport methods between two points (i.e. cities) are concerned (European Comission, 2010; Gremminger, 2003, p. 75). Also, it is of key importance to identify whether the types of transport services are not too differentiated in the form of: quality, price or even journey time and repeatability of the service. Thus, every market must be considered separately and shall be examined taking into

account the abovementioned rules. In result, relevant passenger transport market may include different types of conveyance i.e. by train, plane or bus, but it simultaneously should be similar in terms of customers' utility (journey time, quality). Certain cross-price elasticity ratio should be determined too. Therefore, the author's research has been conducted within two relevant markets:

1) Long-distance passenger transport market between the cities of Wrocław (Poland) and Kraków (Poland).
2) Long-distance international passenger transport market between the cities of Kraków (Poland) and Praha (Czech Republic).

The data for the first market is presented in Figure 4 and the data for the second market is presented in Figure 5.

The data collection methods have been used as follows:

1) Average price has been counted for every competitor for 12 periods (months) in each analysed year. The data has been collected in all periods on the 16th day of the month. The prices have been checked on the last day of the month with an average of prices for one-way journey on that day. That is, the prices have been noted around 14 days before the date of the journey (last day of the month) for each competitor.
2) Market share data is presented for each year. The data has been estimated on the author's observations as well as the assumptions from the supply side method. The total number of journeys in each month has been multiplied by the typical number of available seats in a certain conveyance delivered by every competitor. The number of seats has been adjusted (multiplied) with the rate of 0.68 that represents an average load factor of 68% seats. This number appeared in a different author's studies for the purpose of this paper.
3) Coopetition occurrence has been presented as a point in the figure that refers to the exact official date of deploying the coopetition between two rivals.

The data source for each variable has been generated mostly from the official companies' Internet communication channels, especially from competitors' main websites, sales platforms and press releases. The author has carried out much research by observation particularly in the areas of market structures and coopetition occurrence as well as unknown variables such as seats availability and load factor.

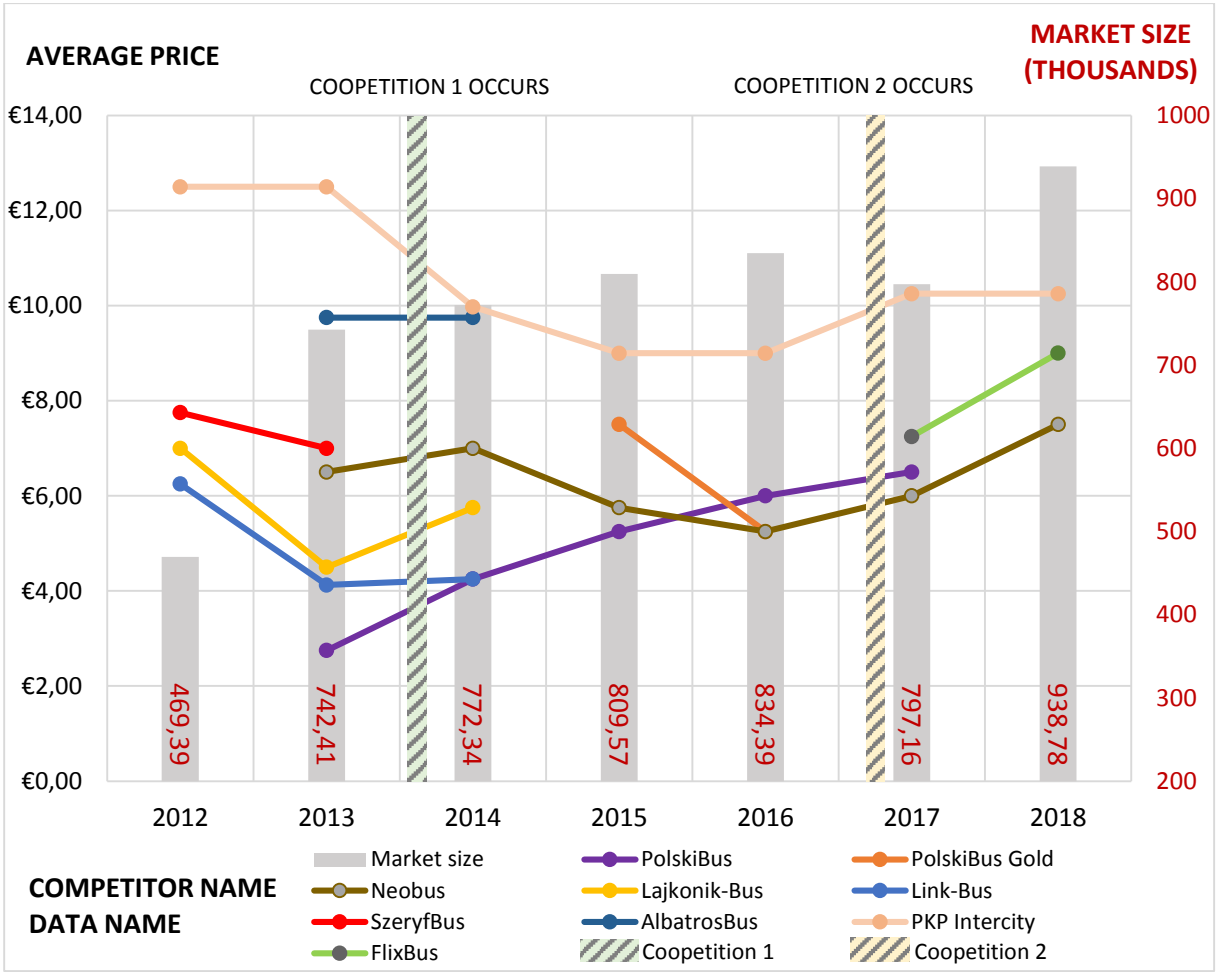


Figure 4. Graphic presentation of crucial data from conducted research on Market 1. Source: author's work.

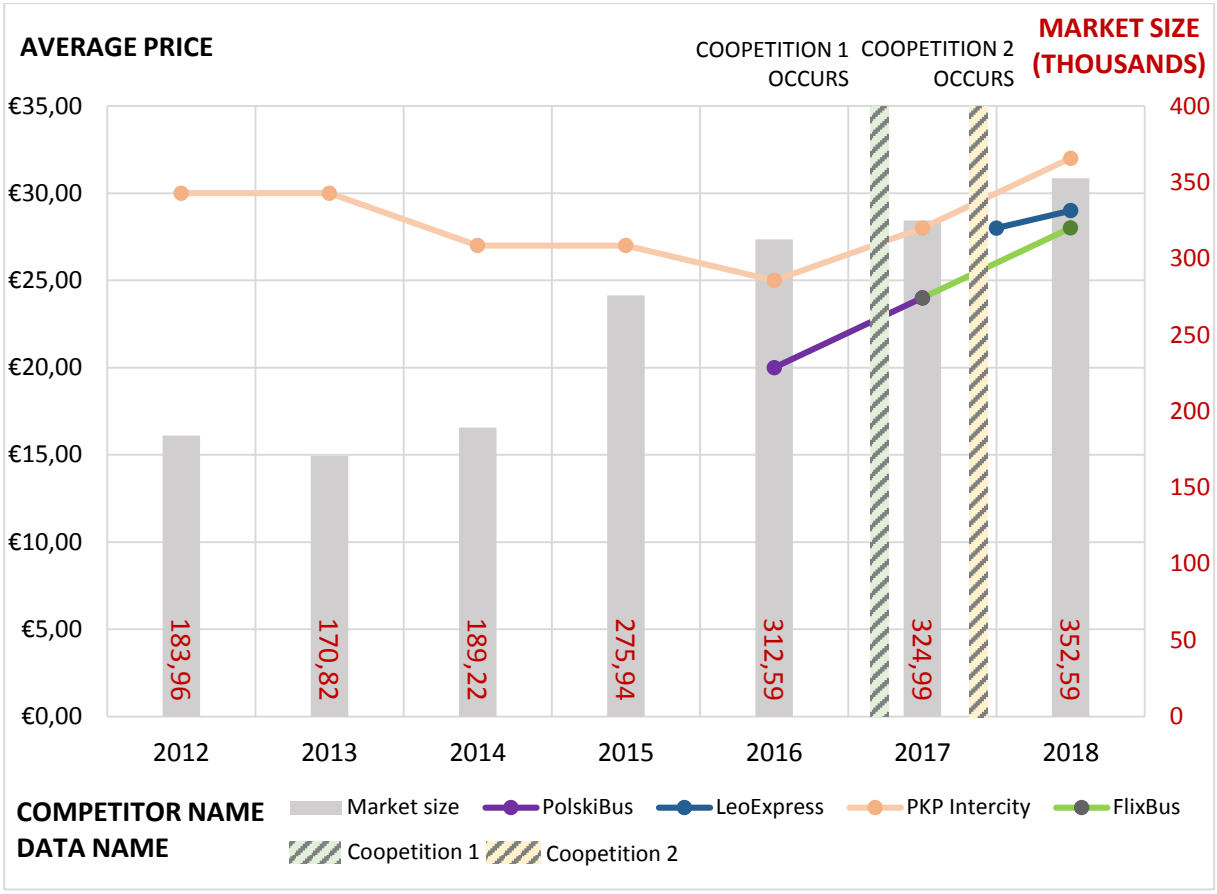


Figure 5. Graphic presentation of crucial data from conducted research on market number 2. Source: author's work.

5. Results

Following the objectives outlined in the research aims and objectives the results of the analysis shall be provided in this section. To explain the most important cause and effect relationships the author will use the example of oligopoly as a market structure in which the probability of coopetition strategy occurrence is the highest.

5.1. First-way causality between Particular market structures and coopetition occurrence

The first step to analyse the results is to partially examine hypothesis H1, so that one might explain the impact of market structures on the occurrence of coopetition strategy on the example of oligopoly. Thus, one should bear in mind not only all of the aspects that determine oligopoly as a market structure but it also needs to be checked if the highlighted strategic issues would really lead to change the business strategy of a theoretical company that acts within oligopoly. The assumption here is that it is not obvious that a company will change their business strategy every single time when a problematic strategic event occurs. Considering the author's

hypotheses in more details, the main reasons of that unresponsiveness are implemented in the particular characteristics of market structures such as: (1) degree of monopoly (pricing) power; (2) level of product differentiation; (3) basic type of competition. By analysing mostly only these three dimensions of market structures one might achieve the theoretical answer to the question posed earlier in the section. Certainly, the other characteristics of market structures are important too, but it is not necessary to include them in each case. Going back to the example of oligopoly, one might note that in oligopoly the selected characteristics are as below: (1) degree of pricing power is high; (2) product is differentiated; (3) competition rivalry is based mostly on pricing strategies (high) and averagely on non-priced strategies (medium). Therefore, having noted them, one may further analyse how these variables affect the managers strategic decisions such as deployment of coopetition with other competitor in a response to certain strategic events enclosed in the matrix (B). Firstly, by having high monopoly (pricing) power, companies that operate in oligopoly structures are very likely to consider the coopetition strategy because of the natural willingness to increase such power. The coopetition allows oligopoly companies to face the problems of decreasing margin or a not satisfactory demand level. Furthermore, differentiated product increases the chance of coopetition occurrence due to the high possibility of achieving new and unique competitive advantages resulting from cooperation with another industry firm. Finally, the type of competition (price or non-price) affects the strategic moves of an oligopoly firm. In the face of tough strategic events such as decreasing demand or decreasing margin oligopoly firms, at least in theory, act in a very ineffective way. Usually the reactions are price wars between competitors or attempts to perform illegal activity such as price fixing i.e. via cartel, although these only exacerbate the problems that occurred at first. Nevertheless, coopetition strategy might be a remedy for such reactions. By implementing simultaneous cooperation with its competitor, oligopoly firm may achieve much better control of its pricing power comparing to usual reactions. The coopetition would also be much more effective strategy while oligopolists face potential entrance to the market. Instead of using the predatory pricing as an entry barrier, oligopolists may cooperate to i.e.: (1) create new innovation; (2) widen sales distribution; (3) create common marketing campaigns. Therefore, coopetition should bring much more added value for both competitors contrarily to choose ‘typical’ strategies. Thus, the occurrence of coopetition strategy is very likely to happen because of specific characteristics of market structures. In this case, the oligopoly nuances implicate the coopetition deployment.

5.2. Second-way causality between coopetition occurrence and market structures. results

Matrix (C) presented in section 3.3. outlines the second effect (causality) that might appear due to the coopetition deployment between two rivals (or a rival with a potential competitor). Therefore, it puts forward arguments to examine the hypothesis H2. To receive such arguments one should answer two simple and yet very important questions: (1) what are the long-term

advantages of coopetition that rivals have already agreed on? (2) Should rivals still maintain this strategy or would it be more effective to change it further? Thus, continuing the example of oligopoly, these questions might be answered as follows: (1) oligopolists may achieve significant increase of price power due to the higher level of innovation or cost effectiveness or wider market size; (2) when the added values from competitive advantages reach marginal utility equaling to zero (there is no more added value as a result of coopetition) oligopolists should expand their cooperation (Besanko, 2013, pp. 154-165; Stigler, 1964). One of the most effective possibilities is to create the so-called one entity. Therefore, second answer results in the aforementioned second causality appearance. Two firms that act on the medium-competitive market with a couple of other competitors, such as oligopoly, after some period of time may not receive anymore any added value from the coopetition strategy. That happens especially when the aim of coopetition was to create innovations or some other non-competitive advantage. After the advantage is accomplished, such firms must decide to dissolve the coopetition and return to full competition or they can reach the cooperation on a higher level. One might expect that such firms act rationally. Thus, more added value and higher effectiveness would be achieved from the next step of cooperation i.e. strategic alliance, merger (Hitt et al., 2015, pp. 244-247; Antelo, and Peón, 2019). Therefore, the author proves that in the long-term one might expect that rationally acting competitors who deployed the coopetition strategy would create another formation similar to one entity. Furthermore, it does not have to be a merger, but this should be new entity that cooperate in so many levels that it practically abandoned rivalry between themselves. Consequently, the market structure on which these two companies operate excludes one competitor. Therefore, on the example of duopoly, this market structure might change in the long-term into monopoly due to the abandonment of rivalry between two competitors.

5.3. Data analysis and conclusion from empirical evidence

The final results with an analysis for both markets – number 1 depicted in Figure 4 and market number 2 depicted in Figure 5 – are presented below in Table 3.

Table 3.
A summary of findings for the data section

Result no.	Analysed result	Market 1	Market 2
1.	Market size	The market size trend line is going up in the course of research regardless of changes in price, number of competition or market structure. Therefore, anytime competitors had a chance to increase the average price, they achieved higher profits due to the probable low ratio of price elasticity.	One might observe a low but continuous growth of the market in the course of research. The reason for that could be low changes in terms of the market characteristics i.e. prices, level of innovations, new entrance.

Cont. table 3.

2.	Number of competitors	Number of competitors have significantly decreased since the beginning of research from 8 competitors to only 3 from which 2 companies represents road passenger transport by bus and 1 company belongs to a railway passenger transport industry.	For the very long time this market used to be monopoly and the only service has been provided by railway company PKP Intercity. Since year 2016 market has evolved from monopoly to oligopoly of 3 firms (2 by train and 1 by bus).
3.	Average price fluctuation	Average price for one-way journey has been fluctuating for each competitor due to the use of price discrimination strategy as well as changes in the pricing power. However, the stabilization of prices might be observed in the times when the number of companies have been 'in the middle', that is around the number of 4-5.	Average price for one-way journey has been quite constant even though new competitors have entered the market. This is the result of high pricing power of each competitor.
4.	Coopetition occurrence with general description	1st coopetition occurred on 13/16/2013 between bus conveyance competitors: Link-Bus and Lajkonik-Bus. 2nd coopetition occurred on 12/11/2017 between bus conveyance competitors: FlixBus and PolskiBus.	1st coopetition occurred on 15/12/2016 when FlixBus has signed an agreement with PolskiBus to cooperate in the areas of sales and marketing. 2nd coopetition occurred on 20/06/2017 when PKP Intercity has signed cooperation agreement with LeoExpress and allowed its competitor to use their resources (railway tracks and infrastructure).
5.	Effects of coopetition	Very high increase of average price might be observed for competitors that implemented the coopetition strategy between themselves. Hence, the improvement of pricing power appeared. Also, the informal collusion in terms of distribution might have happened.	The number of competitors has increased without any negative effect for oligopolists in terms of intensity of rivalry as well as demand size. Moreover, the only railway company operating on that market till 2018, PKP Intercity, has gained extra funds due to signing coopetition agreement. LeoExpress has gained high savings thanks to coopetition.
6.	Market structure differentiation	Having in mind changes in terms of number of competitors as well as price fluctuation one might examine many differentiations of market structures since the research has begun.	Market structure started to differentiate from 2016 due to the entrance of PolskiBus. Furthermore, the market structure has changed quite rapidly from monopoly to oligopoly of 3 firms due to another new entrance of LeoExpress and coopetition of Polskibus with FlixBus.

Source: author's work.

For the purpose of this paper it is of key importance to accentuate the results that might support both hypotheses. Therefore, the empirical study has demonstrated that coopetition on the markets occurred for the reason of certain characteristics of the market structures. On Market 1 the first coopetition instance has been observed due to the decreasing margin. Market structure of oligopoly of many firms forced the competitors to start competing by price wars. In such conditions, two competitors deployed coopetition by agreement to partially abandon competition by change of their journey schedule so that they never interfere. Moreover, they started dyadic marketing activities. In result, they gained higher pricing power by dividing the supply. However, as an effect of higher average prices on that market, in that time, another competitor has been encouraged to enter the market. Once again, most of the competitors started price wars trying to oust a new competitor. Contrarily to the plan, four companies have announced bankruptcy for the reason of too high rivalry intensity. After these

events, prices went higher and the market structure changed to the oligopoly of three and later four firms. Afterwards, market structure yet once again encouraged the competitors to sign coopetition agreement. This time, two companies (PolskiBus and FlixBus) have noticed that they can achieve an added value by integrating their value chains. Thus, one competitor took over all the processes regarding transportation such as infrastructure (buses, service base) and the other one occupied the processes of sales distribution, marketing and innovations. In result, one brand has been established, although two competitors still maintained their own entities. Resulting from that decision, oligopoly of four firms has changed to oligopoly of three firms. Therefore, in both cases of coopetition on Market 1 one might observe the same two-way causality effect. Market structure impacted firms to deploy coopetition and that same coopetition further 'forced' companies to change the market structure once again. By analyzing the examples of coopetition occurrence on Market 2 one might observe the same situation of cooperation between FlixBus and PolskiBus. Nonetheless, six months after the first coopetition occurrence, the second coopetition appeared in the railway industry. Company PKP Intercity have signed the agreement with a potential rival LeoExpress and allowed its competitor to use their resources (railway tracks and infrastructure). Market structure of duopoly or even monopoly if one analyses only the railway industry has encouraged two firms to sign such an agreement. The reason of such a decision is in the high pricing power. PKP Intercity by allowing to use their infrastructure has led in a new competitor to the market. However, their pricing power has not negatively changed due to the stable and high demand. Moreover, LeoExpress pays rent fee to PKP Intercity and so this company has achieved extra funds. LeoExpress, in turn, did not have to create completely new railway infrastructure so it has cut down the investment costs and achieved added value. This example yet one more time has shown that market structure characteristics impacted competitors to deploy the coopetition strategy and afterwards it has changed the market structure. From the duopoly, market structure changed to oligopoly of three firms.

6. Discussion and conclusion

6.1. Conclusion

The main purpose of this paper was to examine the two-way causality effect between market structures and coopetition occurrence. The author has hypothesized that certain characteristics of existing market structure implicate the decision to deploy coopetition strategy within companies operating in this market (H1). Moreover, the occurrence of the coopetition strategy implicates another effect in the opposite way, that is coopetition between market rivals change the market structure on which it was implemented in the first place (H2). To examine the hypotheses various methodologies have been used. The second section concerned many

theoretical aspects that could support the hypotheses. It has been established how the coopetition is defined according to many approaches. The comparison to other cooperation strategies has been conducted too. Moreover, the author considered the aspects of events, motives and values that lead to the deployment of coopetition strategy. Furthermore, a wide analysis of two-way causality phenomena was conducted. The research in section 3 and 4 has shown that there is a high probability for coopetition to occur in certain characteristics of market structures. Also, the theoretical and conceptual bases for the opposite effect of coopetition impacting the change of market structures were provided. Nonetheless, the final and very useful part was to verify the hypotheses by carrying out research in the empirical section. The real market evidence's proved both of indicated main problems in the paper to appear. Hence, certain market strategies characteristics affected companies to deploy the coopetition strategy and the other way round, the strategy changed the market structure in the result of competitors' decision. Taking into consideration all of the theoretical, conceptual and empirical aspects raised throughout the course of the research, both hypotheses have been confirmed.

6.2. Limitations and suggestions for future researchers

The scientific rigor demonstrated by the researcher throughout the studies did not preclude the existence of some restrictions therein. The author has used mostly qualitative methods such as observation, conceptualization or cause and effect analysis in which the natural existence of errors might occur. To test the hypotheses the researcher had to create assumptions and models that represent what should happen if every aspects successfully appear. It might be expected that some other variables affected the market structures during the research that the author was not aware of. Thus, one should interpret the results with the inclusion of the *ceteris paribus* condition. Furthermore, the empirical studies have been limited to two examples of relevant markets due to the use of nonprobability sampling. Hence, for future researchers it might be worth to extend the studies to other relevant markets or industries, so that the assumptions could be tested in more details.

6.3. Managerial implications

This paper concerned various problems that companies face during the processes of competition. When the crucial strategic events occur business owners sometimes act in very standard ways without broader perspective on alternative strategic solutions that may be deployed like eponymous coopetition. Thus, instead of applying the high cost strategies such as price wars or demand seeking, one might use the coopetition to create added values with little or even zero cost. What is more, this strategy may result in higher pricing power, higher market size or better level of innovation. However, applying coopetition might be risky for the reason of cooperation with company's rival. Nonetheless, it is certainly worth of trying as one of the solutions for hard times.

References

1. Ann Peng, T.-J., Yen, M.-H. and Bourne, M. (2018). How rival partners compete based on cooperation? *Long Range Planning*, *51,* pp. 351-383. DOI: 10.1016/j.lrp.2017.10.003.
2. Antelo, M., and Peón, D. (2019). On Cooperation Through Alliances and Mergers. *Journal of Industry, Competition and Trade*.
3. Arora, A., Fosfuri, A., and Gambardella, A. (2004). *Markets for Technology: The Economics of Innovation and Corporate Strategy* (MIT Press Books). The MIT Press.
4. Belleflamme, P. (2010). Industrial organization: markets and strategies. Cambridge, UK-New York: Cambridge University Press.
5. Bengtsson, M., and Kock, S. (2000). "Coopetition" in Business Networks—to Cooperate and Compete Simultaneously. *Industrial Marketing Management*, *29,* pp. 411-426.
6. Bengtsson, M., and Kock, S. (2014). Coopetition—Quo vadis? Past accomplishments and future challenges. *Industrial Marketing Management*, *43*, pp. 180-188.
7. Bengtsson, M., and Raza-Ullah, T. (2016). A systematic review of research on coopetition: Toward a multilevel understanding. *Industrial Marketing Management*, *57,* pp. 23-39.
8. Bernanke, B., Frank, R.H., and Johnston, L. (2009). *Principles of microeconomics*. Boston: McGraw-Hill Irwin.
9. Besanko, D. (ed.) (2013). *Economics of strategy*. Hoboken, NJ: John Wiley & Sons.
10. Bouncken, R.B., Clauß, T., and Fredrich, V. (2016). Product innovation through coopetition in alliances: Singular or plural governance? *Industrial Marketing Management*, *53*, pp. 77-90.
11. Bouncken, R.B., Gast, J., Kraus, S., and Bogers, M. (2015). Coopetition: a systematic review, synthesis, and future research directions. *Review of Managerial Science*, *9*, pp. 577-601.
12. Brandenburger, A., and Nalebuff, B. (1996). *Co-opetition.* New York: Doubleday. Available
13. Certo, S.T., Lester, R.H., Dalton, C.M., and Dalton, D.R. (2006). Top Management Teams, Strategy and Financial Performance: A Meta-Analytic Examination. *Journal of Management Studies*, *43*, pp. 813-839.
14. Chrisman, J.J., Hofer, C.W. and Boulton, W.B. (1988). Toward a System for Classifying Business Strategies. *Academy of Management Review*, *13*, pp. 413-428.
15. Das, T.K. and Teng, B.-S. (2000). A Resource-Based Theory of Strategic Alliances. *Journal of Management*, *26,* pp. 31-61.
16. Dixit, A., and Stiglitz, J. (1977). Monopolistic Competition and Optimum Product Diversity. *American Economic Review*, *67,* pp. 297-308.
17. Drucker, P.F. (1955). 'Management Science' and the Manager. *Management Science*, *1,* pp. 115-126.
18. European Comission (2004). Regulation (EC) No 139/2004 merger procedure, case no. COMP/M.5655 - SNCF/LCR/ EUROSTAR, Pub. L. No. 139/2004 (2010).

19. Fernandez, A.-S., Le Roy, F., and Gnyawali, D.R. (2014). Sources and management of tension in co-opetition case evidence from telecommunications satellites manufacturing in Europe. *Industrial Marketing Management*, *43,* pp. 222-235.
20. Galloway, T.L., Miller, D.R., Sahaym, A., and Arthurs, J.D. (2017). Exploring the innovation strategies of young firms: Corporate venture capital and venture capital impact on alliance innovation strategy. *Journal of Business Research*, *71,* pp. 55-65.
21. Gnyawali, D.R. and Charleton, T. (2018). Nuances in the Interplay of Competition and Cooperation: Towards a Theory of Coopetition. *Journal of Management*, *44,* pp. 2511-2534.
22. Gnyawali, D.R., and Park, B.-J. (Robert) (2011). Co-opetition between giants: Collaboration with competitors for technological innovation. *Research Policy*, *40,* pp. 650-663.
23. Gremminger, M. (2003). The Commission's approach towards global airline alliances — some evolving assessment principles. In: *EC Competition Policy Newsletter*. Bruksela: Competition Directorate-General of the European Commission.
24. Grimm, C.M., Lee, H., and Smith, K.G. (eds.) (2006). *Strategy as action: competitive dynamics and competitive advantage.* Oxford-New York: Oxford University Press.
25. Hamel, G. (1991). Competition for Competence and Inter-Partner Learning Within International Strategic Alliances. *Strategic Management Journal*, *12,* pp. 83-103.
26. Hitt, M.A., Ireland, R.D., and Hoskisson, R.E. (2015). *Strategic management: competitiveness & globalization: concepts and cases.* Mason, Ohio: South-Western Cengage Learning.
27. Ho, H. (Dixon) and Ganesan, S. (2013). Does Knowledge Base Compatibility Help or Hurt Knowledge Sharing between Suppliers in Coopetition? the Role of Customer Participation. *Journal of Marketing*, *77,* pp. 91-107.
28. Jarzabkowski, P. (2005). *Strategy as practice: an activity-based approach.* London-Thousand Oaks: SAGE.
29. Johnson, G., Scholes, K., and Whittington, R. (2009). *Exploring corporate strategy.* Harlow: Prentice Hall.
30. Karlöf, B., and Lövingsson, F.H. (2005). *The A-Z of management concepts and models.* London: Thorogood.
31. Kotler, P., and Keller, K.L. (2012). *Marketing management.* Upper Saddle River, NJ: Prentice Hall.
32. Krugman, P.R., and Wells, R. (2013). *Microeconomics*. New York, NY: Worth.
33. Mariani, M.M. (2016). Coordination in inter-network co-opetitition: Evidence from the tourism sector. *Industrial Marketing Management*, *53,* pp. 103-123.
34. Niemczyk, J., and Trzaska, R. (2020). Network Approach in Industry 4.0: Perspective of Coopetition. In: *Contemporary Challenges in Cooperation and Coopetition in the Age of Industry 4.0: 10th Conference on Management of Organizations' Development*. Cham: Springer, pp. 139-154.

35. Pathak, S.D., Wu, Z., and Johnston, D. (2014). Toward a structural view of co-opetition in supply networks. *Journal of Operations Management*, *32,* pp. 254-267.
36. Pearl, J. (2000). *Causality: models, reasoning, and inference.* Cambridge, UK-New York: Cambridge University Press.
37. Peng, M.W. (2000). *Business strategies in transition economies.* Thousand Oaks, Calif.: Sage Publications.
38. Porter, M.E. (1998). *Competitive strategy: techniques for analyzing industries and competitors: with a new introduction.* New York: Free Press.
39. Raza-Ullah, T., Bengtsson, M., and Kock, S. (2014). The coopetition paradox and tension in coopetition at multiple levels. *Industrial Marketing Management*, *43,* pp. 189-198.
40. Ritala, P. (2012). Coopetition Strategy – When is it Successful? Empirical Evidence on Innovation and Market Performance. *British Journal of Management*, *23,* pp. 307-324.
41. Rusko, R. (2011). Exploring the concept of coopetition: A typology for the strategic moves of the Finnish forest industry. *Industrial Marketing Management*, *40,* pp. 311-320.
42. Schmit, J., and Phelps, K. (1985). Two-Way Causality Between Insurance and Liability. *Marquette Law Review*, *69,* p. 33.
43. Song, D.-W., and Lee, E.-S. (2012). Coopetitive networks, knowledge acquisition and maritime logistics value. *International Journal of Logistics Research and Applications*, *15,* pp. 15-35.
44. Stigler, G. (1964). A Theory of Oligopoly. *Journal of Political Economy*, *72,* pp. 44-61.
45. Tether, B.S. (2002). Who co-operates for innovation, and why: An empirical analysis. *Research Policy*, *31,* pp. 947-967.
46. Varadarajan, P.R., and Cunningham, M.H. (1995). Strategic alliances: A synthesis of conceptual foundations. *Journal of the Academy of Marketing Science*, *23*, p. 282.
47. Varian, H.R. (1992). *Microeconomic analysis*. New York: Norton.
48. Walley, K. (2007). Coopetition: An Introduction to the Subject and an Agenda for Research. *International Studies of Management & Organization*, *37,* pp. 11-31.
49. Wu, J. (2014). Cooperation with competitors and product innovation: Moderating effects of technological capability and alliances with universities. *Industrial Marketing Management*, *43,* pp. 199-209.
50. Yami, S., and Nemeh, A. (2014). Organizing coopetition for innovation: The case of wireless telecommunication sector in Europe. *Industrial Marketing Management*, *43,* pp. 250-260.
51. Yip, G.S. (2004). *Using Strategy to Change Your Business Model*. Rochester, NY: Social Science Research Network.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

PROLEGOMENA FOR THE STUDY OF THE ORGANIZATIONAL QUALITY CULTURE

Anna PIETRUSZKA-ORTYL

Cracow University of Economics, Department of Organizational Behavior; pietrusa@uek.krakow.pl,
ORCID: 0000-0001-7344-782

Purpose: The aim of the study is to conceptualize the construct of an organizational quality culture and to present the instruments of its research.
Design/methodology/approach: The purpose execution is based on a critical literature review.
Findings: The organizational quality culture was defined as one of the types of organizational cultures of enterprises operating in the conditions of knowledge-based economy. The components constituting the organizational culture of quality were determined and broken down into 6 dimensions and 4 areas, with scopes. For each dimension and individual area, a set of indicators was proposed to enable the determination of the level of their development in the perspective of actions and attitudes that emanate them, broken down into rituals and practices as components of organizational culture. Thus, the instruments for studying the phase of evolution towards an organizational culture of quality were presented.
Practical and social implications: The paper presents useful tools to verify specific orientations building an organizational culture of quality and to identify gaps in the development of individual areas creating an organizational culture of quality, and thus providing practical directives in the field of evolution towards an organizational culture of quality, i.e. the stage of permanent quality creation.
Originality/value: An original measurement tool for the organizational quality culture can be helpful in reaching the stage of full and permanent quality culture stage of evolution in an organization.

Keywords: organizational quality culture, measurement tool, quality, organizational culture.

Category of the paper: Conceptual paper, General review.

1. Introduction

Contemporary enterprises operate basically within the framework of the knowledge-based economy. It defines their functioning in the context of two interconnected aspects: organizational culture and quality.

Organizational culture has been known as one of the enterprise's main soft assets since the 1960s, also as a result of the shift to the resource-based approach and to orientation on intangible resources. At the turn of this century, it was unequivocally recognized that organizational culture determines the main areas of operation in a modern organization (Ambekar, Prakash, and Patyal, 2019; Gorzelany, 2020) and is a factor providing the enterprise with a competitive advantage, since it directly impacts the innovativeness of its strategy (Laforet, 2016; Pietersen, 2017). It is one of those intangible resources that critically impact the enterprise's intellectual capital level and thus the value of the entire organization (Al. Saifi, 2015; Trippner-Hrabi, Stroińska, and Jażdżyk, 2020). It also determines the effectiveness of knowledge management in an enterprise (Corfield, and Paton, 2016; Paliszkiewicz, Svanadze, and Jikia, 2017) and the tendency to share knowledge (Tong, Tak and Wong, 2016). It also determines job satisfaction (Tong, Tak, and Wong, 2016; Wolniak, 2019) and the quality of work (Wyrostek, 2012). Therefore, organizational culture directly contributes to the enterprise's market success (Kane, Taylor, and Teare, 2018), in most sectors of the economy (Emond, and Taylor, 2018; Taylor, and Roston, 2018) – in the coal mining industry (Ambekar, Prakash, and Patyal, 2019), shipbuilding (Karakasnaki, Psomas, and Bouranta, 2019), hospitality (Manning, 2018), banking systems (Famiyeh, Asante-Darko, and Kwarteng, 2018), services (Khan, and Naeem, 2018) and manufacturing (Patyal, and Koilakuntla, 2018).

Currently, following the assumptions of the functionalist paradigm, organizational culture is treated as an object of management, and the concept of management through culture is being developed (Sulkowski, 2013a). It is argued that operating in the new economy requires not only adaptive but also anticipatory changes. Hence the organizational culture of modern enterprises is formed deliberately and above all, as a tool for developing the key competences of a specific business entity (Tenji, and Foley, 2019).

The new century has also seen a change in the philosophy of quality management, which has become one of the primary areas of management (Kumar, Singh, and Jain, 2019; Kaur, Singh, and Singh, 2020), especially in manufacturing and services (Lobo, Samaranayake and Laosirihongthong, 2018), with particular emphasis on the service sector. This is due to the intangible nature of the resources on which this branch is based and which it uses (Famiyeh, Asante-Darko, and Kwarteng, 2018). Therefore, the dominant orientation on quality is today's *sine qua non* for the functioning and success of the organization (Cronemyr, Bäckström, and Rönnbäck, 2017; Skotnicka, and Zasadzień, 2020) and at the same time one of the basic tasks of managers (Ali, and Musah, 2012). Its consequence is a different approach to competitiveness, customer and supplier relations or the relations between managers and employees (Troy, and Schein, 1995).

Quality management assumptions have changed recently (Kemenade, and Hardjono, 2019). There has been a reorientation from "hard" elements, i.e. tools, techniques, practices and systems towards "soft" aspects: actions and attitudes, including behaviors conditioned by organizational culture (Tenji, and Foley, 2019). A new, fourth quality paradigm has emerged; the “quality as the core value" philosophy has come into force (Gouda et al., 2019; Kemenade, and Hardjono, 2019). The synergy effect of all these transformations has therefore made the organizational culture the most significant factor determining the success or failure of any quality-related initiatives in the enterprise (Tenji, and Foley, 2019). This is also confirmed by the published results of empirical research (Patyal, and Koilakuntla, 2018; Famiyeh, Asante-Darko, and Kwarteng, 2018).

Following the results of analyzes, which emphasize that the strategy must necessarily take into account the specificity of the organizational culture of the enterprise (Kaul, 2019; Germany, 2020) as well as the need for pro-quality orientation in managing organizations, an obvious line of reasoning is apparent, in line with the fourth quality paradigm. Since the organizational culture should condition the strategy, and a modern strategy must be quality-oriented, enterprises should strive to form an organizational culture that combines these tasks, in line with the framework of the knowledge-based economy. They are therefore faced with the challenge of having an organizational culture of quality as the foundation of all activities, especially that the focus on quality at the strategic level directly influences the innovative possibilities and should therefore be related to the culture of quality applicable in a given organization (Khan, and Naeem, 2018).

Data reveal that many business activities fail because managers are not aware of the key role of organizational culture in shaping the generally applicable philosophy of quality in the enterprise and ignore the overriding role of values and attitudes in this regard (Ingelsson, Bäckström, and Snyder, 2018; Patyal, and Koilakuntla, 2018). It is assumed that effective implementation of quality improvement programs requires first and foremost, the shaping of attitudes, values and best practices in accordance with the commonly held philosophy of quality, in addition to formal tools (Markowitsch, 2018). The study meets these recommendations. Its main goal is to synthesize the subject literature and to conceptualize the construct of the organizational culture of quality, taking into account its dimensions, areas and scopes as well as recommendations for shaping it. This paper is theoretical and consists of four parts. It discusses the essence of the organizational culture of quality, its components, manifestations and areas of analysis. The paper contributes to solving the question of what actions and attitudes emanate the organizational culture of quality. Moreover, it presents an original tool for examining areas, ranges and dimensions of the organizational culture of quality.

2. The essence of the organizational quality culture

The current definition of organizational culture sees it as a commonly shared set of values, norms, assumptions and beliefs characteristic of members of a given organization, which affects their attitudes, way of thinking, decisions and actions. Therefore, symbols, ideas, myths and rituals that determine the way of reading, understanding and interpreting organizational life are the core of a specific organizational culture (Pietersen, 2017; Niemiec, 2020). Thus, organizational culture includes a set of norms and values common for a given enterprise, which emerge over a long period of time and define the way an organization functions (Ingelsson, Bäckström, and Snyder, 2018). Its unique role in the knowledge-based economy stems from the special importance of social communication as a platform for creating a network of interpersonal and inter-organizational cooperation in short-term projects (Bieńkowska, and Sikorski, 2016). Therefore, subject literature offers many propositions of preferred or characteristic organizational cultures for enterprises operating in the conditions of the new economy and aspiring to the name of knowledge-based organizations. The following cultures are convergent and complementary: learning (Kaul, 2019), information (Daneshmandnia, 2019) and knowledge (Glińska-Neweś, 2007; Latusek, 2008; Kucharska, 2017), cooperation (Kamińska, 2012), trust (Sankowska, 2011; Paliszkiewicz, 2013), group (Patyal, and Koilakuntla, 2018), lean (Pereira Paro, and Gerolamo, 2017) and quality (Cronemyr, Bäckström, and Rönnbäck, 2017).

According to Ł. Sułkowski (2013b), many theoretical and practical studies discuss the concepts of organizational culture and quality, despite the fact that it seems methodologically quite risky to combine the concepts of organizational culture and quality. The most common assumption is that pro-quality activities fit in with cultural conditions since in the pursuit of continuous improvement and development in the area of quality, technical systems must be compatible with social systems. This necessitates the creation of a culture of quality (Molenda, 2012).

The literature on the subject is not unanimous as to the way of understanding and studying the organizational culture of quality. This is evidenced by the diversity of definitions of the analyzed phenomenon[1] and the relationship between organizational culture and the culture of quality. Different positions on this issue are still in force (Ehlers, 2009; Markowitsch, 2018). Some researchers argue that culture of quality is an element of organizational culture, a kind of subculture that defines the overall culture of an organization. Others, as adherents of an integrated approach, postulate that the culture of quality is synonymous with the organizational culture, as just another definition of the latter. On the other hand, representatives of the disjointed approach, recognize that the culture of quality can take into account certain

[1] An overview of the organizational definition of culture of quality is presented in the study: (Pietruszka-Ortyl, 2018).

elements and dimensions of the organizational culture, but can also be based on different values that are not reflected in the general culture of the organization. Therefore, it is a construct separate from the organizational culture and cannot be characterized using models describing the organizational culture (the fragmentary approach).

The term culture of quality directly refers to the term organizational culture and its definition, i.e. patterns, behaviors, norms and beliefs related to quality (Berry, 1997; Bugdol, 2013). Such a culture is a set of values, traditions, procedures and member-approved beliefs of the organization, which create an environment that favors shaping and continuous improvement of quality (Ali, and Musah, 2012; Gołębiowski, 2014). It is a type of organizational culture that strives for continuous quality improvement and is characterized by two elements: common values, beliefs and expectations, as well as full commitment to quality, including execution of processes that improve quality and aim to coordinate individual quality efforts into a holistic quality philosophy of the organization (Ha, and Quang, 2014; Markowitsch, 2018). The culture of quality contains three key elements – the general philosophy of quality (performing each task with the utmost care and maximum commitment, even for the first time), unwavering pursuit of continuous improvement and focus on meeting customer needs (Wu, Zhang, and Schroeder, 2011; Wu, 2014). Its products are internal and external customer satisfaction and economic results (Bugdol, 2013). The culture of quality defines an environment in which employees not only follow quality guidelines, but also consistently encourage others to take quality-oriented actions, adhering to and proclaiming a common quality philosophy (Srinivasan, and Kurney, 2014). Its manifestations include empowerment understood as an increased decision-making autonomy in an organization, especially the removal of fear and the sense of threat and fear of managers, full commitment of employees to quality, as well as quality leadership (Bugdol, 2013).

Therefore, in building a culture of quality, interpersonal relationships (Ehlers, 2009), treating employees and clients with respect, focusing on development, earning professional certificates or participation in organization management are of utmost importance. In this respect, the key importance of trust comes to the fore (Sankowska, 2011; Kucharska, 2017) not only in individual relations, but also in employee-organization or client-organization relations.

3. Levels, scopes and dimensions of the organizational quality culture

Taking into account its distinguishing features, i.e. a widely shared philosophy of comprehensive quality management, the importance of people in achieving organizational success, strong values, informal rules of behavior, high business standards or acclaim for the successful employees and promoting their quality awards (Gołębiowski, 2014), the culture of quality can nowadays be a guarantee of a high competitive position of an organization.

Therefore, it should be of special interest among managers of a contemporary organizations operating in the knowledge-based economy. Since only what is measurable can be the object of well-thought-out management strategies, to operationalize the construct and propose the instruments for its research seems well justified.

Figure 1. Orientations building an organizational quality culture, along with their core values. Source: own study.

By identifying the orientations constituting the organizational culture of quality and their core values, six of its components were identified (Figure 1): customer satisfaction orientation, process orientation, group work orientation, open communication and knowledge exchange orientation, and orientation on making decisions based on facts (Adebanjo, and Kehoe, 1998; Ali, and Musah, 2012; Ingelsson, Bäckström, and Snyder, 2018). Each of these organizations was described through actions and attitudes that emanate it, assigned either to the category of practices (P) (noticeable outside the organization by outside observers) or rituals (R) (internal activities of the organization's members) (Table 1). Therefore, in order to determine the extent to which they are developed in a specific organization and at what stage of evolution towards a culture of quality the organizational culture of a given entity is, it should be decided how noticeable are the actions and attitudes emanating from individual levels.

Table 1.
Six dimensions of organizational culture of quality, their core values as well as actions and attitudes that emanate from it

I. Orientation on the customer	**P**	**R**
multidimensional cooperation focused on meeting customer needs		
– cooperation aimed at meeting customer needs	X	X
– specialized employees dedicated to solving customer problems	X	
– adjusting products and services to the constantly monitored customer needs and expectations	X	X
– offering products and services of the highest possible quality	X	X
II. Orientation on the process	**P**	**R**
Subordination in terms of absolute compliance with the adopted guidelines and working method		
– compliance with the accepted guidelines and working methods		X
– decisions about how to perform tasks taken individually		X
– cooperation between the functional units of the organization for the purpose of business development	X	X
– focus on the development of activities within the group and organizational unit	X	X
III. Orientation on building commitment	**P**	**R**
Proactive leadership		
– leaders encourage suggestions for improvement and see problems as opportunities for improvement		X
– leaders assume that employees always try to perform their tasks to the best of their abilities, from the very beginning, to avoid unnecessary mistakes and problems		X
– in decision-making situations, leaders always first pay attention to the consequences in terms of customer orientation		X
– leaders are oriented towards making effective decisions		X
– leaders take preventive actions in every possible situation		X
– leaders quickly find solutions to emerging problems		X
IV. Orientation on common goals	**P**	**R**
Organization development focused on achieving business goals through individual improvement of employees and teams		
– the development of the organization engages all employees and their competences		X
– leaders and specialists are responsible for the development of competences of all employees		X
– all employees are focused on achieving the overarching organization goals	X	X
– employees focus on achieving the goals of their teams		X
V. Orientation on continuous improvement	**P**	**R**
Permanent improvement in every area of the organization's functioning		
– working methods are systematically assessed and improved		X
– problems are solved as they arise	X	X
– improvement activities are conducted in a structured manner		X
– improvement actions are adapted to specific situations		X
VI. Orientation on fact-based decisions	**P**	**R**
Since problems determine and stimulate the directions of the organization's development, they should be solved as quickly and easily as possible.		
– when a problem occurs, its origins are first diagnosed and then solved		X
– problems are solved as quickly and easily as possible	X	X
– information and measurable results on business development are collected	X	
– business development is based on the knowledge and experience of all parties creating the organization	X	X

Adapted from: "Quality culture deployment – using behaviours to explain, diagnose and improve a quality culture" by P. Cronemyr, P. Bäckström, A. Rönnbäck, International Journal of Quality and Service Sciences 9(3/4)/2017.

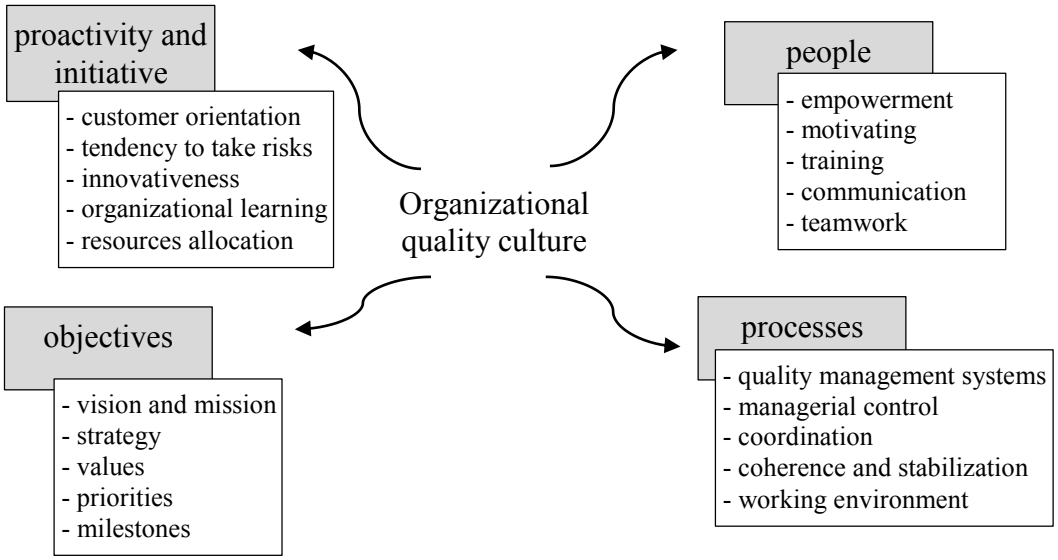


Figure 2. Areas and scopes of the organizational culture of quality, along with the related practices and rituals. Source: own study.

In the course of a deeper analysis and diagnosis, these identified areas can also be treated as a point of reference or a benchmark for the levels and scopes of organizational culture of quality (Figure 2), shaped in the following areas: people, processes, proactivity, priorities (Table 2). Each of the indicated areas should be subject to inference, for example by analyzing the degree of its occurrence or implementation.

Table 2.
Areas and scopes of the organizational quality culture

Areas and scopes	The essence
PEOPLE	
Empowerment	employee participation, employee development, trust
Motivating	how leaders recruit and select, promote and exclude employees, and award rewards
Training	individual learning, purposeful modeling of behavior, coaching and teaching
Communication	striving to eliminate language barriers, from C-level managers to employees–
Teamwork	focusing on multidimensional cooperation
PROCESSES	
Systems	having documented pro-quality management systems
Managerial control	the subject of measurement and control of managers, and its extent
Effective coordination	requires communication, positive relationships, understanding the essence of processes, needs and goals of other organizational units; a culture of cooperation
Stabilization	having consistent, time-stable practices for managing diverse employees and teams
Working environment	friendly working conditions, optimal comfort zone
PROACTIVITY	
Customer orientation	responding to the client's needs and raising awareness of their need for the offered products and services
Tendency to take risks	tendency to take risk, attitude to risk
Innovativeness	Attitude to change, degree of innovation
Organizational learning	enabling continuous improvement; ways in which leaders react to critical events and organizational crises
Investments	how leaders allocate resources

Cont. table 2.

OBJECTIVES	
Vision	formal statements of the company's vision, goals and/or values related to quality
Strategy	the need to formulate and implement a long-term quality vision, mid-term quality strategy and short-term quality-oriented goals
Values	formal philosophy of quality adopted by the organization, a binding system of values, attitudes and beliefs focused on quality
Priorities	transparency, clarity and unambiguity of the organization's goals
Milestones	clear task structure, professed values, adopted performance measures

Adapted from: "The development of a safety and quality culture assessment tool from a longitudinal, mixed-method research journey" by J.Z. Taylor, K.I. Rostron, Worldwide Hospitality and Tourism Themes 10(3)/2018.

Another useful research tool can also be a set of indexes designed in view of 3 categories describing and possibly verifying its condition, i.e. the perspective of the employee, supervisor and the entire organization (for more see: (Pietruszka-Ortyl, 2018)).

4. Conclusions

Organizational culture is an extremely complex phenomenon. Changing it requires time and effort, especially on the part of the management of organizations (Ingelsson, Bäckström, and Snyder, 2018). Managers must be convinced that shaping its development in such a way as to achieve the state of culture of quality is worth the while.

In practice, it is possible to identify founders and managers of organizations who have adopted an orientation towards the conscious shaping of an organizational quality culture and successfully apply it in the enterprises with which they are associated. Then they unanimously confirm that customer orientation, processes orientation, cooperation, achieving common goals determined on the basis of fact-based decisions and continuous improvement are attitudes, actions and values that fit into the DNA of their companies. Such a point of view characterizes, for example, employees (founders, managers and subordinates) constituting Polish software houses – companyies from the IT sector, a significant part of which has achieved a strong position in global competitive markets.

For instance, the software house action "10 Clouds" is described by the maxims: "Don't ask for permission – ask for forgiveness", "Break things, move fast" or "If you don't evolve, if you don't grow, you die" (reflecting high tolerance for making mistakes resulting from the use of innovative solutions, openness to taking risks, stimulating independence and learning from mistakes, shaping high adaptability and agility in action, including flexible market responses). The managers of the organization are strategically focused on building long-term relationships - both with customers and members of the team constituting the company. On the other hand, the operation of the software house "BinarApps" is characterized by a code of values applied simultaneously to external (clients) and internal (employees) stakeholders.

They are curiosity and enthusiasm, transparency and responsibility, humour (distance to oneself and the environment), investing in self-development and participation in designing a workplace. For comparison - the canvas of the organizational quality of the software house "Monterail" is formed by four basic values, convergent with those building the organizational culture of "BinApps" – responsibility, keeping promises, bearing the consequences of your decisions and actions, honesty and remaining modest. Parallel, the pro-quality spirit of "STX Next" is determined by the following overarching principles – team power, software craftsmanship, win-win, transparency, continuous improvement. Moreover, the quintessence of the organizational quality culture of the software house "Boldare" is its name, which is an emanation of the basic assumptions, norms and values, as well as artifacts of this organization. The pride of its functioning is the "Dare to be bold" standard, which reflects expressive, bold actions, transparency of implemented activities, as well as openness, cooperation and responsibility. People creating "Boldare" emphasize that it is a company managed according to the concept of holocracy, following the formula proposed by B.J. Robertson (2015) (for more see: (Smyrska, 2019)). This examples are therefore a contribution to the selection and confirmation of areas and scopes of the organizational quality culture.

Then, the managers of the organizations will be able to guide their enterprises through all the stages of evolution towards a culture of quality identified by K. Cameron and W. Sine: from no emphasis on quality, through error detection and prevention of quality errors to permanent quality creation (Bugdol, 2013; Pietruszka-Ortyl, 2019). The proposed tools for examining the organizational culture of quality can be used for this purpose, by adopting and setting appropriate reference levels of orientation, as well as areas and scopes for each of the indicated phases, which depend on the character of the company's business sector and the level of the industry's competitive advantage. At the same time, the values and norms defining the culture of quality constitute the second level of the analysis of organizational culture according to E. Schein, i.e. values and norms (Cronemyr, Bäckström, and Rönnbäck, 2017; Niemiec, 2020). In this case, they are associated with the following values: solidarity, integration, community, diversity, consensus, omnipresence, adaptability, commitment, consistency, mission (Tenji, and Foley, 2019).

In the evolution towards achieving the level of organizational quality culture, it must be remembered that the basic, parent organizational culture of an enterprise, which can be referred to as the foundational or indigenous culture, has a fundamental impact on the course of this process. Indigenous culture keeps the organizational culture adequate and resistant to environmental turbulence (Kaul, 2019; Pietruszka-Ortyl, 2019). Ideally, this underlying culture should be the culture of quality, or similar based on attitudes and values that are key to a culture of quality. At the same time, research proves that the culture of community is a predictor of reliability, stability, reactivity and empathy, and the innovative culture has a stronger impact on material, technical directions of pro-quality business growth (Karakasnaki, Psomas, and Bouranta, 2019). Additionally, group and development culture largely stimulate both the

technological and social aspects of quality management. Hence, managers should have extensive competences in terms of team management, interpersonal relations and searching for innovation and new resources. They should favor teamwork, help individuals improve and broaden their competences, as well as reward any and all quality improvement initiatives at all levels (Patyal, and Koilakuntla, 2019).

In conclusion, in the modern business environment, having an adequate organizational culture, especially an organizational culture of quality, is the key to success in every area of the company's operations. In order to be able to fully leverage it, activities aimed at shaping the organizational culture of quality should be operationalized. The concept of its research proposed in this paper may be helpful in achieving this goal.

It is possible due to the theoretical and practical contribution of this article to the exploration of organizational quality culture issues. Namely, firstly, it is the determination of six orientation components for building an organizational quality culture – customer satisfaction orientation, process orientation, group work orientation, open communication and knowledge exchange orientation, and orientation on making decisions based on facts – and setting them in the context of primates. values and related activities – trust, learning, participation, communication. Secondly, it is the selection of four areas and the scopes of the organizational quality culture: people (empowerment, motivation, training, communication, teamwork), processes (systems, managerial control, effective coordination, coherence and stabilization, working environment), proactivity and initiative (customer orientation, tendency to take risks, innovativeness, organizational learning, investments) and objectives (vision, strategy, values, priorities, milestones).

They, in turn, also determine the areas of further research, in particular the verification of the proposed tools in practice, i.e. checking their suitability for analysis and diagnosis, whether given organizations are focused on building an organizational quality culture, in what phase of evolution to organizational quality culture are they, or runs evenly and covers all identified orientations as well as the indicated areas and scopes. These inferences can take place in the context of specific organizations and take the form of a case study or concern analyses of specific sectors of the economy or be conducted comprehensively.

Acknowledgements

The publication was financed from the subsidy granted to the Cracow University of Economics for science.

References

1. Adebajo, D., Kehoe, D. (1998). An evaluation of quality culture problems in UK companies. *International Journal of Quality, 3(3),* 275-286.
2. Al Saifi, S.A. (2015). Positioning organisational culture in knowledge management research. *Journal of Knowledge Management, 19(2),* 164-189.
3. Ali, H.M., Musah, M.B. (2012). Investigation of Malaysian higher education quality culture and work performance. *Quality Assurance in Education, 20(3),* 289-309.
4. Ambekar, S., Prakash, A., Patyal, V.S. (2019). Role of culture in low carbon supply chain capabilities. *Journal of Manufacturing Technology Management, 30(1)*, 146-179.
5. Berry, G. (1997). Leadership and the development of quality culture in schools. *International Journal of Educational Management, 11/2,* 52-64.
6. Bieńkowska, J., Sikorski ,C. (2016). *Ewolucja zarządzania – dyktat struktury, strategii i kultury.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
7. Bugdol, M. (2013). *Kultura jakości jako wyraz filozofii zarządzania*. In: T., Oleksyn (Ed.), *Filozofia a zarządzanie* (pp. 213-242). Warszawa: Oficyna Wolters Kluwer Polska SA.
8. Corfield, A., Paton, R. (2016). Investigating knowledge management: can KM really change organisational culture? *Journal of Knowledge Management, 20(1),* 88-103.
9. Cronemyr, P., Bäckström, A., Rönnbäck, A. (2017). Quality culture deployment – using behaviours to explain, diagnose and improve a quality culture. *International Journal of Quality and Service Sciences, 9(3/4),* 498-518.
10. Daneshmandnia, A. (2019). The influence of organizational culture on information governance effectiveness. *Records Management Journal, 29(1/2),* 18-41.
11. Ehlers, U.D. (2009). Understanding quality culture. *Quality Assurance in Education, 17(4),* 343-364.
12. Emond, B., Taylor, J.Z. (2018). The importance of measuring food safety and quality culture: results from a global training survey. *Worldwide Hospitality and Tourism Themes, 10(3),* 369-375.
13. Famiyeh, S., Asante-Darko, D., Kwarteng, A. (2018). Service quality, customer satisfaction, and loyalty in the banking sector: The moderating role of organizational culture. *International Journal of Quality & Reliability Management, 35(8),* 1546-1567.
14. Glińska-Neweś, A. (2007). *Kulturowe uwarunkowania zarządzania wiedzą w przedsiębiorstwie*. Toruń: Wydawnictwo Dom Organizatora.
15. Gołębiowski, M. (2014). Elementy kultury jakości w organizacji. *Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania, 38(1),* 33-42.
16. Gorzelany, J. (2020). Integration of structure, culture and strategy in designing a management system. *Scientific Papers of the Silesian University of Technology. Organization and Management Series, 144,* 115-124.
17. Gouda, S.K., Awasthy, P., Krishnan, T.S., Sreedevi, R. (2019). What does "green quality" really mean? *The TQM Journal, 31(1),* 52-69.

18. Ha, N.D., Quang, B. (2014). Factors Influencing the Process of Developing Quality Culture at the University of Social Sciences and Humanities. Vietnam National University-Ho Chi Minh City. *Asian Journal of Humanities and Social Sciences, 2(4),* 1-9.
19. Ingelsson, P., Bäckström, I., Snyder, K. (2018). Strengthening quality culture in private sector and health care. What can we learn from applying soft measures? *Leadership in Health Services, 31(3),* 276-292.
20. Kamińska, B. (2012). Rola kultury organizacyjnej w funkcjonowaniu współczesnych przedsiębiorstw. *Przegląd Organizacji, 2,* 10-14.
21. Kane, K., Taylor, J.Z., Teare, R. (2018). Reflections on the theme issue outcomes: Can the culture of safety and quality in organizations be measured and changed? *Worldwide Hospitality and Tourism Themes, 10(3),* 391-396.
22. Karakasnaki, M., Psomas, E., Bouranta, N. (2019). The interrelationships among organizational culture and service quality under different levels of competitive intensity: An application in the shipping industry. *International Journal of Quality and Service Sciences11(2),* 217-234.
23. Kaul, A. (2019). Culture vs strategy: which to precede, which to align? *Journal of Strategy and Management, 12(1),* 116-136.
24. Kaur, M., Singh, K., and Singh, D. (2020). Identification of barriers to synergistic implementation of TQM-SCM. *International Journal of Quality & Reliability Management.* Retrived from: https://doi.org/10.1108/IJQRM-05-2019-0141, 24 August 2020.
25. Kemenade, E., Hardjono, T.W. (2019). Twenty-first century Total Quality Management: the Emergence Paradigm. *The TQM Journal, 31(2),* 150-166.
26. Khan, B.A., Naeem, H. (2018). The impact of strategic quality orientation on innovation capabilities and sustainable business growth: Empirical evidence from the service sector of Pakistan. *International Journal of Quality & Reliability Management, 35(8),* 1568-1598.
27. Kucharska, W. (2017). Relationships Between Trust And Collaborative Culture In The Context Of Tacit Knowledge Sharing. *Journal of Entrepreneurship, Management and Innovation (JEMI), 13(4),* 61-78.
28. Kumar, R., Singh, K., and Jain, S.K. (2019). Development of a framework for agile manufacturing. *World Journal of Science, Technology and Sustainable Development, 16(4),* 161-169.
29. Laforet, S. (2016). Effects of organisational culture on organisational innovation performance in family firms. *Journal of Small Business and Enterprise Development, 23(2),* 379-407.
30. Latusek, D. (2008). *Rola kultury organizacyjnej w zarządzaniu wiedzą*. In: D., Jemielniak, A.K., Koźmiński (Eds.), *Zarządzanie wiedzą. Podręcznik akademicki* (pp. 161-194). Warszawa: Wydawnictwa Akademickie i Profesjonalne.
31. Lobo, R.S., Samaranayake, P., Laosirihongthong, T. (2018). Quality management capabilities of manufacturing industries in the Western Sydney region: Comparative

analysis for quality improvement. *International Journal of Quality & Reliability Management, 35(6),* 1232-1252.

32. Manning, L. (2018). The value of food safety culture to the hospitality industry. *Worldwide Hospitality and Tourism Themes, 10(3),* 284-296.
33. Markowitsch, J. (2018). Is there such a thing as school quality culture? In search of conceptual clarity and empirical evidence. *Quality Assurance in Education, 26(1),* 25-43.
34. Molenda, M. (2012). Znaczenie wartości organizacyjnych w rozwoju kultury jakości. *Zeszyty Naukowe Politechniki Śląskiej. Seria: Organizacja i Zarządzanie, 63a(1891),* 1641-3466.
35. Niemiec, M. (2020). Organizational culture of the War Studies University in opinion of students of the Faculty of Management and Command. *Scientific Papers of the Silesian University of Technology. Organization and Management Series, 145,* 345-357.
36. Paliszkiewicz, J. (2013). *Zaufanie w zarządzaniu.* Warszawa: PWN.
37. Paliszkiewicz, J., Svanadze, S., Jikia, M. (2017). The role of knowledge management processes on organizational culture. *Online Journal of Applied Knowledge Management, 5(2),* 29-44. Retrieved from: http://www.iiakm.org/ojakm/articles/2017/volume5_2/OJAKM_Volume5_2pp29-44.pdf, 1 June 2019.
38. Patyal, V.S., Koilakuntla, M. (2018). Impact of organizational culture on quality management practices: an empirical investigation. *Benchmarking: An International Journal, 25(5),* 1406-1428.
39. Pereira Paro, P.E., Gerolamo, M.C. (2017). Organizational culture for lean programs. *Journal of Organizational Change Management, 30(4)*, 584-598.
40. Pietersen, Ch. (2017). Organizational culture: a foundational perspective. *African Journal of Economics and Management Studies, 8(3),* 262-273.
41. Pietruszka-Ortyl, A. (2018). In search of quality culture – theoretical analysis. In: B., Mikuła, T., Rojek (Eds.), *Knowledge, Economy, Society: Reorientation and transformations of economy and organization management concepts* (pp. 137-146). Cracow: Foundation of the Cracow University of Economics.
42. Pietruszka-Ortyl, A. (2019). Organizacyjna kultura jakości – ujęcie teoriopoznawcze. In: M., Gębarowski, M., Jabłoński (Eds.). *Towaroznawstwo w badaniach i praktyce – Jakość wobec wymagań współczesnego rynku* (pp. 149-158). Radom: Sieć Badawcza Łukasiewicz – Instytut Technologii Eksploatacji.
43. Robertson, B.J. (2015). *Holocracy: The New Management System for a Rapidly Changing World.* New York: Henry Hold & Co.
44. Sankowska, A. (2011). *Wpływ zaufania na zarządzanie przedsiębiorstwem. Perspektywa wewnątrzorganizacyjna.* Warszawa: Difin.
45. Skotnicka-Zasadzień, B. (2020). Quality aspects of improving the production process effectiveness by eliminating critical defects. *Scientific Papers of the Silesian University of Technology. Organization and Management Series, 144,* 439-447.

46. Smyrska, M. (2019). *Napędzani zaufaniem. Kultura organizacyjna w polskich software house'ach. Case studies.* Warszawa: Contella Publishing.
47. Srinivasan, A., Kurey, B. (2014). Creating a Culture of Quality. *Harvard Business Review, April issue.* Retrived from: https://hbr.org/2014/04/creating-a-culture-of-quality, 23 August 2020.
48. Sułkowski, Ł. (2013a). Funkcjonalistyczna wizja kultury organizacyjnej w zarządzaniu – dominujący paradygmat i jego krytyka. *Problemy Zarządzania, 11(4)*, 20-32.
49. Sułkowski, Ł. (2013b). Kultura jakości w zarządzaniu, czyli pomiędzy tożsamością a kulturą organizacyjną. *Przedsiębiorczość i Zarządzanie, (8)*, 25-37.
50. Taylor, J.Z., Rostron, K.I. (2018). The development of a safety and quality culture assessment tool from a longitudinal, mixed-method research journey. *Worldwide Hospitality and Tourism Themes, 10(3),* 313-329.
51. Tenji, T., Foley, A. (2019). Testing the readiness of an organisational culture profile to a TQM implementation. *The TQM Journal, 31(3),* 400-416.
52. Tong, C., Tak, W., Wong, A. (2016). The Impact of Knowledge Sharing on the Relationship between Organizational culture and Job Satisfaction: The Perception of Information Communication and Technology (ICT) Practitioners in Hong Kong. *International Journal of Human Resources Studies, 5(1),* 19-47.
53. Trippner-Hrabi, J., Stroińska, E., Jażdżyk, A. (2020). From intellectual capital to the customer capital model in the process of the real estate revitalization on the example of the city of Lodz. *Scientific Papers of the Silesian University of Technology. Organization and Management Series, 144,* 559-571.
54. Troy, K., Schein, L. (1995). The quality culture: manufacturing versus services. *Managing Service Quality, 5(3),* 45-47.
55. Wolniak, R. (2019). The problems of quality of working life measure. *Scientific Papers of the Silesian University of Technology. Organization and Management Series, 138,* 253-262.
56. Wu, S.J., Zhang, D., Schroeder, R.G. (2011). Customization of quality practices: the impact of quality culture. *International Journal of Quality & Reliability Management, 28(3),* 263-279.
57. Wu, S.J. (2014). The impact of quality culture on quality management practices and performance in Chinese manufacturing firms. *International Journal of Quality & Reliability Management, 32(8),* 799-814.
58. Wyrostek, M. (2012). Wpływ kultury organizacyjnej na jakość pracy w przedsiębiorstwie. *Rynek – Społeczeństwo – Kultura, 2,* 43-49.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE ROLE OF DIGITAL COMMUNICATION TOOLS IN THE PROCESS OF HUMANIZATION OF SMART CITY

Barbara ROŻAŁOWSKA

Silesian University of Technology; barbara.rozalowska@polsl.pl, ORCID: 0000-0003-3455-1073

Purpose: The aim of the article is to characterize the channels of communication between citizens and the authorities of Polish cities and check the extent to which cities use the digital possibilities of contact.
Design/methodology/approach: In order to find out about the communication patterns, 280 randomly selected cities were examined. The subject of communication was part of a broader study on the functioning of a smart city in Poland. The theoretical basis used in the article is human smart city. This concept assumes that the functioning of cities requires social participation and effective communication also using channels supported by information and communication technologies (ICT).
Findings: The conclusions of the study show that most cities still used the traditional approach in dealing with the locals. Personal meetings and a paper-based message are preferred.
Research limitations/implications: In further research, it is worth observing in which direction the development of city websites is progressing, whether there are general tendencies to expand meeting places between residents, groups of residents and city officials, and what new functionalities are offered by city portals, including social networks. Quantitative research should be extended with case studies to better illustrate the subject of communication.
Practical implications: The article can be used by municipal authorities to improve communication with residents. Moreover, it enables comparisons to be made between groups of cities differing in the number of inhabitants.
Originality/value: The text considers the subject of communication between the authorities and residents, which has never been studied on a national research sample. New are also developed theoretical models on which to work.

Keywords: citizen participation, smart city, e-participation, social media, digital engagement.

Category of the paper: Research paper.

1. Introduction

The idea of a smart city is already well established in the discourse on the possibility of using information technology in the development of cities and urban communities around the world. From the moment this topic appeared in the scientific discussion, its gradual evolution from the "technology driven method" to the "human driven method" (Kummitha, 2017), from smart city to smart citizen (Shelton, and Lodato, 2019) or the transformation of management from top-down on the bottom-up (Breuer et al., 2014). Initially, the focus was on the use of internet of things (IoT), urban applications and other data collection and gathering tools, which can be called urban informatics (Foth, 2018). After taking into account that the use of IT is not an end in itself, but should serve the development of the entire urban system, the perception of the city has become citizen-centric (Wolff, 2020). The definition of Caragliu (2011) shows that the human factor is very important: “city can be defined as 'smart' when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory governance.

The area of scientific reflection on the smart city also expanded the cultural changes taking place in the city management models. The new participatory way of city governance is now seen as better at implementing urban policies and as capable of achieving more complex goals (Simonovski et al., 2017; Sengboon et al., 2018). Although civic participation is not a new phenomenon, it has long been regarded as a pillar of democracy and the basis of civil society activities aimed at developing civic skills (Michels, and de Graaf, 2010). The new promoted version has been extended with digitization elements, provided in the smart city package, which is why some authors write directly about Digital Citizen Participation (Bouzguenda et al., 2019).

Human smart city means looking at the city from the perspective of its inhabitants and their needs, instead of focusing on the requirements of efficiency and reliability of technical systems (Pfäffli et al., 2018). De Oliveria in his manifesto described the idea as follows: “The human smart cities are those where governments engage citizens be being open to be engaged by citizens, supporting the co-design of technical and social innovation processes through a peer-to-peer relationship based on reciprocal trust and collaboration. The human smart city is a city where people – citizens and communities – are the main actors of urban 'smartness'“ (de Oliveira, 2016, p. 201). A human smart city is therefore a city based on civic participation, efficient in the multidirectional flow of information, involving various stakeholders in order to improve the quality of life. It is clearly visible that the role of communication with residents in the city is beginning to take on a new meaning. The goal is not only to provide information about the residents' own needs, but also to be able to communicate widely and cooperate with each other. In smart city, thanks to the use of social media by city authorities, the way of

communication between various stakeholders in the city has expanded. Two-way communication has emerged instead of simply providing information in the top-bottom direction (Johnson et al., 2020). The intelligence of an urban area depends on the extent to which digitization will make it easier for the city, district or smaller ecosystems to become more open, participatory and experimental. Proprietary platforms and social media are becoming the main nodes connecting various stakeholders in the city's digital space. Platforms that are hosted and controlled by municipal government are very important. They make it possible to provide information and obtain data sent by stakeholders, e.g. during voting. Berntzen and Johannessen (2016) list many advantages of such a tool. It covers many important areas for various city users, from providing current information, to specialized urban planning tools and geographic information systems. Their social impact is also appreciated, as in places with low civic participation it can contribute to the creation of grassroots movements and improve social inclusion rates. The same is happening in the area of social media, which allow the inclusion of a wider representation of residents in discussions about the city (Zavattaro et al. 2015). In addition, aggregation of data from social media can provide valuable information (Berntzen et al., 2016).

The aim of the article is to consider the channels of communication between the authorities and residents as well as the conditions of civic participation in young Polish cities in terms of the degree of development of democracy. Only after the local government reform in 1990, introducing decentralization of management, cities and their citizens gained self-government (Izdebski, 2014). The development of democracy happened at the same time as the IT revolution that introduced smart solutions to city systems was taking place in other cities around the world. It is therefore interesting what strategies for communicating with residents have been chosen in cities of various sizes and to what extent the Internet has facilitated dialogue for Polish cities with the locals. For this purpose, data obtained in a nationwide survey conducted by the Department of Organization and Management of the Silesian University of Technology were used.

2. Communication channels in a smart city

Contact with the residents of smart city is possible thanks to off-line and on-line communication. Bertnzen and Johannessen (2016) claim that the traditional ways of dialogue between the authorities and citizens, including focus groups, surveys and town-hall meetings are still important activities undertaken by city officials. However, the use of communication and information technologies (ICT) allows more people to participate in the decision-making processes. Among the possible participatory activities, smart city offers new means of communication directed by residents towards the city authorities. Thanks to various

communication channels, such as: e-mail, electronic forms, webGIS, social networks and mobile applications, it is possible to report matters of various importance to city officials. They may even be information about damaged benches, holes in the roads.

An important role in the inclusion of citizens in city affairs plays a way to transfer information. Participation is strengthened when a given means of communication is perceived as easy-to-use tools and when residents receive positive feedback from the local government (Kopackowa, Komarkova, 2020). However, the implementation of new solutions requires time, mutual support and building an atmosphere of trust. The original use of city websites resulted from treating the city as an enterprise, therefore the content posted on them focused on providing information about the city and facilitating transactions concluded by the city and business (Urban, 2002). In such a model, there was no room for dialogue with the residents, unless they were entrepreneurs.

Johnson, Robertson, and Philpot (2020) distinguish between traditional and transactional types of contacts in their research on the means of communication between authorities and stakeholders. They indicate four modes of transaction: intentional contribution (type), intermediated by third party (tweet), convened or requested transaction (tap), and transaction based on movement (pass). Most related to traditional means of communication is type, which includes a form of intentional citizen-initiated contact such as letter, telephone, e-mail. Tweet mode refers to communication using social media platforms managed by third parties not related to the municipal government. A tap is a transaction convened at the request of the authorities and requires online activity, e.g. voting for projects in the civic budget. However, this is done without the intermediation of external companies in relation to the city authorities. A pass is a transaction resulting from collecting data using sensors, tracking traces on the Internet in order to learn about the activity, behaviour and habits of users of a given space. It is often perceived as the most controversial due to the privacy issue and ignorance of the people from whom the data is collected. Technologies typical for a smart city are used here, i.e. sensors and cameras.

Table 1.
Hierarchy for smart city citizen engagement activities

Forms of citizen engagement		**Coded type of acitvity**
Transactive	Online inputs with formal standing in decision process	Online public consultation platforms (desktop and mobile) Social media
Traditional	Online inputs without formal standing in decision process. Public discussion, interviews, surveys, hands-on activities and targeted sessions with formal standing	Focus groups Public discussion Workshops and hands-on activities Surveys
	Passive information delivery	Audio-visual information Website information

Source: Johnson, P.A., Acedo, A., and Robinson P.J. (2020) Canadian Smart Cities: Are We Wiring New Citizen-local Government Interactions? *The Canadian Geographer/Le Géographe Canadien*, p. 6. https://doi.org/10.1111/cag.12623.

The division of communication channels into transactive and traditional ones, proposed by the researchers, is presented in Table 1. Transactive channels are typical of activities with the highest level of participation of residents. They require the use of ICT in the relationship between city officials and residents. Canadian research on the relationship between citizen participation, management and the type of communication channels used shows that they most often still use traditional methods of involving residents in city activities. Organizing face-to-face meetings is still the most popular (Johnson et al., 2020). Research explains the role of particular communication channels.

3. Methods

The first method used was based on an analysis of the literature to conceptualize the research. The articles were selected on the basis of scientific text search engines: Science Direct, Google Scholar, Scopus, and Web of Science. The following keywords were searched for: citizen participation, smart city, e-participation, social media and digital engagement. Subsequently, articles whose titles and summaries corresponded to the subject of this work were qualified for research.

Table 2.
Characteristics of communication channels in a smart city

Features of communication channels	**Examples**
Initiated by officials	Information on the city's website, printed materials, surveys of residents, consultations, meetings with residents.
Initiated by residents	Civic initiatives; ideas, complaints and comments submitted by residents.
Indirect	Transmission in writing or via the website, telephone, social media.
Direct	Face-to-face meetings between officials and residents.
One-way	Information via website, leaflets, brochures, digital information boards.
Two-way	Social media, interactive websites, chats with officials, telephone, letter, e-mail.
Supported by ICT	City websites and mobile applications, e-mail, social media, digital information board.
Traditional – without ICT support	Letter, phone, flyer, brochure, face-to-face meeting.
Individual	E-administration; ideas, complaints, comments and individual initiatives.
Group	Social media, group civic initiatives.
Formal	Consultations via the Internet, consultations in direct contact with groups of residents, surveys.
Informal	Social media.

The aim of the next stage of the research was to develop a theoretical research model, which was then used in extensive studies of Polish cities. The research was inspired by the considerations of Canadian researchers on the involvement of citizens in the city's affairs (Johnson, Robinson, and Philpot, 2020; Johnson, Acedo, and Robinson, 2020).

The model proposed by Canadian researchers was extended to include a juxtaposition of various interweaving features of communication channels. The applied categorizations allow for the specification of the characteristics of various forms of activities undertaken by the authorities and citizens. They are organized as follows: officials initiated – initiated by residents, indirect – direct, one-way – two-way, ICT-supported – traditional without ICT support, individual – group, with formal standing in decision process – without formal standing in decision process. Examples are presented in Table 2.

The research assumed that a smart city is a city where communication between officials and residents takes place not only through digital platforms and mobile applications. Technology is more of an intermediary, while the main goal is to activate and enable residents to decide on matters related to the functioning of the city, which can be helped by a variety of communication channels. Therefore, the balance between pairs of channel characteristics is viewed as an asset.

An extensive questionnaire was addressed to 280 randomly selected city offices in Poland, which accounts for almost 30% of all cities. Research problems related to the methods of communication between city offices and residents constituted one of the 6 modules related to the smart city category. The main questions relevant to the research process are:

- whether information technologies have replaced the traditional way of communicating with the inhabitants;
- to what extent large urban centres (if this is true) outpaced the smaller ones in using the Internet in contacts between city authorities and residents;
- what are the characteristics of the communication process in a smart city.

Table 3.
Division of communication channels

Digital communication channels	Traditional communication channels
➢ city website ➢ a website or subpage devoted to public consultations ➢ website dedicated to expressing opinions, suggestions, commenting ➢ social media ➢ urban mobile applications ➢ digital information boards	➢ traditional letter ➢ written opinions submitted directly to the city hall ➢ telephone ➢ face-to-face contact with the clerk ➢ sounding

The research tool was constructed to obtain detailed information on the communication channels used. It was assumed that nowadays all Polish cities have a city website, which, however, may differ in the degree of transactivity. The general division of communication channels includes two categories: digital and traditional (Table 3). Digital communication channels are primarily related to the city's website, which can be a very complex tool that allows you to conduct online consultations, chat with an official or collect ideas and comments from residents. Social media are also important for creating a space for dialogue, as they allow for greater interactivity and encourage participation (Mossberger et al., 2013).

4. Results

Research reveals that Polish cities most often use traditional methods of contacting their residents (Fig. 1). The most popular forms of contact are face-to-face meetings with officials. The research did not distinguish whether these are meetings in the city hall or in another city space, and whether the meeting is related to consultations. Almost the same number of respondents indicated the letter form as an important communication channel. Slightly less, 70.7% allows the letter to be left at the municipal office. Sending a regular letter may be considered an alternative for people who do not use a computer.

Another traditional method is opinion polls, which as a form of one-way communication are usually used to measure quality of life. However, such research is expensive, which is why the largest cities conduct them more often among their inhabitants. 72% of the surveyed city offices confirmed that such research is carried out. The overall result for all cities is around 30%.

The second category of communication channels is related to the use of Internet tools. Most cities communicate with residents via e-mail, although few (13.2%) have a special form for sending content directly from the city's website. Social media are becoming more and more popular places to exchange content between different users of urban space. Facebook is definitely dominant in Polish cities with a result of 73.6%, while Tweeter and Instagram are used by a small percentage of cities. It is a form of communication mediated by large companies external to city councils (Johnson, Robertson, and Philpot, 2020). Analysing the city size, it can be seen that cities with more than 100,000 residents use various sets of possible communication channels and definitely differ from smaller towns. It looks like the number of 100,000 inhabitants, it becomes the limit quantity. Above it, cities are forced to introduce more communication channels in order to improve the quality of contact with residents, as it becomes impossible to use only traditional forms. In the group of the largest cities, the use of social media is increasing – 92% of them stay in touch via Facebook, and Instagram is increasingly important (40%). Tweeter in Polish cities did not gain popularity, it was noticed as a supporting medium in cities over 50 thousand residents. In this group, only every fifth city uses Tweeter, while among the larger cities with more than 100 thousand residents it is every third city.

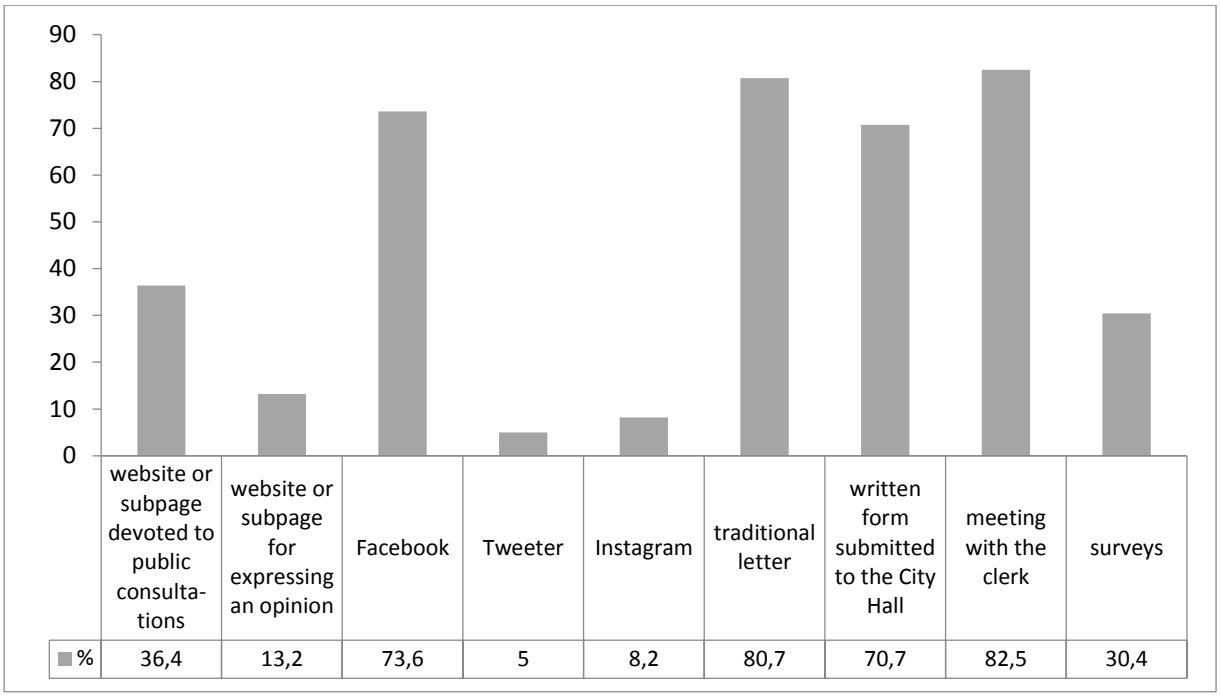


Figure 1. *Communication channels used in Polish cities.*

Table 3.
Communication channels depending on the city size (% of yes answers)

What channels do the city authorities use to communicate with residents?	Number of inhabitants (in thousands)					
	Up to 5 000	**5 001-10 000**	**10 001-25 000**	**25 001-50 000**	**50 001-100000**	**More than 100000**
a website or subpage devoted to public consultations	23.1	23.3	30.9	55.3	33.3	84.0
a website or subpage dedicated to expressing opinions and suggestions, commenting on current issues important to residents	5.1	13.3	14.9	15.8	8.3	20.0
social media – Facebook	53.8	60.0	75.5	92.1	83.3	92.0
social media – Twitter	0.0	1.7	0.0	0.0	20.8	32.0
social media – Instagram	5.1	6.7	4.3	5.3	4.2	40.0
opinions and comments may be sent by traditional mail	79.5	75.5	77.7	89.5	79.2	96.0
opinions and comments in writing can be left at the city hall or at a selected point in the city	69.2	60.0	63.8	86.8	83.3	88.0
opinions and comments may be presented to the official in person	82.1	78.3	85.1	86.8	70.8	88.0
surveys	17.9	16.7	25.5	52.6	25.0	72.0

It can be noticed that in smaller cities, traditional communication channels not supported by ICT are much more often chosen. Only few cities have their own smartphone applications for contacting residents. Among the largest Polish cities, only Warsaw has such an application.

5. Discusion

The study reveals that in a smart city, two-way communication supported by the Internet does not dominate among the possible ways of transmitting information. In Poland, only 36.4% of cities have a website dedicated to public consultations, which enables dialogue with city authorities. Traditional methods of contacting residents are more often chosen. Canadian researchers (Johnson, Acedo, and Robinson, 2020) drew similar conclusions from their research. The problem of working out the ways in which the Internet is used to engage residents remains valid. As noted by Feerney and Brown (2017), city websites can greatly influence the development of democracy by providing places for civic dialogue and transparency of information, but most of them do not implement new solutions to improve the communication process. The development of communication channels is related to the overall vision of who a city user is. Researchers indicate that the dominant position of a city dweller can be described as service user or entrepreneurial. It is rare to see a citizen in an inhabitant whose actions are not related to politics or market activity (Cardullo, and Kitchen, 2019). This is why the city's websites still lack space for two-way exchange of information between citizens and city authorities. Urban (2002) had shown in his research the relationship between the democratic use of websites and the degree of city development much earlier. Richer city more often used city websites to support the lives of their inhabitants, while the poorer ones treated their websites as a shop window for attracting business and tourists to the city. In Poland nowadays, these largest cities have the best conditions to develop towards a smart city (Jonek-Kowalska, 2019).

The inclusion of social media in the communication channels used gave the residents hope for the development of dialogue between the authorities and the residents. About 73% of offices in Polish cities use social media, which is a low percentage compared to other countries. In the USA, already in 2013, 92.4% of cities used Facebook (Norris, and Reddick, 2013). The role of social media is appreciated despite the informal formula of contacts between users. This is evidenced by the inclusion of more and more alternative portals, such as Instagram, YouTube by other cities.

Large Polish cities – as research has shown – use much more communication channels, both traditional and digitized, which enable the participation of diverse groups of residents. The slow process of "the evolution from people as residents, consumers, participants, to co-creators" may be an obstacle in the democratization of space (Foth, 2018). The activity of residents is still relatively low (Inglot-Brzęk, 2017) and attachment to traditional methods of transmitting information between the city hall and residents is visible. The problems faced by cities planning to involve citizens in the discussion about the city do not only concern how to encourage residents to be active. Researchers indicate that obtaining a real representation of all smart city users is extremely difficult. This is mainly due to the fact that the initiatives are

targeted at people with an information technology (IT) education and address the issue of “entrepreneurial citizenship” (Engelbert et al., 2019). The development of social capital could contribute to the improvement of participation rates in civic life in cities aspiring to be "smart" (Kuzior, and Sobotka, 2019).

In further research, it is worth observing in which direction the development of city websites is progressing, whether there are general tendencies to expand meeting places between residents, groups of residents and city officials, and what new functionalities are offered by city portals, including social networks. It is also puzzling whether digitized communication channels are able to dominate the contacts between the authorities and residents in a smart city.

6. Conclusions

Information technologies have not replaced traditional methods of information exchange between city authorities and users of urban space, as direct activities are still dominant among them. However, in the largest cities, more frequent use of new communication channels supported by ICT can be observed. This increases the possibilities of participation and co-governance of the city, which should result in an increase in the quality of life. Regardless of whether the inhabitants take full advantage of the new possibilities of transmitting information, cities, especially the larger ones, are becoming more and more open to citizens and gain the ability to quickly respond to changes in the changing reality.

Acknowledgements

The study used data obtained in studies conducted at the beginning of 2020 by the Department of Organization and Management of the Silesian University of Technology. They were financed from the part of the research subsidy of the department – 13/990/BK_19/0138. The subject of civic participation and communication channels used in Polish cities is a part of a broader research on the functioning of smart city in Poland.

References

1. Bertzen, L., Johannessen, M.R. (2016). The Role of Citizen Participation in Municipal Smart City Projects: Lessons Learned from Norway. In: J.R. Gil-Garcia, T.A. Pardo, T. Nam, *Smarter as the new urban agenda a comprehensive view of the 21st century city*. Springer International Publishing.
2. Bouzguenda, I., Alalouch, C., & Fava, N. (2019). Towards smart sustainable cities: A review of the role digital citizen participation could play in advancing social sustainability. *Sustainable Cities and Society*, *50*, 101627. https://doi.org/10.1016/j.scs.2019.101627.
3. Breuer, J., Walravens, N., & Ballon, P. (2014). Beyond defining the smart city. Meeting top-down and bottom-up approaches in the middle. *TeMA - Journal of Land Use, Mobility and Environment*. https://doi.org/10.6092/1970-9870/2475.
4. Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, *18(2),* pp. 65-82. https://doi.org/10.1080/10630732.2011.601117.
5. Cardullo, P., & Kitchin, R. (2019). Smart urbanism and smart citizenship: The neoliberal logic of 'citizen-focused' smart cities in Europe. *Environment and Planning C: Politics and Space*, *37(5),* pp. 813-830. https://doi.org/10.1177/0263774X18806508.
6. de Oliveira, À.D. (2016). The human smart cities manifesto: A global perspective. In: W.G. Concilio & F. Rizzo (eds.), *Human Smart Cities* (pp. 197-202). Springer International Publishing. https://doi.org/10.1007/978-3-319-33024-2_11.
7. Engelbert, J., van Zoonen, L., & Hirzalla, F. (2019). Excluding citizens from the European smart city: The discourse practices of pursuing and granting smartness. *Technological Forecasting and Social Change*, *142*, pp. 347-353. https://doi.org/10.1016/j.techfore.2018.08.020.
8. Feeney, M.K., & Brown, A. (2017). Are small cities online? Content, ranking, and variation of U.S. municipal websites. *Government Information Quarterly*, *34(1)*, pp. 62-74. https://doi.org/10.1016/j.giq.2016.10.005.
9. Foth, M. (2018). Participatory urban informatics: Towards citizen-ability. *Smart and Sustainable Built Environment*, *7(1),* pp. 4-19. https://doi.org/10.1108/SASBE-10-2017-0051.
10. Inglot-Brzęk, E. (2017). Znaczenie roli władz samorządowych w kształtowaniu partycypacji obywatelskiej. *Nierówności społeczne a wzrost gospodarczy*, *50(2),* pp. 329-348. https://doi.org/10.15584/nsawg.2017.2.21.
11. Izdebski, H. (2014). *Samorząd terytorialny. Podstawy ustroju i działalności*. Warszawa: PWN.

12. Johnson, P.A., Acedo, A., & Robinson, P.J. (2020). Canadian smart cities: Are we wiring new citizen-local government interactions? *The Canadian Geographer/Le Géographe Canadien*, cag. 12623. https://doi.org/10.1111/cag.12623.
13. Johnson, P.A., Robinson, P.J., & Philpot, S. (2020). Type, tweet, tap, and pass: How smart city technology is creating a transactional citizen. *Government Information Quarterly*, *37(1),* 101414. https://doi.org/10.1016/j.giq.2019.101414.
14. Jonek- Kowalska, I. (2019). Identification of budgetary sources of risk in polish smart cities practical approach. *Scientific Papers of Silesian University of Technology. Organization and Management Series, 9(6),* pp. 147-162. https://doi.org/10.29119/1641-3466.2019.140.12.
15. Kopackova, H., & Komarkova, J. (2020). Participatory technologies in smart cities: What citizens want and how to ask them. *Telematics and Informatics*, *47*, 101325. https://doi.org/10.1016/j.tele.2019.101325.
16. Kummitha, R.K.R., & Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. *Cities*, *67*, pp. 43-52. https://doi.org/10.1016/j.cities.2017.04.010.
17. Kuzior, A., Sobotka, B., & Syntea, S.A. (2019). The role of social capital in the development of smart cities. *Scientific Papers of Silesian University of Technology. Organization and Management Series*, *134,* pp. 109-119. https://doi.org/10.29119/1641-3466.2019.134.9.
18. Lim, S., Abdul Malek, J., Hussain, M.Y., & Tahir, Z. (2018). Citizen participation in building citizen-centric smart cities. *Malaysian Journal of Society and Space*, *14(4),* pp. 42-53. https://doi.org/10.17576/geo-2018-1404-04.
19. Michels, A., & De Graaf, L. (2010). Examining citizen participation: Local participatory policy making and democracy. *Local Government Studies*, *36(4),* pp. 477-491. https://doi.org/10.1080/03003930.2010.494101.
20. Mossberger, K., Wu, Y., & Crawford, J. (2013). Connecting citizens and local governments? Social media and interactivity in major U.S. cities. *Government Information Quarterly*, *30(4),* pp. 351-358. https://doi.org/10.1016/j.giq.2013.05.016.
21. Norris, D.F., & Reddick, C.G. (2013). Local e-government in the united states: Transformation or incremental change? *Public Administration Review*, *73(1),* 165-175. https://doi.org/10.1111/j.1540-6210.2012.02647.x.
22. Pfäffli, M., Habenstein, A., Portmann, E., & Metzger, S. (2018). Eine architektur zur transformation von städten in human smart cities. *HMD Praxis der Wirtschaftsinformatik*, *55(5),* pp. 1006-1021. https://doi.org/10.1365/s40702-018-00451-z.
23. Shelton, T., & Lodato, T. (2019). Actually existing smart citizens: Expertise and (Non)participation in the making of the smart city. *City*, *23(1),* pp. 35-52. https://doi.org/10.1080/13604813.2019.1575115.

24. Urban, F. (2002). Small town, big website? *Cities*, *19(1),* pp. 49-59. https://doi.org/10.1016/S0264-2751(01)00045-2.
25. Wolff, A., Barker, M., Hudson, L., & Seffah, A. (2020). Supporting smart citizens: Design templates for co-designing data-intensive technologies. *Cities*, *101,* 102695. https://doi.org/10.1016/j.cities.2020.102695.
26. Zavattaro, S.M., French, P.E., & Mohanty, S.D. (2015). A sentiment analysis of U.S. local government tweets: The connection between tone and citizen involvement. *Government Information Quarterly*, *32(3),* pp. 333-341. https://doi.org/10.1016/j.giq.2015.03.003.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

AN IMPROVING THE PROCESS OF RISK ASSESSMENT OCCUPATIONAL FOR INDUSTRY

Dominika SIWIEC[1], Andrzej PACANA[2*]

[1] Rzeszow University of Technology, Faculty of Mechanical Engineering and Aeronautics, Rzeszow, Poland; d.siwiec@prz.edu.pl, ORCID: 0000-0002-6663-6621
[2] Rzeszow University of Technology, Faculty of Mechanical Engineering and Aeronautics, Rzeszow, Poland; app@prz.edu.pl, ORCID: 0000-0003-1121-6352
* Correspondence author

Purpose: The aim was improving the process of risk assessment occupational for industry, by implemented in this process the fuzzy scale (and the Fuzzy Analytic Hierarchy Process, FAHP).
Design/methodology/approach: The FAHP method was integrated with the PN-N-18002 method.
Findings: It was demonstrated that implemented the FAHP method in PN-N-18002 method allows on more precise an assessment of the root of threats on the workplace.
Research limitations/implications: This method can be used to risk assessment of each workplaces, by integrating the FAHP with any methods of occupational risk assessment.
Practical implications: The assumption was to improve the method of risk assessment occupational for industry, in which as was shown the number of accidents in work was the highest. Test of the proposed method was carried out for the operator's position of a floating excavator KG-2.5 in one of Podkarpacie enterprise extracting aggregate.
Social implications: This method can be helped to the entity performing the occupational risk assessment in precise identify the root of threats on the workplaces. This will ensure a safe workplace.
Originality/value: The originality of the proposed method is to achieve more precise an assessment of the root of threats in the workplace than by using the traditional risk assessment methods.

Keywords: risk assessment occupational, production engineering, mechanical engineering, PN-N-18002, FAHP.

Category of the paper: research paper.

1. Introduction

Providing a safe workplace is the basis for the functioning of each organization. As part of these actions is making the risk assessment occupational, for example, Risk Score method, FTA method (Fault Tree Analysis) or ETA method (Event Tree Analysis). Another often practice method of risk assessment occupational is the PN-N-18002 method (PN-N-18002:2011), which belongs to the PN-N-18002 series of occupational health and safety standards (Bajdur, and Idzikowski, 2012; Karkoszka, 2009; Woźny, and Pacana, 2013). As part of the literature review was shown that the actions, which have the aim to improve the process of risk assessment occupational were made. For example, the models of improving the risk assessment occupational and the way of reporting results were proposed (Aagedal et al., 2002). Also, was integrated the risk assessment occupational methods in the context of meeting the legal requirements of assessment the OHS, environment and quality management (Karkoszka, 2009; Karkoszka and Szewieczek, 2007). However, in the context of improving the process of risk assessment occupation was not tried to reduce the inconsistencies in assessments resulting from using a traditional number scale. Because this issue was not analyzed yet, it was considered for the research gap.

Therefore, it was justified to improving the process of risk assessment occupational as part of reducing the inconsistencies in the grades by implemented the fuzzy scale in process of risk assessment occupational, and then making the calculation adequate for it FAHP method (Fuzzy Analytic Hierarchy Process) (Chen et al., 2020; Gil, and Gonzalez-Rodriguez, 2012; Siwiec et al., 2020). It was founded that it is beneficial to implementing the Saaty scale in the PN-N-18002 method (Duda, and Juzek, 2018). The choice was resulting from preferring to using the PN-N-18002 method in risk assessment occupational in industry, in which the number of accidents in work was the highest in Poland, i.e. 28 212 accidents in the 2019 year (GUS, 2020). Therefore, the aim was improving the process of risk assessment occupational for industry, by implemented in this process the Saaty scale (and the Fuzzy Analytic Hierarchy Process, FAHP). The analysis was made as part of risk assessment occupational for the workplace in one of Podkarpacie enterprise extracting aggregate.

2. Method

The proposed method was a combination of the method of risk assessment occupational with Fuzzy Analytic Hierarchy Process (FAHP) (Pacana et al., 2020; Pacana, and Siwiec, 2020). This integration consisted of a combination of assessments obtained from risk assessment with assessments in fuzzy scale, and then on carrying out calculations the risk assessment by the FAHP method. The premise of integrating these methods was definition in

a precise manner the root of threats on workplace, by which this precision relates to reduction of the occurring inconsistencies of assessments (which was obtained by applying the fuzzy scale). This method was presented in three main steps (Fig. 1).

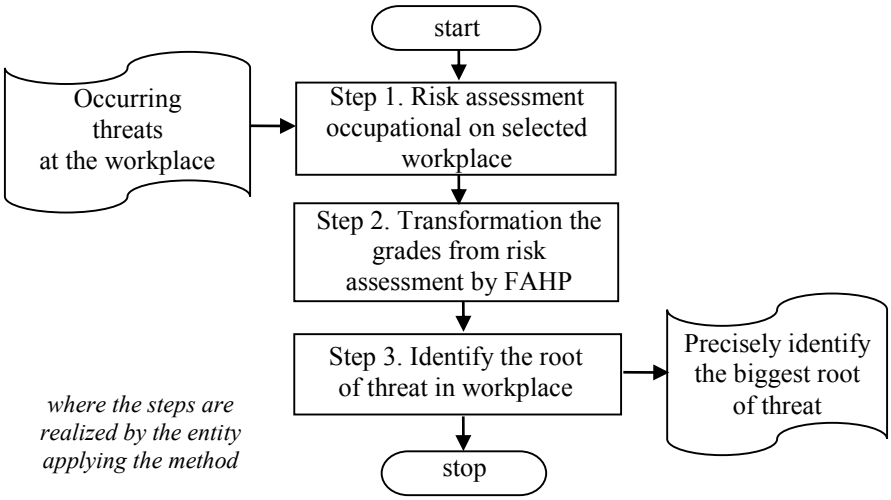


Figure 1. Algorithm of risk assessment occupational supporting by FAHP method.

The first step is to make a risk assessment for the selected workplace. Risk assessment occupational can be realized by any method in depending on the threats on workplace and needs of enterprise (Pacana, 2019).

The second step is the transformation of grades from risk assessment obtained in traditional number scale on triangular, fuzzy scale, i.e. 1-5, 1-7 or 1-9, according to the article (for example: Tsai et al., 2020). If the root of threats has more than one assessment, it is necessary to choose maximum assessment from all of the assessments for this root of threat.

The third step is making calculations by the Fuzzy Analytic Hierarchy Process (FAHP) with aim of assessing the root of threats in the workplace. This step including the reduction of inconsistency in the assessments given as part of the performed risk assessment occupational (step 1). This process is made based on transformed the grades from risk assessment occupational on triangular, Saaty scale (step 2). Then, the fuzzy comparison matrix is created in which the assessments in a fuzzy scale are comparison in pair. Then on the diagonal of the matrix there are values equal to the grade 1, i.e. in the triangular fuzzy grade scale 1,1,1. The relative fuzzy weight value is then calculated and expressed as (1) (Chang, 1996; Łuczak, 2012; Pacana et al., 2020; Tsai et al., 2020):

$$W_i = \frac{\left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}}}{\sum_{i=1}^{n}\left(\prod_{j=1}^{n} a_{ij}\right)^{\frac{1}{n}}} \; where\; i,j = 1 \sim n \tag{1}$$

where:

a_{ij} – the Tringular Fuzzy Number located at row *i* and column *j* in the parawise comparision matrix,

W_i – the fuzzy weight of row *i*.

Subsequently, the degree of possibility is calculated by the formula (2) (Chang, 1996; Łuczak, 2012; Pacana et al., 2020; Tsai et al., 2020):

$$V\left(\widetilde{W_i} \geq \widetilde{W_j}\right) = \mu_{\widetilde{W_i}}(d) = \begin{cases} 1, & for \quad m_{ij} \geq m_{ji} \\ 0, & for \quad l_{ji} \geq u_{ij} \\ \dfrac{\left(l_{ji} - u_{ij}\right)}{\left(m_{ij} - u_{ij}\right) - \left(m_{ji} - l_{ji}\right)} & for\ others. \end{cases} \tag{2}$$

where the degree of possibility is determined for all compared fuzzy numbers, assuming that $\widetilde{W_i} = \left(l_{ij}, m_{ij}, u_{ij}\right)$ and $\widetilde{W_j} = \left(l_{ji}, m_{ji}, u_{ji}\right)$. Successively, it is possible to find the smallest degree of possibility with respect to the fuzzy numbers (3), weight vector (4) and normalized weight vector (5) (Chang, 1996; Łuczak, 2012; Pacana et al., 2020; Tsai et al., 2020):

$$V\left(\widetilde{W_i} \geq \widetilde{W_j} | j = 1, \dots, n; i \neq j\right) = \min_{\substack{j \in (1,\dots,n) \\ j \neq i}} V\left(\widetilde{W_i} \geq \widetilde{W_j}\right) = \mu_{\widetilde{W}_i}(d) = \mu_{\widetilde{W}_j}(d); i = 1, 2, \dots, n \tag{3}$$

$$W' = \left(min_1 V\left(\widetilde{W_i} \geq \widetilde{W_j}\right), \dots, min_n V\left(\widetilde{W_i} \geq \widetilde{W_j}\right)\right) \tag{4}$$

$$W'_N = \left(\frac{\mu_{\widetilde{W}_i}(d)}{\sum minV}, \frac{\dots}{\dots}, \frac{\mu_{\widetilde{W}_n}(d)}{\sum minV}\right)^T = \left(w_j, \dots, w_n\right), \text{where i} = 1, 2, \dots \text{n; j} = 1, 2, \dots, \text{n} \tag{5}$$

The maximum value of the normalized weight vector is the greatest source of risk at the analyzed workplace.

3. Results

A test of the proposed method was made for one of Podkarpacie industry enterprises which was extracting aggregate. The choice the analyze in context of the extracting aggregate was conditioned one of the highest numbers of accidents at work, which was noted for mining and quarrying plants (i.e. 2407 accidents in 2019 year) (GUS, 2020; Siwiec, and Pacana, 2018). In mentioned the industry enterprises (and in mining and quarrying plants) one of the most practice methods for risk assessment occupational is the PN-N-18002 method (Duda, and Juzek, 2018). This method is also practiced to the risk assessment in enterprise extracting aggregate, which was selected to analyze. Therefore, as part of the test proposed method, it was reasonable to integrate the FAHP method with the PN-N-18002 method. The workplace which was subject to occupational risk assessment by the PN-N-18002 method was the workplace of KG-2,5 floating excavator operator. It resulted from a relatively high assessment of the occupational risk obtained for this job (i.e.: 4.57 – low risk according to PN-N-18002) compared to the remaining job positions of the analyzed enterprise.

The operator of floating excavator KG-2,5 of selected enterprise makes the jobs on water bodies to 30 meters from the water table, and also brings out among others gravel, sand and clay. The results of risk assessment by the PN-N-18002 method for the operator of floating excavator KG-2,5 are shown in Table 1.

Table 1.
The results of risk assessment by the PN-N-18002 method for the operator of floating excavator KG-2,5

The root of the threat	Threat	Protection	Risk category adopted	Total points in the group
Machine	Noise during plant inspection	Applied noise reduction measures below 85 dB (A)	4	4
		Exceeding NDN, noise above 85 dB, hearing protectors are used	-	
		Noise above 85 dB - hearing protectors are not used	-	
		Equivalent sound L level A [dB]	68,4 dB	
		Multiplicity	0,5417	
Machines, production process	Vibration	General vibration	4	4
		Local vibration	-	
		No mechanical vibrations	-	
		Vector mean sum	0,169	
		Multiplicity of the limit value	0,21	
Production process	Petroleum vapors	Possibility of diesel spill	3	3
		No oil can spill	-	
		Failure to apply security	-	
Electric lighting of the workplace	Electric shock	Applied efficient fire protection	4	4
		Failure to apply or ineffective fire protection	-	
Work at height	Fall from a height	Use of personal protective equipment against falls from a height	5	5
		Failure to use personal protective equipment	-	
Work in forced position	Fatigue	Use of facilities and auxiliary equipment	-	4
		Failure to use auxiliary equipment	4	
Machines, stationary and auxiliary tools	Hit, fall, slip	Possibility of hitting moving parts of the machine (without guards)	1	1
		Hazards related to sharp and protruding parts	2	2
		Hazards related to the movement of people and equipment (drowning)	3	3
		Hazards related to the physical properties of the material (weight, sharp edges, slippery surfaces, etc.)	2	2
		Electric shock hazard inadequate electrical installation	2	2
		Work in open space	6	6
		Burn hazard	1	1
		Risk of a person falling	4	4
Sum				45

Achieved assessments from the risk assessment occupational for the root of threats on the operator of floating excavator KG-2,5 were transformed on a triangular fuzzy scale (i.e. scale from 1 to 5). By which, for the root of threat i.e. machines, stationary and auxiliary tools, was achieved more than one assessment (in total points in the group). Therefore, it was chosen the maximum assessment from these threats, it was the work in open space (with 6 points).

As part of analyzing the root of threats were named in symbolic from T1 to T7, where: T1 – machines, T2 – machines, production process, T3 – production process, T4 – electric lighting of the workplace, T5 – work at height, T6 – work in forced position, T7 – machines, stationary and auxiliary tools. Subsequently, the calculations were carried out in accordance with the FAHP method, the results of which are presented in Table 2.

Table 2.
Results from the FAHP analysis

No.	Fuzzy assessment	Fragment of the fuzzy matrix pairwise comparisons			Relative fuzzy weight value	Normalized weight vector and ranking	
	l_{ij}, m_{ij}, u_{ij}	T1	T2	T3	Wi	Wn'	Ranking
T1	3; 4; 5	1,0; 1,0; 1,0	0,6; 1,0; 1,7	0,8; 1,3; 2,5	0,1; 0,1; 0,3	0,13	4
T2	3; 4; 5	0,6; 1,0; 1,7	1,0; 1,0; 1,0	0,8; 1,3; 2,5	0,0; 0,1; 0,4	0,14	3
T3	2; 3; 4	0,4; 0,8; 1,3	0,4; 0,8; 1,3	1,0; 1,0; 1,0	0,0; 0,1; 0,3	0,12	5
T4	3; 4; 5	0,6; 1,0; 1,7	0,6; 1,0; 1,7	0,8; 1,3; 2,5	0,0; 0,1; 0,4	0,14	3
T5	4; 5; 6	0,8; 1,3; 2,0	0,8; 1,3; 2,0	1,0; 1,7; 3,0	0,0; 0,2; 0,4	0,15	2
T6	3; 4; 5	0,6; 1,0; 1,7	0,6; 1,0; 1,7	0,8; 1,3; 2,5	0,1; 0,2; 0,4	0,15	2
T7	5; 6; 7	1,0; 1,5; 2,3	1,0; 1,5; 2,3	1,3; 2,0; 3,5	0,0; 0,2; 0,5	0,17	1

After calculations, it has been shown that the greatest source of threat at the position of the KG-2.5 excavator operator is the threat conventionally designated as T7 – the root of threat about the machines, stationary and auxiliary tools. This hazard reached the maximum value of the normalized weight vector (i.e. 0.17). Next (the second position in the ranking, weight 0,15) were the work at height (T5) and work in forced position (T6). Then (the third position in the ranking, weight 0,14) were the machines, production process (T2) and electric lighting of the workplace (T4). The fourth position in ranking (weight 0,13) was the root of threat about the machine (T1), and the last position in the ranking (weight 0,12) was the root of threat about the production process (T3).

4. Summary

The risk assessment occupational is basic to functional each enterprise. In Poland, the largest number of accidents in work was noted in production enterprises (28 212 accidents in the 2019 year), and also in enterprises of mining and quarrying (2407 accidents). Therefore, it was justified to analyze the way of making the risk assessment occupational in the mentioned production enterprises. It was shown, that the most often used method is PN-N-18002, but this method (as other methods of risk assessment occupational), was not improved in the context of reducing inconsistent grades. Therefore, the aim was to improve the process of risk assessment in industry enterprises by integrated the PN-N-18002 method with the FAHP method (Fuzzy Analytic Hierarchy Process). The method was tested in an enterprise

localized in Podkarpacie (which was extracting aggregate), on position the operator of floating excavator KG-2,5. After analysis, it has been shown that the greatest source of threat at the position of the KG-2.5 excavator operator is a threat about the machines, stationary and auxiliary tools. According to the context of the proposed method, it was concluded that there results from the implemented method allows for precise risk assessment occupational. The main benefit of the proposed method is an assessment of the root of threats to the workplace by reducing the inconsistent grades by fuzzy scale. This method can be used to assess the threats on other workplaces, by integrated the FAHP method with any method of occupational risk assessment.

References

1. Aagedal, J. et al. (2002). *Model-based Risk Assessment to Improve Enterprise Security*. IEEE, Proceedings of the Fifth International Enterprise Distributed Object Computing Conference, pp. 51-62, September 17-20, 2002, Lausanne, Switzerland.
2. Bajdur, W., and Idzikowski, A. (2012). Analiza i ocena ryzyka zawodowego wybranych stanowisk pracy w zakładzie odkrywkowym dolomitu. *PTZP*, pp. 691-702. Available online http://ptzp.org.pl/files/konferencje/kzz/artyk_pdf_2012/p062.pdf, 21.11.2020.
3. Chang, D.Y. (1996). Application of the extent analysis method on fuzzy AHP. *Eur. J. Oper. Res*., 95(3), pp. 649-655.
4. Chen, T. et al. (2020). Multistage Decision Framework for the Selection of Renewable Energy Sources Based on Prospect Theory and PROMETHEE. *International Journal Of Fuzzy Systems, 22(5),* pp. 1535-1555. DOI: 10.1007/s40815-020-00858-1.
5. Duda, A., and Juzek, T. (2018). Ocena ryzyka zawodowego podczas czynności związanych z drążeniem przodka I zabudową obudowy. *Systemy wspomagania w inżynierii produkcji. Górnictwo – perspektywy i zagrożenia. Węgiel, tania czysta energia i miejsca pracy, 7, 1,* pp. 329-340.
6. Gil, M.A., and Gonzalez-Rodriguez, G. (2012). *Fuzzy vs Likert scale in Statistics. In Combining Experimentation and Theory.* Springer-Verlag, pp. 407-420. DOI: 10.1007/978-3-642-24666-1_27.
7. GUS (2020). *Wypadki przy pracy w 2019 r. – dane wstępne,* 03.11.2020.
8. Karkoszka, T. (2009). Improvement of the chosen process based on the occupational health and safety criterion. *Journal of Achievements in Materials and Manufacturing Engineering, 37(20),* pp. 735-742.
9. Karkoszka, T., and Szewieczek, D. (2007). Risk of the processes in the aspect of quality natural environment and occupational safety. *Journal of Achievements in Materials and Manufacturing Engineering, 20(1-2),* pp. 539-542.

10. Łuczak, A. (2012). Ocena ważności czynników strategicznych w gminie wiejskiej z wykorzystaniem rozmytego analitycznego procesu hierarchicznego. *Journal of Agribusiness and Rural Development, 4(26),* pp. 43-56.
11. Pacana, A. (2019). *Systemy zarządzania bezpieczeństwem i higieną pracy zgodne z ISO 45001:2018.* Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
12. Pacana, A., and Siwiec, D. (2020). Improving the process of analysing the causes of problem by integrating the Ishikawa diagram and FAHP method. *Scientific Papers of Silesian University of Technology. Organization and Management Series, 143,* pp. 247-257. DOI: 10.29119/1641-3466.2020.143.20.
13. Pacana, A., Siwiec, D., and Bednárová, L. (2020). Method of Choice: A Fluorescent Penetrant Taking into Account Sustainability Criteria. *Sustainability, 12,* p. 5854. DOI: https://doi.org/10.3390/su12145854.
14. PN-N-18002:2011. *Systemy zarządzania bezpieczeństwem i higieną pracy – Ogólne wytyczne do oceny ryzyka zawodowego*.
15. Siwiec, D., Bednarova, L., and Pacana, A. (2020). Metoda doboru penetrantów dla przemysłowych badań nieniszczących. *Przemysł Chemiczny, 99(5),* pp. 771-773. DOI: DOI: 10.15199/62.2020.5.18.
16. Tsai, H.-C. et al. (2020). An Application of the Fuzzy Delphi Method and Fuzzy AHP on the Discussion of Training Indicators for the Regional Competition, Taiwan National Skills Competition, in the Trade of Joinery. *Sustainability, 12(10),* p. 4290. DOI: https://doi.org/10.3390/su12104290.
17. Woźny, A., and Pacana, A. (2013). *Ocena ryzyka zawodowego: teoria i przykłady*. Oficyna Wydawnicza Politechniki Rzeszowskiej, ISBN: 8371999054.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

A LIQUIDATION OF THE MINE IN SRK S.A. IN A PROCESSIVE APPROACH

Janusz SMOLIŁO[1], Andrzej CHMIELA[2*]

[1] Spółka Restrukturyzacji Kopalń S.A., Bytom; jsmolilo@srk.com.pl, ORCID: 0000-0003-4987-2881
[2] Spółka Restrukturyzacji Kopalń S.A., Bytom; achmiela@.srk.com.pl, ORCID: 0000-0002-0833-0923
* Correspondence author

Purpose: The scientific research was aimed to identify the procedure of actions in the company which deals with the liquidation of the mines. The procedure and conclusions which are presented will be the base to ensure effectiveness and efficiency of the processes of the liquidation.
Design/methodology/approach: To create a model of the process management systems in SRK S.A. three stages of research were achieved. The available literature on the management processes was analyzed and compared with personal experience of the mine liquidation. Interviews were conducted with the Branch Management of SRK S.A. The maps of the process of the liquidation were prepared and the areas and problems of the research were shown.
Findings: The respondents wanted to have prepared the process flow maps, that will facilitate the conduct of current and possible future liquidation processes in terms of financial efficiency.
Research limitations/implications: An analysis and solution of those problems will allow to improve the efficiency and accuracy of the conducted liquidation process.
Practical implications: The process of the liquidation of the mines is complex and costly. The rationalization and the minimization of the costs is the base to ensure effectiveness and efficiency of the processes of the liquidation.
Social implications: The process of the liquidation of the mining plant requires a number of interrelated economic, environmental and legal factors. A lack of indicated priorities can repeatedly led to competency, ambition and organizational conflicts.
Originality/value: The article presents the maps, figures, tables and surveys which introduce the process of the liquidation of the mines.

Keywords: process management, restructuring of mining enterprises, liquidation of a hard coal mine.

Category of the paper: research article.

1. Introduction

The areas of the Upper Silesian and Lower Silesian Coal Basin were among the most industrialized regions in the country and Europe with rich mineral deposits. The exploitation of the natural resources there, and in a particular coal mining since the turn of the 18th and 19th centuries, has led to a drastic disturbance of the balance of the natural environment. The caving in of ground surfaces above mining sites and flooding of large areas, contamination of surface waters and drainage of aquifers have been the results of the impact of mining on the environment. The consequences can be felt not only during the active operations, but also many years later after its completion. The mine liquidation is the last stage of the mining activity, usually as a result of the depletion of the exploited deposit or unprofitability of mining. The investment process leading to the mine liquidation is complex and costly. Important conditions influencing the conditions of the implementation process of liquidation in Polish mines are: the age of mines, a multi-deck exploitation, the depth of exploitation, an occurrence of numerous often associated natural hazards, the urbanization and a rich infrastructure on the surface of mining areas. In the old coal basins of Europe, with comparable or even easier conditions, hard coal mining has already been abandoned or is no longer able to function without state aid (Grmela et al., 2017; Harat et al., 2017).

Since the beginning of the 1990s the Polish hard coal mining industry has been implementing restructuring activities aimed at adapting the industry to the needs and conditions of the market economy, which were based on government programs mainly financed from the budget. As a result of the restructuring processes, the number of active hard coal mines decreased from 70 in 1990 to 20 today, and the number of employees has decreased from almost 400,000 people to about 70,000 people (Korski, Korski, 2015; Marek, 2006; Paszcza, 2010).

The liquidation activities are carried out by Spółka Restrukturyzacji Kopalń S.A., established in 2000. The company's tasks include the liquidation and securing of mining excavation sites, the liquidation of buildings, machinery and equipment, security works and the implementation of measures to prevent hazards resulting from the liquidation of the mining plants. These tasks are currently carried out by 8 Branches of SRK S.A. (www.srk.com.pl). Other responsibilities of one of the branches of SRK S.A. include the management of industrial property after the liquidated mines in conjunction with the Property Management Department. Its Housing Resource Administration is also responsible for the management of non-industrial assets (apartments, garages, commercial premises, etc.). As part of the securing of neighboring mines against flooding, the Company pumps water from sites of previously closed mines.

On the basis of European Union approval, the Polish government obtained permission to finance the liquidation from the state budget until the end of 2023. The value of the subsidy will amount to approximately 5 billion PLN. Despite such significant expenditures, the implementation of the mine liquidation processes has not been the subject of scientific research yet aimed at defining the principles of rationalizing and minimizing the costs incurred.

2. Legal and economic aspects of the mine liquidation process

The economic activity of extracting minerals has led to unfavourable environmental changes that may occur both at the stage of exploitation and many years after its completion (Duda 2018, Wójcik 2018). Legal regulations correspond to the complexity of the environmental consequences of mining activities. The closure of the mines is regulated in Chapter 5 of the Act of June 9, 2011, Geological and Mining Law. According to the Art. 129 of this Act, in the event of liquidation of a mining plant, in whole or in part, the entrepreneur is obliged to:

- secure or liquidate mining excavations as well as equipment, installations and facilities of the mining plant,
- Secure the unused part of the mineral deposit,
- Secure the adjacent mineral deposits,
- Take necessary measures to protect the excavations of neighbouring mining plants,
- Take necessary measures to protect the environment and reclaim the land after mining activities.

For many years, the costs of liquidation of mining plants were covered by the state budget. In 1998, the amendment to the 1994 Geological and Mining Law, which was then in force, obliged mines to establish liquidation funds as of 1 January 2000. Enterprises with a license for underground and borehole mining undertook to establish a liquidation fund in the amount of no less than 3% of depreciation charges on fixed assets of the mining plant. The collected funds may be used only to cover the costs of decommissioning the mining plant (Paszcza, 2010; Turek, 2013).

3. Research problems

In a dynamic and competitive economic world, a company's success requires modern management to utilise methods which lead to the improvement and effectiveness in the conduct of business activity (Przybyła, Chmiela, 2007). The concept of process management has recently become one of the dominant and developing directions of economic theory and practice (Bijańska, Wodarski, 2018, 2020; Bitkowska, 2013; Brilman, 2002; Brzychczy et al., 2018; Dźwigoł, 2007; Grajewski, 2012; Nowosielski, 2011; Rother, Shook, 2009; Skrzypek, Hofman, 2010).

In the hard coal mining industry, no comprehensive solutions tailored to the specifics of the industry have been developed. A developed solution for solving issues related to the efficiency of the mining process or preparatory works (Jonek-Kowalska, 2013, Przybyła, Chmiela, 2002,

2007; Turek, 2013; Turek, Jonek-Kowalska, 2013). In the case of liquidation of mines, no scientific research has been conducted so far to improve efficiency. The available literature concerns only general issues related to these problems (Grajewski, 2012; Riesgo et al., 1997, 2000, 2001, 2003).

The lack of available literature in this particular field has exacerbated and complicated the research process. These studies will be aimed at developing the procedures for implementing a management process. The publication tries to identify the problem and research areas that require further analysis, present procedures and conclusions displaying information for the analysis of costs associated with implementation of procedures in complex economic conditions (Bitkowska, 2013; Brilman, 2002; Brzychczy et al., 2018; Dźwigoł, 2007; Grajewski, 2012; Nowosielski, 2011; Rother, Shook, 2009; Skrzypek, Hofman, 2010).

4. Research methods

To create a model of process management systems in SRK S.A. it was necessary to identify the areas and research problems that needed to be solved. The Objective was achieved in three steps (Table 1). The research plan was carried out on the basis of the actual data collected on the current mine closure processes.

Table 1.
Methods and results of their use in individual research stages

Research stage	Research methods	Results of the use of research methods
I	- Study of literature - Analysis - Synthesis	- Adaptation of basic concepts to the specificity of SRK S.A. - The current state of process management in SRK S.A. - Development of a questionnaire for the interview.
II	- Face-to-face interview - Panel studies - Analysis - Synthesis	- Indication of basic research areas and problems. - Development of an initial model of liquidation processes.
III	- Direct interview - Panel studies - Analysis - Synthesis	- Building a map of the processes taking place in SRK S.A. - Indication of problem solving and problem solving.

Source: An own study.

In stage I, the available literature on the management processes was analysed and compared with personal experience of the mine liquidation. The author's considerations focused on adapting and organising scientific terms with their practical application. It was considered which elements would allow the correct adaptation of the process management concept to the specificity of SRK S.A. The results of the analysis made it possible to prepare an interview which is used in the second stage.

In the second stage, interviews were conducted with individuals directly managing the activities of the Company and its Branches. The interviews allowed for the identification of areas and research problems necessary to solve for the adaptation of the process management system to the specificity of SRK S.A. The prepared interview questionnaire is presented in the Table 2. Based on conversations and own experience, preliminary models of the progression of processes taking place in the closed mines at SRK S.A. were prepared. Initial models were used in the third stage of the research.

In the third stage, the preliminary process maps were consulted and corrected in order to obtain the final version of the process map compatible with all Branches of SRK S.A. During this stage, questions were asked about the nature of the process, technical problems in the implementation of these processes, the correctness of their progression and suggestions for possible changes in the liquidation practice. The process was carried out in two stages, as shown in Fig. 1. The preliminary process model prepared in the second stage was consulted with people closely related to the mine closure and changes were applied on an ongoing basis. After all experts had analyzed the working process model and all changes had been made, the process map was re-presented to the same experts for approval (panel studies). After approval by all experts, the model became the final model of the process. Following the experts' suggestions, the maps of component processes were prepared in a similar way.

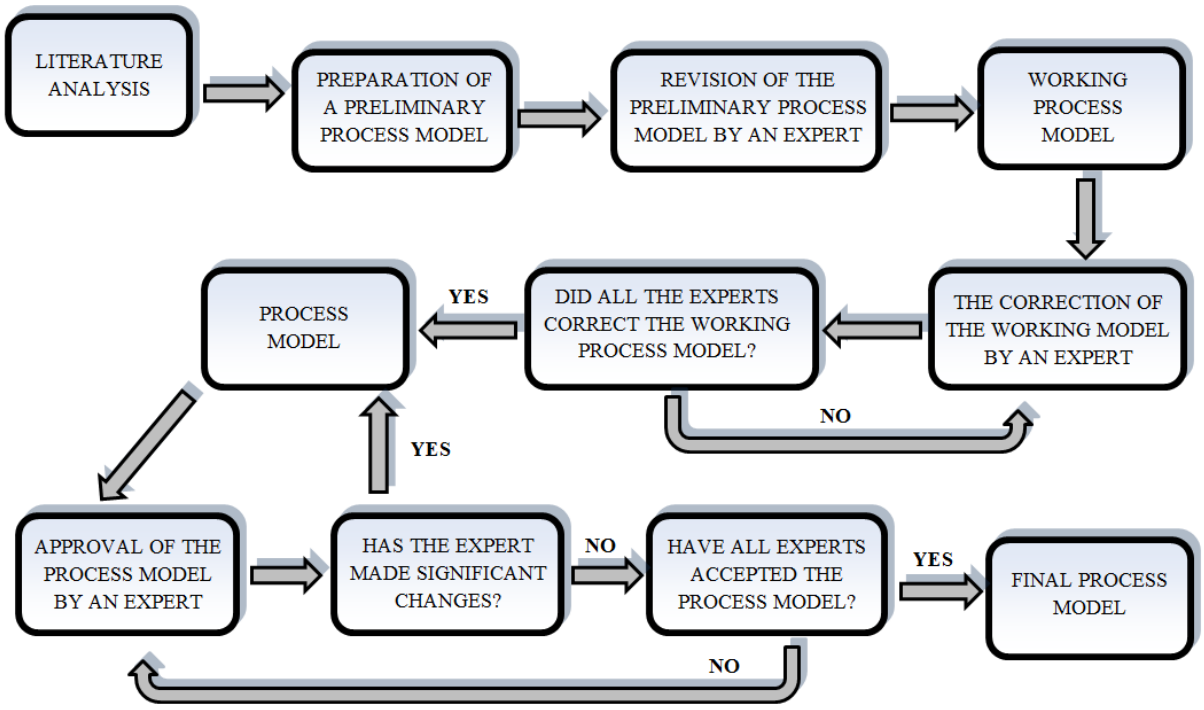


Figure 1. A map of the research process (panel study). Source: an own study.

5. Findings

In the first stage of the research, on the basis of a literature study on process management, the concept of the terms "process", "process approach" and "process management" was systematized. The authors agreed with the definitions proposed for mining enterprises (Bijańska, Wodarski, 2018, 2020). In SRK S.A:

A "process" is a sequence of ordered, reciprocal works with each other, carried out sequentially to produce the final production, which is combined with other processes, remaining with each other in specific dependencies and relationships necessary for the goal of creating value.

The "process approach" is an ideological layer or a philosophy of company management that places processes at the centre of attention of its management and employees.

"Process management" is a comprehensive management concept aimed at satisfying customer needs as fully as possible through the improvement and efficiency of value management.

After systematizing the top positions and persistent attempts to steer along the way, an intelligence survey was prepared. Questions included in the form, as well as related problems, to get to know the current state and identify areas and research problems related to the management of the processes, requiring analysis and development.

In the second stage interviews were held with seventeen participants involved in the liquidation. The respondents were Branch Directors, Chief Engineers and Main Engineers. During the course, the field for comments was completed. Synthetic authors of the answers provided are presented in Table 2.

Table 2.
A set of survey questions with an original summary of the respondent's answers

	Question	Answer
1.	Is there an awareness of the actions in processes in SRK S.A?	
	Most employees function within unspecified processes.	
2.	Is there an awareness of the interconnection between processes in SRK S.A.?	
	There is unsystematic knowledge about the interconnection of processes.	
3.	Are the processes identified within SRK S.A?	
	Some of the tasks were identified and named, but the main process is common knowledge.	
4.	Is there a knowledge of division into primary and auxiliary processes in SRK S.A?	
	There is an unsystematic knowledge about which process is primary and which is ancillary.	
5.	Is there a mapping of the liquidation processes in SRK S.A?	
	Processes are presented as regulations or procedures. Respondents report an urgent need for a process map.	
6.	Is the organizational structure within SRK S.A. managed in a way to allow it to manage processes?	
	The organizational structure of the Branches is not adapted to process management, and to allow functional teams to implement the process.	
7.	Are processes related to strategic goals in SRK S.A. ?	
	Employees are aware that their actions lead to the achievement of the Company's goals.	
8.	Does SRK S.A. evaluate the process control?	
	Due to the long implementation time of the processes, improvement is usually not sought.	

Cont. table 2.

9.	Do employees have an influence on the correction of processes?
	Workers sometimes have a choice.
10.	Does SRK SA. have application teams for implementing individual processes?
	Assessment teams for individual processes are established.
11.	Are SRK S.A. employees team-oriented?
	Employees participate in a teamwork.
12.	Do SRK S.A. employees know the concept of the process management?
	Only the top management knows the principles of the process management.
13.	Do SRK S.A. employees have knowledge about the implementation of processes?
	An intelligible message was prepared on the implementation of the individual processes.
14.	Are SRK S.A. employees motivated to share their experience?
	There is a lack of motivation to share knowledge, but in some Departments the Master-Apprentice binary system works well.
15.	Is there an incentive system connected to completions?
	Due to the long implementation time, there is no incentive system in place which is connected to final results of the processes.

Source: an own study.

During the research, the respondents noted a certain difficulty in using the term "process", which is related to a cyclical phenomenon. For most employees, the cyclical nature of activities in SRK S.A. is imperceptible. The vast majority of the Company's staff are former employees of active mines and their experience is associated with short cycles, e.g. the mining cycle or the excavation cycle, which took place several times in a shift. The mine liquidation period, depending, among other things, on its size ranges from 2 to 8 years. Employees in SRK S.A. (mainly due to the age) usually only work on one liquidation cycle and each of their activities, from their point of view, is only performed once. The cyclicality is observed from the level of the entire Company. From this perspective, the repeatability of certain activities is visible, and although each of the mines is different, certain elements that appear constantly can be distinguished. Only from this point of view, in the case of the liquidation of mines, one can speak of a cyclical nature and treat these activities as repetitive long-term processes.

The respondents pointed to the need for the preparation of process flow maps, that will facilitate the conduct of current and possible future liquidation processes in terms of financial efficiency. The respondents found that the classification of processes into basic, auxiliary and accompanying processes was particularly important and urgent to develop, as the failure to indicate priorities repeatedly led to competency, ambition and organisational conflicts, which translates into the Company's financial result.

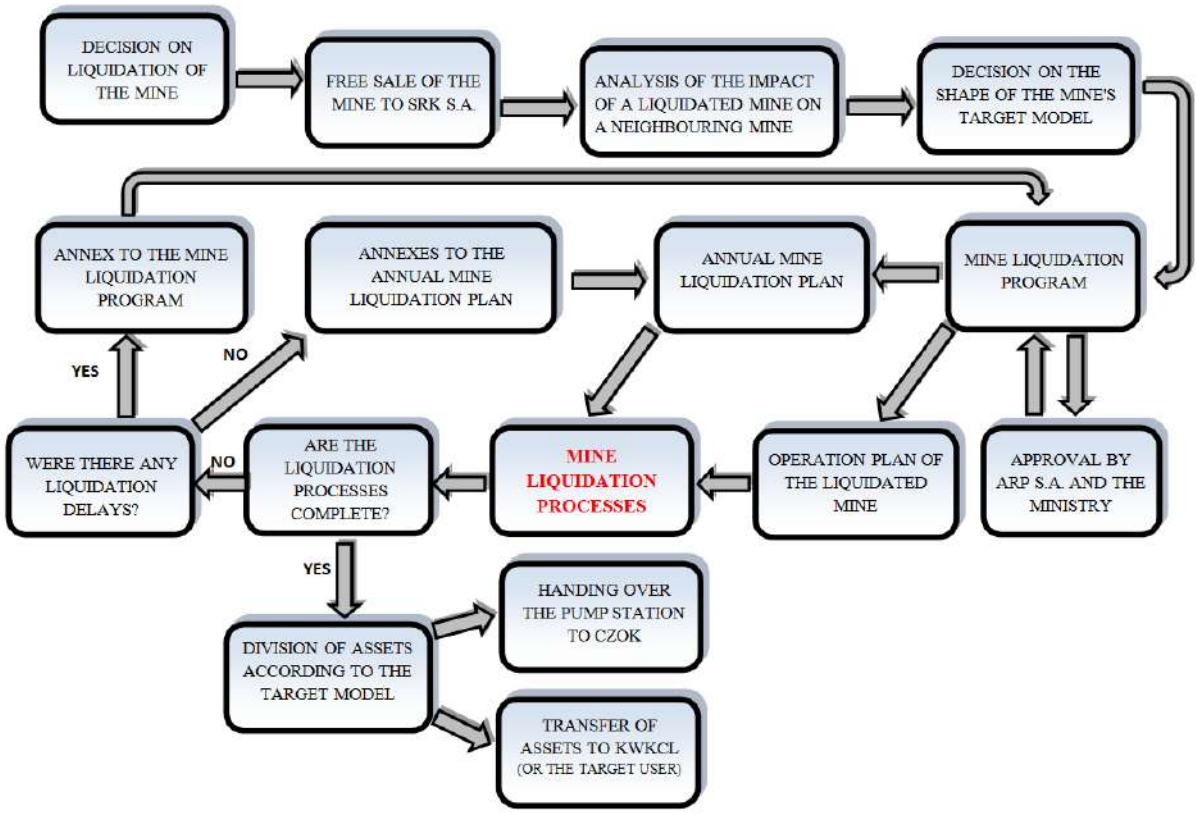


Figure 2. A map of the mine liquidation processes at SRK S.A. Source: an own study.

At this stage of research, research areas and problems were identified:

developing guidelines for changing the structure of the Branches to one in line with the "process approach."

- definition of the process mapping standards and possible quick preparation of process maps,
- urgent development of the existing system of classification processes for basic, auxiliary and accompanying processes,
- indication of the main factors influencing the course of processes, and thus assigning their measures to the processes,
- developing guidelines for building an employee knowledge management system,
- developing guidelines for building an incentive system.

In the third stage of research, in accordance with the conclusions of stage II, attempts were made to formalize the course of the processes taking place during the mine's liquidation. The research, just like in stage II, was based on interviews with experts, with the difference that they were presented with a map of the process for correction. The experts changed their opinions significantly. During the analysis of the process maps, a "loose" conversation was conducted on the course of the processes and possible conclusions for changing the current state, with experts ranging from the Higher Supervisory Board to the Company's President.

Everyone agreed that in the course of the mine liquidation the core of the basic processes, will be a group of processes in Figure 2 named as "Mine liquidation processes" (written in red). This group of processes does not run independently. Each basic process is accompanied by auxiliary or accompanying processes, and in this perspective all other processes should be understood as such. In accordance with the procedure shown in Figure 1. The authors developed a map of the mine liquidation processes shown in Figure 2.

The mine liquidation processes are broad terms, it would be difficult to treat them as one process. According to the principles of process mapping (Rother, Shook, 2009; Skrzypek, Hofman, 2010) and the practice used in SRK S.A. mine liquidation processes are divided into 10 smaller processes (referred to as "schedules" in SRK S.A. Each of the processes (schedules) presented in Table 3 and Figure 3 includes specific operations and activities. At this level of mapping detail, the inter dependencies between individual processes are not visible, and processes 3 to 10 can temporarily be treated as accompanying processes, but their operation results from processes 1 and 2.

The respondents unanimously stated that the liquidation of a mine usually follows two variants. These variants are related to the construction of the target mine model. Due to the protection of the neighboring mining plants, the mine can be completely closed (Fig. 4) or with the pumping station (Fig. 5). The liquidation process is slightly different in each of these cases. Figures 4 and 5 use a different process presentation system. An unscaled horizontal timeline has been added to improve readability and illustrate the mutual overlapping of the processes over time.

In the first case, the liquidation process ends with the transfer of the property remaining after the liquidation to the SRK SA Department. Coal Mines in Total Liquidation or the eventual end user. The entire underground infrastructure (excavations and shafts) is being liquidated. Processes 1 and 2 can take place at the same time, but the basic process for the entire liquidation is Liquidation and protection of corridor workings (Process 1). Upon completion of Process 1, Process 2 liquidation and securing of shafts and shafts becomes the primary process. In this model the process of liquidation workings (Process 1), and the process of securing the neighboring mines (Process 3) must be completed before the completion of the shaft liquidation process (Process 2). The land reclamation process (Process 5), may begin only after the mine infrastructure liquidation (Process 4) and maintenance of the facilities to be liquidated (Process 6) are completed. The remaining processes (Process 7, 8, 9 and 10), are carried out throughout the mine liquidation period.

In the event of liquidation and leaving the pumping station, the liquidation ends with the transfer of the study results after, the liquidation to the Department of Coal Mines. Coal Mines in full liquidation, the prepared pumping station to the Central Mine De-watering Plant of the SRK SA Division. A process known as liquidation, and the process of corridors (Process 1). In this case, the process of securing the neighboring mines (Process 3) must continue until the end of the mine closure. Liquidation of shafts (Process 2) may start from the closure of the pits

(Process 1) and may end later, because the liquidation of pits may lead to the shafts remaining open for the pumping station service to continue for the duration, even until the end of the mine closure. The experience as in the first case of the land reclamation process (Process 5) can only start after the mine liquidation process has been repaired (Process 4) and the service facilities to be liquidated (Process 6), and the remaining processes (Process 7, 8, 9 and 10) are also take place throughout the entire period of the mine's liquidation.

Table 3.
The mine liquidation processes in SRK S.A.

1.	Liquidation and securing of excavation gates
2.	Liquidation and securing of shafts and pits
3.	Protection of neighboring mines against water, gas and fire hazards
4.	Liquidation of the mine's infrastructure
5.	Land reclamation
6.	Maintaining the facilities for liquidation in sequence ensuring safe liquidation of the mining plant
7.	Carrying out security works and measures to prevent hazards in connection with the liquidated mining plant
8.	Development of the required projects, documentation, opinions, expertises and analyses related to the closure of the mine
9.	Repair of damage caused by mining plant operations
10.	General management of the tasks performed during the mine closure

Source: data from SRKS.A.

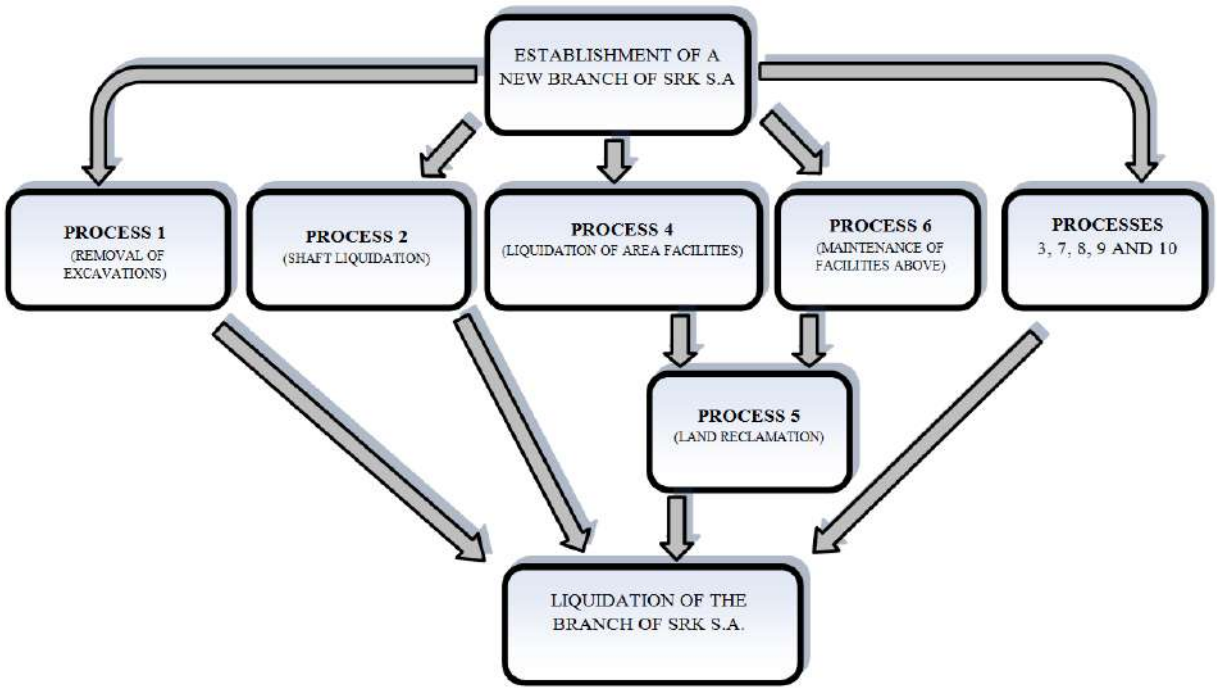


Figure 3. A map of the mine liquidation processes in SRK S.A. Source: an own study.

Figure 4. A schedule of the processes of complete mine liquidation in SRK S.A. Source: an own study.

Figure 5. A schedule of the mine liquidation processes in SRK S.A. with further use of the pumping station. Source: an own study.

During the process mapping, the experts asked for the mapping to be refined so that it was possible to formalize the component processes of the mine liquidation. At this stage of the research, a map of the process of the free disposal of the mine to SRKS.A. (Fig. 7), the map of the process of developing the target model of the liquidated mine (Fig. 8) and the map of the preparation of the mine liquidation program (Fig. 9). These processes are carried out within the organizational structures of SRK SA. Experts (the vast majority of whom had previously taken

part in making such a decision) requested the authors, for formal reasons, to also prepare a map of the decision-making process for the mine to be liquidated (Fig. 6), although this process is not carried out within the framework of the Company and is an external decision, but it is nevertheless an integral part of the activities carried out in the SRK S.A. At this stage of operations, it was considered that the basic process is the deposit exploitation process.

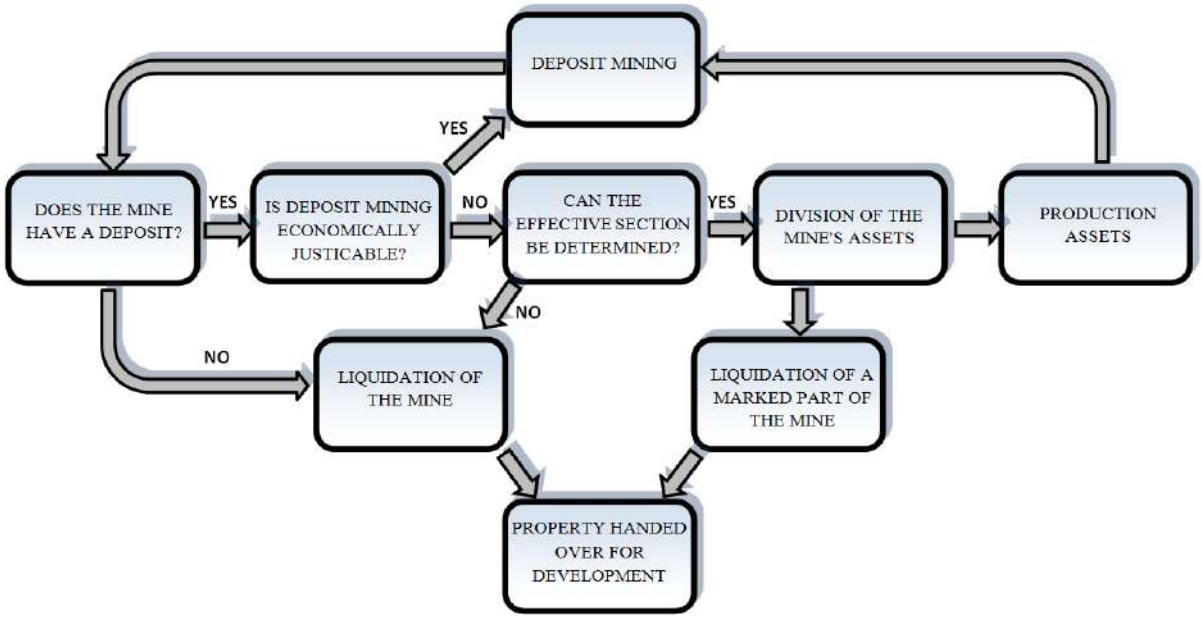


Figure 6. A map of the decision-making process to designate the mine for liquidation. Source: an own study.

Another process carried out outside the structures of the Company is not the sale of the mine or its designated part to SRKS.A. (Fig. 7). It was recognized that the handover process is the division of property transferred for development to individual SRK S.A. Branches.

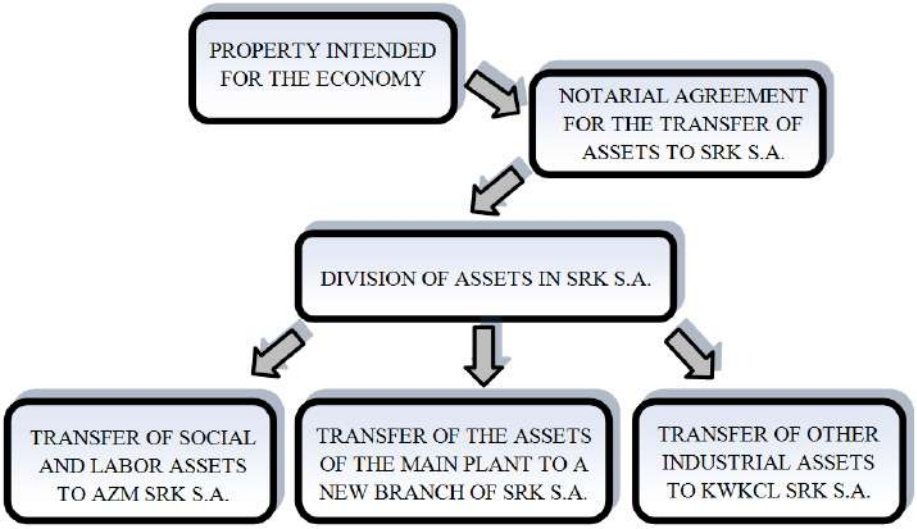


Figure 7. A map of the process of free sale of the mine to SRK S.A. Source: an own study.

Two subsequent processes, the development of the target model of the liquidated mine (Fig. 8) and the preparation of the mine liquidation program (Fig. 9), according to experts, were the processes where the most mistakes were made. These two processes, if carried out correctly, can bring significant financial and non-financial savings for the Company. Due to the lack of procedures, guidelines, experiences or literature on the subject, the decisions taken in the past, then right, often turned out to be wrong in retrospect. When verifying the model maps of these processes, the experts stated that in the case of making decisions on the target model of a mine, the basic process is to prepare this model depending on the water hazards, and decisions on prevention of other hazards must result from water hazards prevention. Figure 8 shows a map of the process of building the target model of the mine, however, experts suggested that the mapping should be refined and a map of this process should be presented with a focus on water hazards.

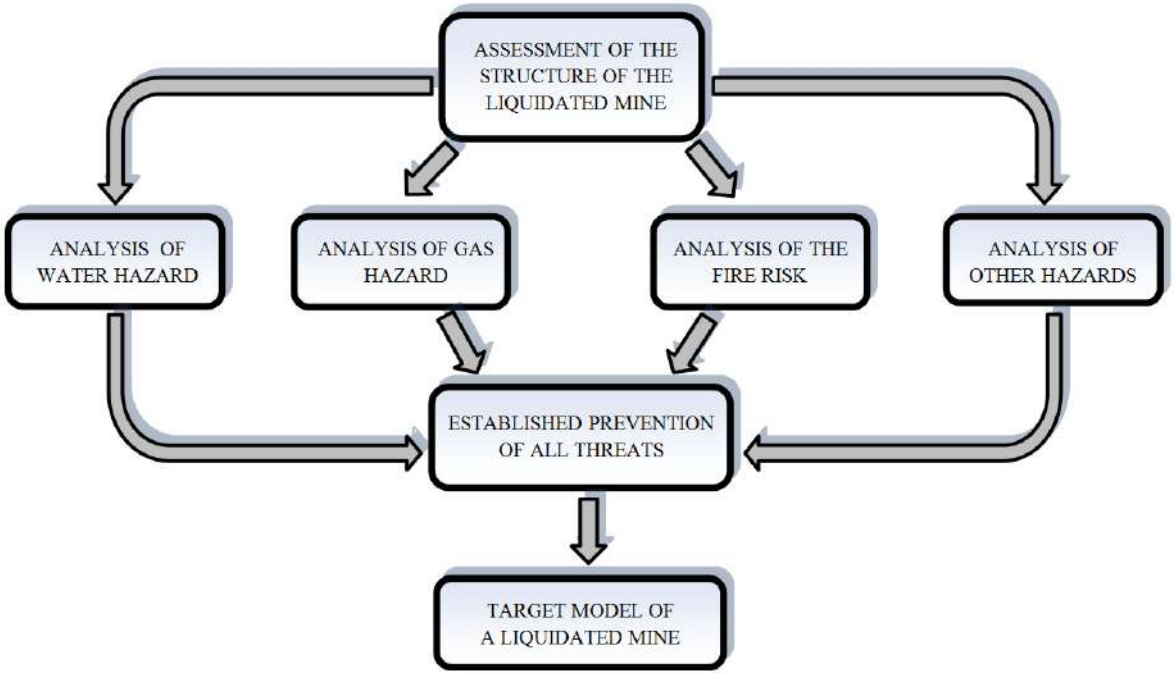


Figure 8. A map of the process of developing the target model of the liquidated mine Source: an own study.

In the map of the mine liquidation program preparation process map (Fig. 9), the experts recognized the liquidation schedule prepared by the mining and ventilation department as the basic process. As in the previous case, it was suggested to lower the mapping level and to show the dependencies and organizational conditions in the process of preparing the liquidation program, so that the division liquidation schedules follow the mining division liquidation schedule. The mining and ventilation department, when developing a schedule for the liquidation of underground facilities and related surface facilities, consults with the power engineering department whether there has been a technical conflict of the time of liquidation. The power engineering department, if possible, should adapt to the schedule of the liquidation process presented by the mining and ventilation department as the superior process. The process

of liquidation the processing plant may proceed independently of the liquidation of shafts and workings, the only limitation may be the structure of the mining plant's buildings, technically requiring the liquidation of another object first. The schedule for the liquidation of administrative facilities also runs independently of the main processes. In this case, it is only necessary to plan the order of liquidation of objects in such a way as to leave the objects necessary to support the processes of liquidation of shafts and workings as long as possible.

Here, attention is paid to competence and priority issues. Preparation of applicable procedures in this regard and the design criteria resulting therefrom may, in the event of the possible preparation of the liquidation programs for other mines, help to avoid errors and improve the efficiency of the liquidation processes. In both cases, the authors agreed with the experts, but due to the wide scope of research necessary to implement these postulates, it was assumed that this research problem would be implemented as soon as possible.

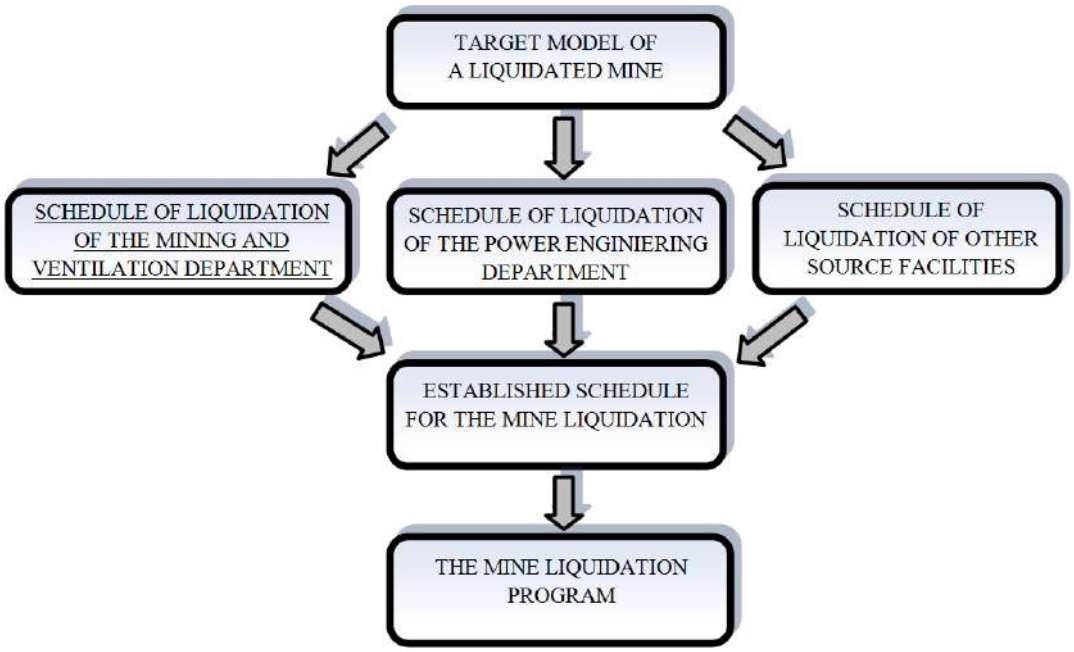


Figure 9. A map of the mine liquidation program preparation process. Source: own study.

6. Conclusion

The conducted research resulted in the following conclusions:

The implementation of the mine liquidation processes has been so far the subject of only random scientific research aimed at determining the principles of activities providing to rationalizing and minimizing costs.

The publication indicates the areas and research problems, which the solution will improve the efficiency and accuracy of the liquidation process.

The project of the mine liquidation is very complex and costly, due to the large scope of the liquidation works to be performed.

The process of liquidation a mining plant requires taking into account a number of interrelated factors of an economic, environmental and legal nature.

Correct definition of the system of processes and activities in the liquidated underground mine should enable the development of a methodology for planning and management of the technical liquidation processes in hard coal mines, allowing for the minimization of costs of activities carried out.

Defining the process of creating costs in the underground mine will allow for the construction of a model methodology of cost rationalization of the technical processes of the liquidation of hard coal mines.

The mapping of the processes taking place during the liquidation will allow for the repeatable mapping of the procedure, ensuring the effectiveness and efficiency of the activities carried out.

References

1. Bijańska, J., Wodarski, K. (2020). Model of process management system in enterprises of the hard coal mining industry. *Management Systems in Production Engineering, Vol. 28, Iss. 2*, pp. 112-120.
2. Bijańska. J., Wodarski. K. (2018). Process management in a mining enterprise – basic areas and research problems. *Scientific Papers of Silesian University of Technology, series: Organization and Management, vol. 120*, pp. 35-50.
3. Bitkowska, A. (2013). *Zarządzanie procesowe we współczesnych organizacjach.* Warszawa: Difin.
4. Brilman, J. (2002). *Nowoczesne koncepcje i metody zarządzania*. Warszawa: PWE.
5. Brzychczy, E., Napieraj, A., Sukiennik, M. (2018). Modelling of processes with use of process mining techniques. *Scientific Papers of Silesian University of Technology, series: Organization and Management, vol. 116*, pp. 23-36.
6. Duda, A. (2018). Identification of environmental events associated with mine closures in selected countries of the European Union. *Przegląd Górniczy, 3*, pp. 7-15.
7. Dźwigoł, H. (2007). *Model restrukturyzacji organizacyjnej przedsiębiorstwa górnictwa węgla kamiennego.* Warszawa: Difin.
8. Fernandez de la Buelga, L., Chmiela, A. (1995). The Spanish Energy Sector: Regulatory Changes and Prospects. *Scientific Papers of Silesian University of Technology, 1307, series: Mining, vol. 225*, pp. 59-72.
9. Grajewski, P. (2012). *Procesowe zarządzanie organizacją*. Warszawa: PWE.

10. Grmela, A., Harat, A., Adamczyk, Z. (2017). Proces likwidacji kopalń jako problem środowiskowy, ekonomiczny i prawny. *Ecological Engineering, vol. 18, 4*, pp. 39-45.
11. Harat, A., Grzesik, B., Adamczyk, Z. (2017). Ocena oddziaływania na środowisko i jej zastosowanie w procesie inwestycyjnym likwidacji kopalni. *Budownictwo, 23*, pp. 110-115.
12. Jonek-Kowalska, I. (2013). Analiza i ocena kosztów w cyklu istnienia wyrobiska wybierkowego – wnioski dla rachunkowości zarządczej. *Scientific Papers of Silesian University of Technology, series: Organization and Management, vol. 66*, pp. 195-206.
13. Korski, J., Korski, W. (2015). Underground mine as a system of processes. *Mining – Informatics, Automation and Electrical Engineering, 2(522),* pp. 19-27.
14. Marek, J. (2006). Conditions and course of the liquidation process of hard coal mines. *Studia Ekonomiczne, Akademia Ekonomiczna w Katowicach, 37, Zarządzanie strategiczne w przedsiębiorstwie*, pp. 269-283.
15. Nowosielski, S. (2011). *Podejście procesowe w organizacjach*. Wrocław: Wydawnictwo Uniwersytetu Ekonomicznego.
16. Paszcza, H. (2010). Restructuring processes in the Polish hard coal mining industry in terms of the implemented changes and changes in the resource base. *Górnictwo i Inżynieria, 3,* pp. 62-82.
17. Przybyła, H., Chmiela, A. (2007). *Organizacja i ekonomika w projektowaniu wybierania węgla.* Gliwice: Wydawnictwo Politechniki Śląskiej.
18. Przybyła, H., Chmiela, A. (2002). *Technika i organizacja w robotach przygotowawczych*. Gliwice: Wydawnictwo Politechniki Śląskiej.
19. Riesgo Fernandez, P., Chmiela, A., Stanienda, K. (2003). The situation of coal mining in Spain after joining the European Union. *Scientific Papers of Silesian University of Technology, 1600, series: Mining, vol. 258*, pp. 291-301.
20. Riesgo Fernandez, P., Przybyła, H., Chmiela, A., Kołodziejczyk, P., Wesołowski, M. (2001a). Economic policy towards coal mining in Spain. Cz. 1. *Wiadomości Górnicze, 3*, pp. 118-123.
21. Riesgo Fernandez, P., Przybyła, H., Chmiela, A., Kołodziejczyk, P., Wesołowski, M. (2001b). Economic policy towards coal mining in Spain. Cz. 2. *Wiadomości Górnicze, 4*, pp. 136-143.
22. Riesgo Fernandez, P., Przybyła, H., Chmiela, A., Kołodziejczyk, P., Wesołowski, M. (2000). Coal restructuring program in Spain. *Scientific Papers of Silesian University of Technology, 1480, series: Mining, vol. 246*, pp. 453-465.
23. Riesgo Fernandez, P., Wesołowski, M., Chmiela, A. (1997). Financing of mining investment projects in Spain with intensive capital expenditure. *Scientific Papers of Silesian University of Technology, 1378, series: Mining, vol. 236*, pp. 249-258.
24. Rother, M., Shook, J. (2009). *Naucz się widzieć, eliminacja marnotrawstwa poprzez mapowanie strumienia wartości.* Lean Enterprise Institute.

25. Skrzypek, E., Hofman, M. (2010). *Zarządzanie procesami w przedsiębiorstwie*. Warszawa: Oficyna Wolters Kluwer business.
26. Turek, M. (2013). *Analiza i ocena kosztów w górnictwie węgla kamiennego w Polsce*. Warszawa: Difin.
27. Turek, M. (2013). *System zarządzania kosztami w kopalni węgla kamiennego w cyklu istnienia wyrobiska wybierkowego*. Warszawa: Difin.
28. Turek, M., Jonek-Kowalska, I. (2013). Contemporary cost accounting as an inspiration for the cost accounting in the life cycle of a mining excavation. *Scientific Papers of Silesian University of Technology, series: Organization and Management, vol. 66*, pp. 113-184.
29. Wójcik, J. (2018). Former mining areas of Wałbrzych Basin 20 years after mine closures. *Przegląd Geograficzny, 2*, pp. 267-290.

SILESIAN UNIVERSITY OF TECHNOLOGYPUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIESNO. 151

THE CREATIVE CITY CONCEPT AND CITY DEVELOPMENT

Brygida SMOŁKA-FRANKE

The Silesian University of Technology, Department of Organisation and Management, Faculty of Applied Social Sciences, Gliwice; brygida.smolka-franke@polsl.pl, ORCID: 0000-0003-0741-0267

Purpose: The concept of "creative city" is becoming more and more popular in urban development theories. The development of the city was often associated with economic and spatial development. The development of broadly understood culture and creative industries was not always taken into account or appreciated. However, analyzes and studies of cities characterized by dynamic development showed a strong dependence of their development on the factor of creative industries. The concept of a "creative city" was developed and described in detail in his publications by Charles Landry, proving how the creative development of the city stimulates the rest of its life. The aim of the article is to show the practical dimension of the theory of Ch. Landry on the importance of creative industries in city development, based on the idea of the UNESCO Creative Cities Network.
Project/methodology/approach: The research method used in the article focuses primarily on the socio-economic analysis of the development of Polish cities, such as: Cracow, Katowice, Łódź and Wrocław, which are included in the UNESCO Creative Cities group.
Findings: Cities that have acquired the status of creative cities undoubtedly have enormous cultural, historical and institutional potential. However, for a city to be creative, tradition and monuments are not enough. Without innovative thinking, noticing the need to invest in the development of "creative industries", and thus attracting representatives of the so-called the creative class responsible for smart and sustainable urban development, none of these cities would be successful.
Originality/value: The article's innovation consists in an in-depth analysis of factors favoring the development of cities, with particular emphasis on the development of creative industries. The obtained results of the analysis and the formulated conclusions may allow for the use and implementation of similar solutions in other cities in order to stimulate their future development.

Keywords: creative city, smart city, urban space, sustainable urban development.

Category of the paper: empirical research.

1. Introduction

One of the most important factors in the development of a modern city is creativity.

The creative industry is a very specific sector of the economy that produces goods and services with artistic and creative value. Thanks to this, it affects, among others on: quality and standard of living, sense of identity or tourism development.

Over the years, there has been a trend in which traditional sectors of the economy are losing in importance, while cultural products are becoming increasingly appreciated.

Thanks to the development of the creative industry, new jobs are created mainly for creative people who do freelance jobs. Creative industries are most often concentrated in city centers or downtown, and increasingly also in so-called iconic city districts.

Creative industries are seen as a kind of driving force for the creative economy. According to Andrzej Klasik, they can be a tool for: revitalization of city centers and old districts that are neglected, regeneration of excluded social environments and regeneration of post-industrial areas (Klasik, 2009, p. 31).

Professor Andrzej Klasik from the University of Economics in Katowice, on the basis of conducted research regarding the potential of the creative industry of the cities of the Upper Silesian conurbation, selected the cultural potential of the cities of the Upper Silesian agglomeration. He recognized then that "one can build and promote the development of Katowice as a city of high culture, music and the music industry" (Klasik, 2014, p. 3).

A few years later, the city was declared a UNESCO creative city in the field of music and eventually obtained this title in 2017.

Starting from 2013, when the first Polish city – Cracow, was awarded the title of UNESCO Creative City (in the field of literature), four more "creative" cities arrived on the map of the country.

The article aims to show how to create an urban social space and its impact on city development, using examples of the most creative Polish cities.

The analysis carried out for the purposes of the study has an explanatory and descriptive character. Accepted research methods indicate a qualitative type of research. These include both observation technique and content analysis.

Professional literature, both in the field of sociology and economics, was also used to analyze the development of creativity in urban space by the creator of the concept of "creative class" - Richard Florida, as well as the author of the concept of "creative city" Charles Landry, also Andrzej Klasik and scientists focused on issues related to with urban issues in sociology, such as: Aleksander Wallis or Bohdan Jałowiecki.

2. “Smart city” and “creative city”

Along with the development of information and communication technologies, the idea of a "smart city", i.e. a city, which uses modern technologies to increase the interactivity and efficiency of urban infrastructure and its elements, as well as to raise the awareness of residents, has emerged.

Most definitions of "smart city" focus on information and communication technologies as the main determinant of a smart city.

A combination of different definitions of an intelligent city was presented by Professor Nicos Komninos. He noted that an intelligent city is an area with four basic elements:

- Creative population that implements intensive activities that use knowledge or a cluster of such activities.
- Effective institutions and procedures for creating knowledge that enable it to be acquired, adapted and developed.
- Developed broadband infrastructure, digital space, e-services and online knowledge management tools.
- Proven ability to innovate, manage and solve problems that appear for the first time because of innovation and management under conditions of uncertainty, they are crucial to assess intelligence (Komninos, 2008, p. 26).

In the first place, however, the author mentions an element related to social capital which is the creative population.

The existence and meaning of so-called creative classes or creative populations described by Richard Florida.

R. Florida includes two segments in the creative class. One of them is: scientists, engineers, artists, actors, designers, architects, opinion leaders, who regularly engage in creative work consisting in creating new forms or projects, and not just solving problems. The second segment is all those who work in professions requiring advanced knowledge, e.g. ICT industry, legal environment, area of financial services (Florida, 2010, p. 13).

Another important thread in R. Florida's considerations is the role of place (geographical location) in the development of creative industries. He argues that there are creative centers whose special "atmosphere" has a positive effect on the development of creative industries, regardless of factors such as natural resources, the way local policies are pursued, or the location close to transport routes. According to Florida, in the "creative era", the basic development factor is not only knowledge, but also creativity, that is creating new, useful forms from this knowledge. The economic function of a creative class is to generate economic value through creativity, which in turn defines social identity, consumption habits and the lifestyle of that class (Florida, 2010, p. 10).

Charls Landry – the creator of the concept of **creative city**, defines a creative city as a process that requires a change in the way of thinking and functioning by people and institutions to one that makes it possible to understand the development of the city and solve its problems in an integrated way. Stresses that the essence of a creative city is its **sustainable development**, and this concept is currently one of the main in urban development sciences.

Balance according to Ch. Landry is not just about environmental issues and ecological, but also broadly understood psychological and economic balance and cultural so that the city space inspires new thinking and allows to create sustainable forms of creativity (Landry, 2013, p. 36).

The author of this thesis encourages authorities and city dwellers to look at their own history and future in order to best identify and "branding" (create a brand) their advantages. In this approach, the process of reaching creativity is equally important, what its effects, because its purpose is to reflect on how to create meaning in a given place, how to maintain it and create it again so that the place lives on constantly.

Ch. Landry distinguished several features that determine the creativity of cities and are:

- Political spheres that encourage creative attitudes.
- Diversity and uniqueness.
- Tolerance and openness of society.
- Innovation and entrepreneurship.
- Strategic leadership, vision and implementation.
- Appropriate landscape infrastructure.
- Easy access to communication and the Internet.
- High quality of life and public services.
- Effectiveness, efficiency and professionalism (Landry, 2013, p. 36).

From the city sociologist's point of view, one of the most interesting features of cities' creativity is their diversity and uniqueness. What we especially appreciate the city for is, apart from all the above mentioned by Ch. Landry's features that make living in the city comfortable and moves freely, it is also something that determines its originality in the background of other cities, namely the special atmosphere or in other words "genius loci", which causes that some of the cities clearly stand out from the rest and that these cities are most often recognized as creative development centers.

3. UNESCO Creative Cities Network

On the growing influence of the importance of creativity, development on cities and their ranking the world, evidenced by the UNESCO Creative Cities Network established in 2004.This network was created to promote cooperation between cities that consider creativity as a strategic factor for sustainable development.

Cities that aspire to be a creative city can prove themselves in such fields of activity as literature, film, music, crafts and folk art, design, use in the development of digital technology and media, and even gastronomy.

Currently, UNESCO Creative Cities Network brings together 246 centers, including four from Poland. These include, among others:

- Crafts and folk art – Kanazawa, Gabrovo, Wuhan.
- Music – **Katowice**, Liverpool, Seville.
- Design – Bilbao, Berlin, Seoul.
- Film – **Łódź**, Rome, Sydney.
- Gastronomy – Burgos, Jeonju, Panama City.
- Literature – **Cracow, Wrocław**, Barcelona, Seattle.
- Media art – Austin, Guadalajara, Linz.

UNESCO argues that the city is worthy of the title of "creative city" if the city treats culture not as an addition to its strategy, but as its pillar.

The first of Polish cities that managed to obtain this title in 2013 in the field of literature is one of the oldest cities in Poland with an undeniable cultural heritage – namely Cracow.

Cracow is also the most recognizable city among Polish cities in the world. His monuments have been added to the list of the most valuable objects in the world.

In 2000, Cracow also served as the European Capital of Culture, which undoubtedly strengthened its position on the map of "cultural" cities in Europe. In 2013, however, he was recognized primarily for his huge contribution to the development of world literature, including because it is also a city of Nobel Prize winners in a distinguished field like Czesław Miłosz or Wisława Szymborska. It also hosts the most important literary events in Poland and was recognized for his contribution to combining traditional literature with technology, which is a special development factor for **the creative sector**.

Katowice is the second of Polish cities that deserved the title of a UNESCO creative city in 2015 in the field of music industry. Katowice also became the first City of Music from Central and Eastern Europe.

Katowice is an example of a post-industrial city that very effectively used its cultural potential, making it one of the most important assets of its development after the fall of heavy industry.

Katowice's achievements in the development of music, including the location of one of the most recognized music colleges in the country, the organization of prestigious music festivals and finally the commissioning of one of the most modern music buildings in Europe, i.e. the seat of the Polish National Radio Symphony Orchestra (photo below), became an impulse to create the capital of Upper Silesia as a city of "music industry".

Figure 1. Modern building of the Polish National Radio Symphony Orchestra – Katowice. Source: own study.

Complementing the city's achievements in the field of music and the development of creative industries is also the creation of a prestigious and extremely attractive space known as the "Culture Zone", which was built in the vicinity of the aforementioned modern buildingof the Polish National Radio Symphony Orchestra adjacent to the famous Sports Hall "Spodek" (saucer). Nearby historic post-industrial buildings of the former "Katowice" Mine were revitalized and adapted for the modern headquarters of the Silesian Museum for the purposes of the Zone.

Figure 2. Culture Zone – Katowice. Source: www.katowice.eu/Strony/Strefa-kultury1201-4230.aspx.

The title of the City of Music is for Katowice, however, above all crowns the process of transformation of an industrial city into a city of creative industries. Katowice's special merit is that over the past few decades, thanks to its development strategy, the city has radically changed its face from a heavy industry center with a relatively short urban origin (compared to other creative cities in Poland) into a thriving and modern industrial center creative.

In 2017, Łódź was the third Creative City of UNESCO in Poland in the field of film industry. Nearly half a thousand companies related to the film industry operate here, drawing on the unique heritage of the Feature Film Production Company, where the greatest masterpieces of Polish cinema were created.

Three public colleges have been educating staff for the industry throughout Poland for years. Known around the world, the Łódź Film School is honing the talents of the greatest film makers of Polish and world cinema. The Academy of Music offers studies in the field of film music composition, sound production and music in the media. Łódź is also the host of numerous film art festivals ("lodzcityoffilm", 2020).

Wrocław is the last of the Polish cities that was honored with the title of a creative city in 2019, just like Cracow in the field of literature. Wrocław as the second city in Poland (the first was Cracow in 2000) also held the function of the European Capital of Culture in 2016.

As the President of Wrocław Jacek Sutryk said: "Wrocław projects are focused supporting local creative industries related to the book, building communities around literary events and involving various groups of residents. All planned activities are implemented in the form of cooperation with other UNESCO Cities of Literature" ("wroclaw", 2020).

It can be seen that the cities considered to be the most creative are not only historically shaped dynamic urban organisms, which were naturally predestined for creative activities, but by all cities that have focused on the intensive development of creative industries, making it the basis of their development. They are also cities able to, apart from developing creative activities, create a specific "atmosphere" of the place which R. Florida mentioned.

4. The city as a place

The city is not only a space "furnished" with institutions, companies, communication routes or places of consumption and relaxation. Social perception of the city it is above all a special atmosphere, the "spirit of the place", which consists of aesthetic impressions, artistic sensations, often memories, history, which is all that makes the city unique and original, determines its specific climate, is its hallmark. It is this climate that attracts the city – tourists, artists, people looking for sensations, sensations – people who "revive" and shape the city.

Bohdan Jałowiecki wrote about the significance of the place: "Place is always a fragment of space distinguished, due to some special features, by the perceiving subject. Historical features can be a distinguishing place or contemporary, unique buildings, monuments, outdoor sculptures, as well as features given to some banal fragment of space by its users due to for example on an exciting event. The place is unique because it often produces a specific culture, which in turn strengthens the uniqueness of the place" (Jałowiecki, 2011, p. 12).

In B. Jałowiecki we also read: "In the literature on the perception of space, the term *magical place* often appears - this adjective is to emphasize the uniqueness, beauty, mystery of the place, which not only arouses curiosity, but also evokes emotions. Photographers and painters exhibit their works, giving the exhibition the phrase "my magic place". This concept remains objectively impossible to define, because this magic of the place is a matter of subjective feelings and emotions. Can they be shared by others? Yes, although of course not by everyone, because this magic can be experienced by being equipped with a certain cultural capital" (Jałowiecki, 2011, pp. 15-16).

All of the Polish cities honored with the title of UNESCO Creative City, in addition to the listed services in a specific field of culture, also have places marked by the characteristic magic that B. Jałowiecki mentioned.

Aleksander Wallis referred to these special places with the term "cultural area", writing:"Urban space that is becoming a cultural area is carefully shaped. This means its conservation and extension or reconstruction, which preserves its basic features and structure. At the same time, it grows with feelings and ideas that find expression in art, in literary and historical works, today also in the mass media. Thanks to this, the most important cultural areas of the city are located within public reach. As a result, the most interesting cultural areas include those that are the product of long social and cultural development" (Wallis 1980, p. 71).

The special atmosphere of the place is associated with the shape of space, most often of historical significance, saturation with places that are conducive to meetings and organization of cultural and social life. The spirit of the place makes the city interesting and attracts creative people. Thus, we return to understanding the concept of a creative class and creative space discussed in the second chapter of the article.

That is why cities that understand the importance of caring for their "cultural areas" and make many efforts to develop and promote them most often.

5. Summary and research results

Cities that have obtained the most creative status undoubtedly have enormous cultural, historical and institutional potential.

They are usually historic cities with centuries-old tradition. Nevertheless, to make the city creative, tradition and monuments are not enough. Without innovative thinking, recognizing the need to invest in the development of "creative industries", and thus attracting representatives of the so-called creative class responsible for intelligent and sustainable city development, none of these cities would be successful.

A perfect example of a Polish city that, despite the lack of centuries-old historical traditions, has been a huge success, becoming one of the most dynamic centers of creativity in the country are Katowice.

The capital of Upper Silesia for years was associated only with heavy industry. Despite the fact that it was a large, industrial city, for years it did not meet the criteria of a large city, such as having prestigious universities or cultural institutions. The first university – the University of Silesia inaugurated its activity in Katowice only in 1968. The post-war period in Katowice is also the time of introducing architectural chaos, especially in the central area of the city, which lost its basic social and culture-forming functions.

Despite these lags, Katowice broke into one of the most dynamic creative centers in Poland and it would be difficult to expect such a spectacular success without assuming the city's vision as a thriving center for the development of creative industries and consistently implemented on the basis of this vision strategy of its development.

Creativity of cities today is primarily associated with the ability to predict and using in their development those assets that can constitute their competitive advantage. Determining the strengths of the city and their successive development may prove to be the most effective strategy on the road to the so-called intelligent development, which primarily requires attracting people to the city who will create its "creative potential".

References

1. Florida, R. (2010). *Narodziny klasy kreatywnej oraz jej wpływ na przeobrażenia w charakterze pracy, wypoczynku społeczeństwa i życia codziennego*. Warszawa: National Center of Culture.
2. Jałowiecki, B. (2011). *Miejsce, przestrzeń, obszar*. Łódź: Przegląd Socjologiczny. Lodz Scientific Society. www.yadda.icm.edu.pl/yadda/element/bwmeta1.element.desklight-1f86f0a0-c77e-4cec--+a249-480c459fd646, 2017.04.28.
3. Klasik, A. (2009). *Przemysły kreatywne oparte na nauce i kulturze*. Katowice: University of Economics Publisher.
4. Klasik, A. *Sektor kultury i przemysły kreatywne w rozwoju regionu na przykładzie Aglomeracji Górnośląskiej*, 2014.08.18.
5. Komninos, N. (2008). *Intelligent Cities and Globalization Innovation Networks*. London-New York: Rutledge.
6. Landry, C. (2013). Kreatywne miasto. Warszawa: National Center of Culture.
7. Wallis, A. (1980). Pojęcie obszaru kulturowego. In: S. Nowakowski, and W. Mirowski (Eds.), *Planowanie społecznego rozwoju miast i społeczności terytorialnych,*

a badania socjologiczne. Wrocław-Warszawa-Kraków-Gdańsk: PWN, Institute of Philosophy and Sociology.
8. Wojnar, K. (2016). *Polska klasa kreatywna*. Warszawa: National Center of Culture.
9. www.creativepoland.eu/documents/bazawiedzy/n_62fb3ac_sektor_kkultury_i_przemysly_kreatywne_w_rozwoju_regionu_na_przykladzie_aglomeracji_gornoslaskiej.pdf.
10. www.lodzcityoffilm.com/lodz_miasto_filmu/lodz-kreuje-film/, 2020.04.22.
11. www.wroclaw.naszemiasto.pl/wielki-sukces-wroclaw-miastem-literatury-unesco/ar/c13-7407572, 2020.04.22.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SELECTED SUPPORT PROGRAMMES FOR THE INTERNATIONALISATION OF SMES (BASED ON THE EXAMPLE OF THE UK)

Ewa STAWIARSKA

Silesian University of Technology; ewa.stawiarska@polsl.pl, ORCID: 0000-0003-1198-1134

Purpose: The article discusses the conditions for the participation of British SMEs in foreign trade. The activities supporting the internationalisation of small and medium-sized enterprises in Great Britain are described. There was attempt to group these activities into the process of supporting internationalisation, distinguishing the following stages: preparation of support, preparation of programmes, development of IT tools. Obstacles to the implementation of undertaken internationalisation activities were identified. The main objective of the article was to indicate effective programmes supporting SMEs in Great Britain.
Design/methodology/approach: An attempt was made to assess the effectiveness of internationalisation activities conducted in a specific period of time based on official reports and opinions of entrepreneurs and organisations supporting entrepreneurship. The research used literature studies and the desk research method consisting in compiling, analysing and processing data and information from existing sources, and finally formulating conclusions on their basis.
Findings: The research presented provided an insight into the obstacles encountered in the process of internationalizing SMEs in the UK. Identifying the needs of SMEs was the basic activity to ensure the effectiveness of the support. The UK government has proposed solutions to facilitate border crossing by British SMEs. Before implementation, the effectiveness of these solutions was tested, and after implementation, their annual evaluation took place.
Originality/value: The research perspective adopted in the research and the geographic scope of research – Great Britain, constitute a relatively little researched alternative to research conducted in their mainstream. The obtained research results may be of interest to representatives of science and practice, especially in the context of the new economic system after Brexit.

Keywords: SMEs, internationalisation, government-support programmes, private-support programmes.

Category of the paper: Research paper.

Introduction

Internationalisation of small and medium-sized enterprises is an essential aspect in the era of globalisation. It is therefore of importance for the governments of the European Union to take measures that will result in a greater internationalisation of economic operators. This article presents effective programmes deriving from the Great Britain that are worth following in terms of creating support policies for the SME sector companies.

Research on the degree of internationalization of British micro, small and medium-sized enterprises is important for creating internationalisation programms for Polish organisations. Internationalisation conditions can be divided into external and internal. The first of these are related to general and competitive environment, both nationally and internationally. The second type of internal conditions lies in the enterprise, mainly in the terms of the company's potential and its commitment to the internationalisation process (Daszkiewicz, 2016). According to the resource view of exports, the company's results are derived from features such as size, experience and competence (Komor, 2017). The review of empirical research from 2000-2019 indicates significant impact of external determinants on export results. External determinants are: the foreign and domestic environments. The foreign environment is shaped by the structure and intensity of competitive systems in the sectors of enterprise operations (Kosińska, 2008). The task of the national environment is to support the internationalisation of native enterprises. The work carried out by researchers associated with Uppsala University should be considered groundbreaking for the development of research on the internationalisation of enterprises. Researchers have clearly demonstrated that it is the state authorities that will constitute an important external factor in supporting enterprises (Nummela, 2011). Based on case studies of Swedish companies, reserches proposed a process-oriented way of looking at issues of support for internationalisation of enterprises (Forsgren, 2015). Forsgren and others have argued that external support for the SME internationalisation processes should take place in separate stages. Pietrasiński (2014) analyses the impact of the government programms activating the internationalisation of enterprises on the activities undertaken by these enterprises. Oczkowska (2013) presents the relationship between government programms and the internationalisation of business operations. It emphasizes the role of the state in the processes of internationalisation of small and medium enterprises and shows good practices in activating the internationalisation of European small and medium enterprises. The effective programms originating from the Great Britain are also worth following in the creation of support policy for companies in the SME sector.

1. SME participation in foreign trade in the UK

The United Kingdom of Great Britain and Northern Ireland (UK) is one of the five largest economies in the European Union (EU). In the UK, services account for almost 80% of the economy and 20% are goods. The United Kingdom of Great Britain and Northern Ireland is an open economy. Goods and services were sold abroad (The sales value was in 2016 for about €670 billion). Goods constituted about 56% of the export in 2016. However, the export of services for years have been growing steadily. Services are exported to the USA (31% of services), Japan (19% of services), China (10% of services) (Apfelthaler, and Lin, 2017). Figure 1 shows the ratio of exports of services to goods, in the EU countries, in countries that belong to the largest EU economies by GDP (France, Germany, Italy, Spain, UK) and in the UK alone.

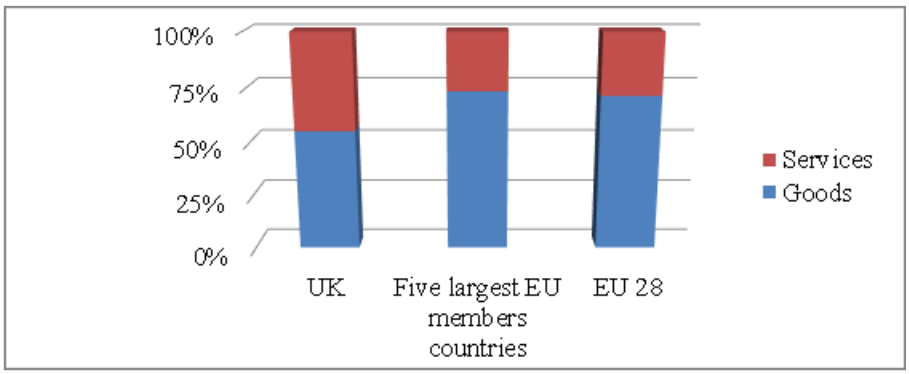


Figure 1. The ratio of exports of services to goods in the EU 28, the five largest EU economies and the UK in 2016. Source: World investment report investment and the digital economy 2017: UNCTAD.

The UK is a country that exports more goods to countries outside the EU. Most goods and services are exported to the USA (mainly by large companies). The majority of SMEs from France, Germany, Italy, Spain and the UK do not participate in the international arena outside the EU. SMEs export largely to EU countries (about 30% of their services and goods) and only 3% outside the EU. An international analysis of the activity of the UK SMEs only showed that in 2015 17% of UK SMEs exported to EU countries and 11% outside the EU. The countries to which the UK SMEs export are Germany 67%, France 5%, Ireland 3% (https://www.pwc.co.uk/…).

Trade flows give only a partial overview of cross-border activities of companies (including SMEs). An important form of internationalisation is Foreign Direct Investment (FDI). Companies can invest abroad in order to: gain better access to foreign markets, to be closer to customers or suppliers, to strive for fragmentation of production processes so as to gain comparative advantages. Large EU companies contribute significantly to global direct investment (in total, the five largest EU member countries have 19% of global foreign resources obtained through FDI). Few SMEs are actively involved in FDI. The contribution of SMEs to

total FDI volumes is limited to less than 1%. FDI flows have three components: equity (purchase of shares in a foreign company, reinvested earnings in the foreign company and cross-company loans). None of these forms is preferred by SMEs. Research has shown that 68% of UK SMEs have no experience of any form of internationalisation, as shown in figures 2a and 2b.

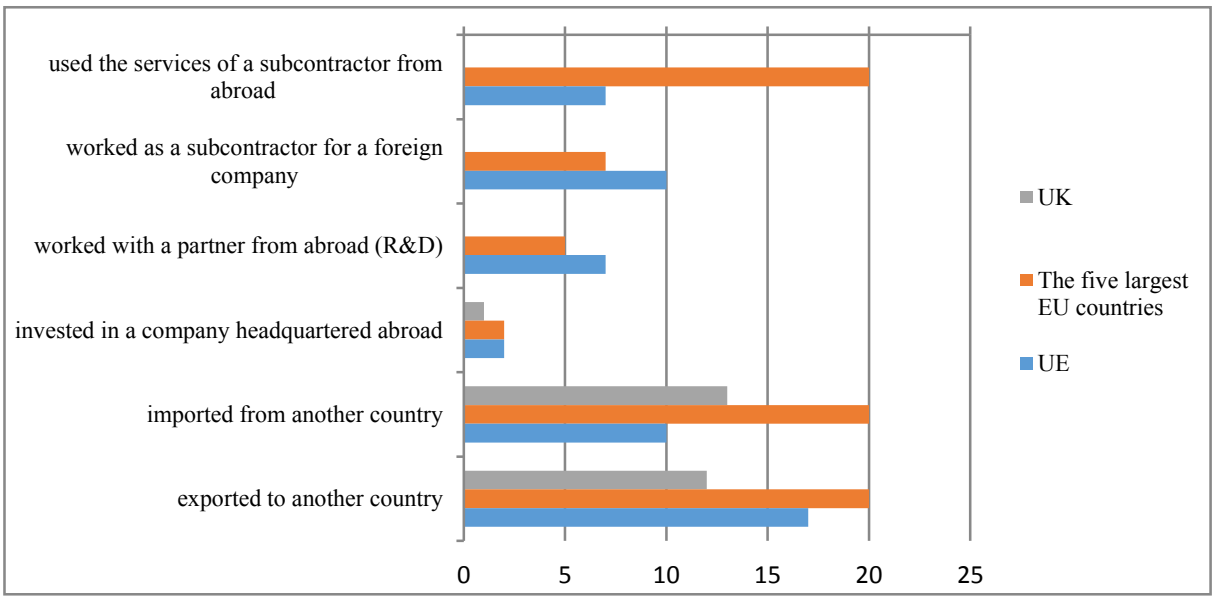


Figure 2a. International — intra-EU activities of SMEs from the EU 28, five largest EU economies and the UK in 2016 (% of enterprises).

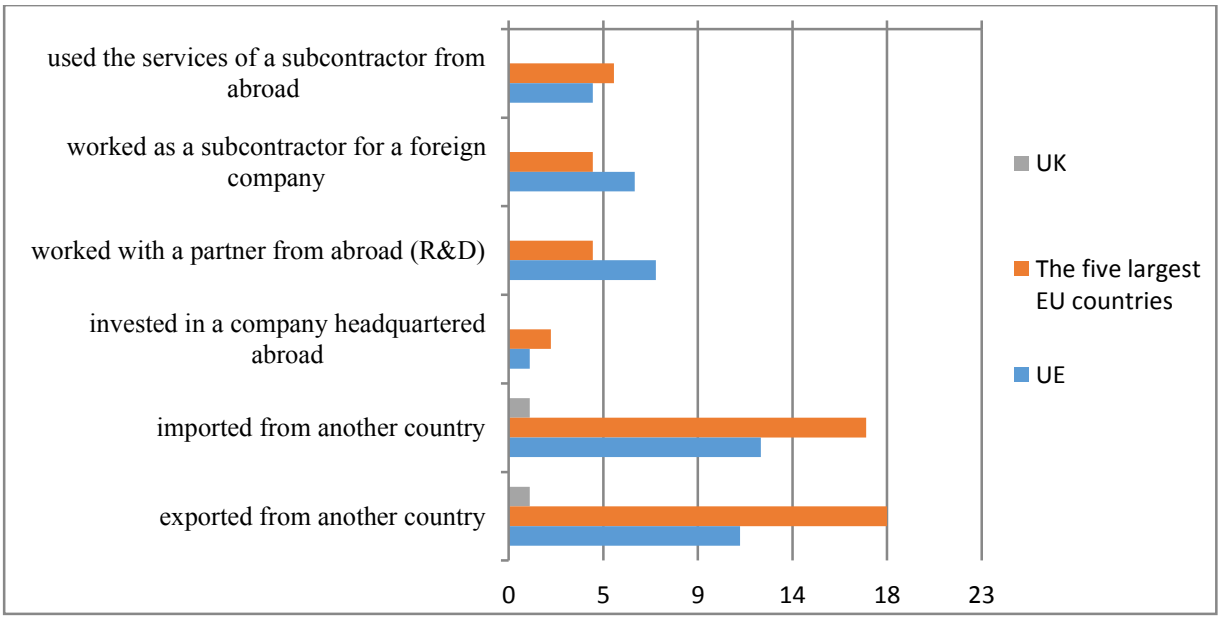


Figure 2b. International — extra-EU activities of SMEs from the EU 28, the five largest EU economies and the UK in 2016 Source: World investment report investment and the digital economy 2017: UNCTAD.

The figures show that UK SMEs seem to be focused on domestic activities. Despite this apparent reluctance to export, import and other forms of internationalisation, it was examined that only around 10% of UK SMEs declare that they will never export or import. Many UK SMEs were potentially willing to export or import, but respondents believe that existing obstacles have not yet been eliminated. The obstacles mentioned by the respondents are shown in Figure 3.

2. History and conditionings of internationalisation activities in the UK

The support needs of SMEs are changing as a result of Brexit and are also related to the geographical (island) location of the country. Once a colonial power, it still has international market partners and extensive experience in exporting goods.

The previous studies have shown that a key factor for successful international expansion of SMEs is the implementation of niche strategies combined with UK brand recognition. Success was achieved by targeting a narrow product group and a clearly defined market segment (Tordjman, 1994; Simpson, and Thorpe, 1996; Foscht et al., 2006). Over time, exporting SMEs began to adjust their products and operations to local preferences in foreign markets (Feigenbaum, 1993; Lipow, 2002). The brand identity of the company with the British brand is still a key asset, but also a precedent in trade with the USA (Americans love British products and the quality accompanying them).

Research (Hutchinson et al., 2007) shows that the success of UK SMEs increasingly depends on internal and external factors supporting internationalisation. Internal factors include: a global vision (abandonment of national pride thinking), mindset (taking into account the needs and identity of foreign customers), an entrepreneurial personality and informal personal relationships in foreign markets. External factors include: governmental assistance and advice from international logistics operators and companies providing cybersecurity solutions for small businesses. Albauma et al. (1994), Morgan and Katsikeas (1997) identified four main sets of internal obstacles that explain why SMEs are reluctant to export. The authors identify: strategic, operational, information and process-based obstacles. The last three obstacles can be overcome by companies using e-commerce (c-commerce, m-commerce, social networking sales). By not being proficient in e-commerce operations they use logistics operators and integration platforms.

3. The characteristics of internationalisation support process

Stage I of support — Investigation of the potential of SMEs for internationalisation and expectations of support

The process of company internationalisation is long-lasting (Alexander, and Doherty, 2009), characterised by organisational changes and increased risk exposure (Palmer, and Quinn, 2001). Researches to date have identified barriers to SME internationalisation (Salmon, and Tordjman, 1989; Muniz-Martinez, 1998; Burt, and Sparks, 2002; Evans et al., 2008). The researchers distinguished external obstacles to SME internationalisation such as: different regulations of host governments, economic and political instability, cultural differences, exchange rate fluctuations and difficulties in organising goods, information and money flows in distribution channels. Other researchers have documented internal obstacles that are related to lack of resources, management's attitude to foreign expansion, risk perception and insufficient knowledge of foreign conditions and markets (Salmon, and Tordjman, 1989). Fillis (2001) has argued that two types of external obstacles to internationalisation may arise: those created by the domestic market (e.g. weak government support) or the foreign market (e.g. intensity of competition, exchange rate fluctuations). Rundh (2001) argued that the most important obstacles concern lack of financial resources, language and cultural differences and administrative difficulties. However, Leonidou et al. (1995) claimed that SMEs require assistance in overcoming obstacles to foreign expansion. E-commerce has been identified as a factor that significantly facilitates the internationalisation of SMEs. Other researchers (Mostafa et al., 2005; Fosch et al., 2006) presented financial and organisational risks that cannot be mitigated without partners experienced in international business. Holmund and Kock (1998) and Terziovski (2003) recommend consulting with experts from outside the company as a way of filling in the knowledge gaps. In their opinion "internationalisation takes a lot of time and resources" which is a particular difficulty for SMEs. They argue that an international logistics operator has the necessary knowledge and resources. Figure 3 shows the main obstacles to the internationalisation of SMEs with and without international experience, which are frequently identified by EU governments.

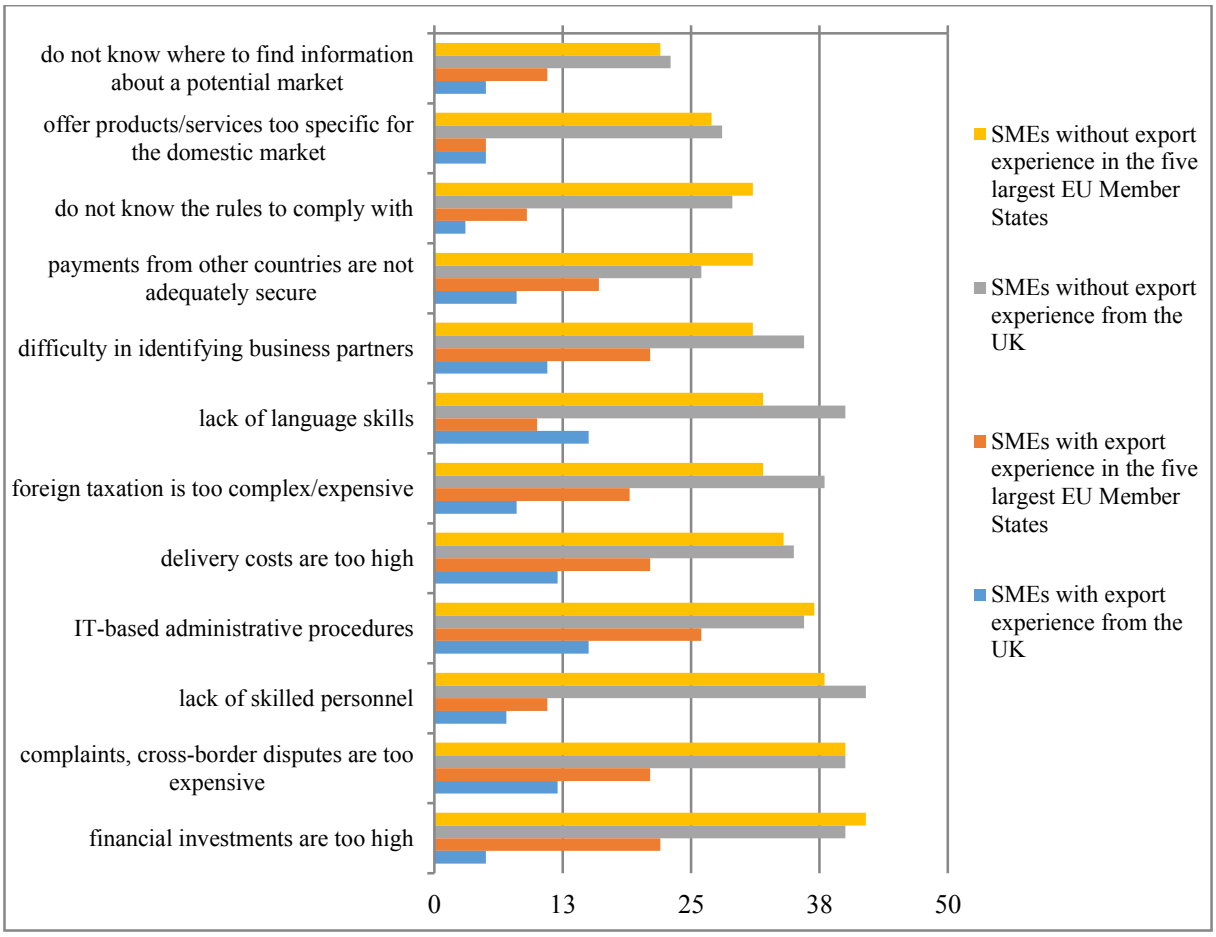


Figure 3. Main obstacles to the internationalisation of UK SMEs with and without international experience (surveys in 2016; % of responses) Source: Share of SMEs which have engaged in the respective activity outside the EU in the three years previous to the survey. European Commission (2016/2017).

Figure 3 shows that the greatest obstacle in undertaking export is the lack of specialised personnel, and for companies that have already started international operations, the financing of further investments is the greatest impediment.

The expectations of SMEs to support internationalisation are also investigated. In the five largest EU countries (including the UK) SMEs expect more assistance in supporting export financing and consider this support to be most useful, as shown in Figure 4.

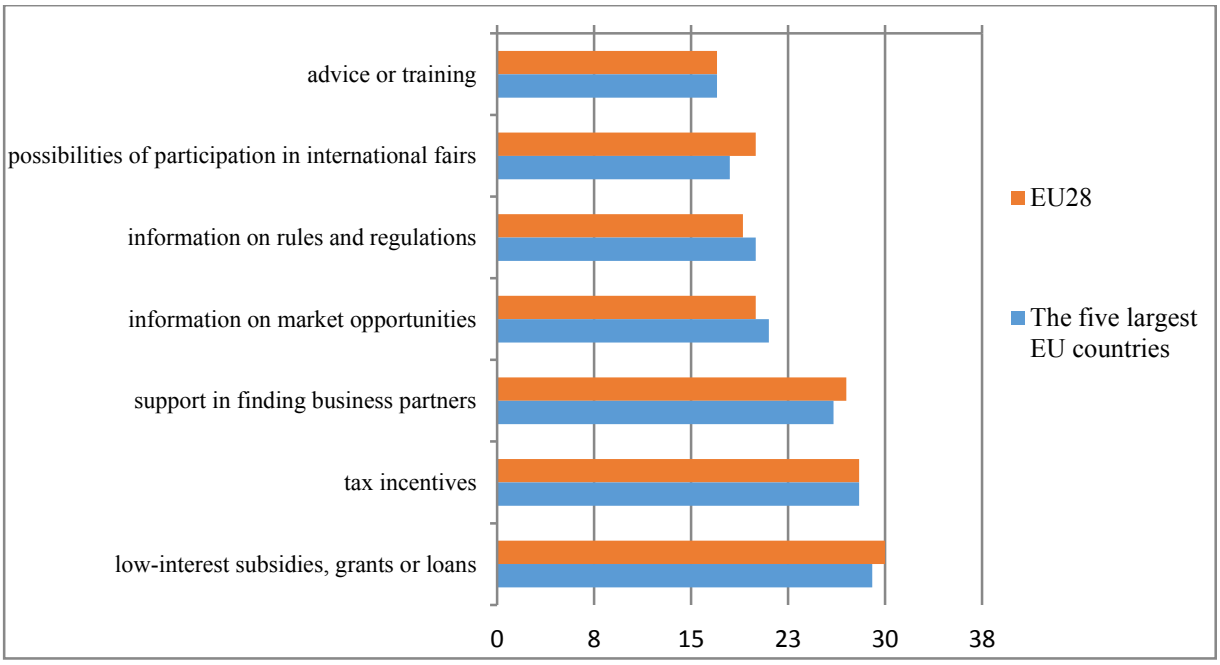


Figure 4. Desirable forms of support for the internationalisation of SMEs (surveys in 2016; % of responses) Source: Share of SMEs which have engaged in the respective activity outside the EU in the three years previous to the survey. European Commission (2016/2017).

Stage II of support — Applied programmes

The UK's policy to support the internationalisation of SMEs is responsible:

- Department for International Trade — providing operational support for exporters and facilitating internal and external investment. The supporting body to the Department for International Trade is the British Business Bank.
- UK Export Finance — provides financial products/services.

UK Export Finance offers a wide range of products: working capital loans and risk insurance. It provides opportunities to recover the cost of 'default' on an export contract; a direct loan and loan guarantee designed to encourage foreign companies to buy UK products. Apart from financial and insurance products, Export Finance also offers advice through Export Finance Manager. Advice is offered by regional contact points providing information about:

- payment methods and types,
- the types of financial support available,
- trade finance (before and after export),
- credit insurance,
- currency risks.

It is possible to discuss with a consultant the options of activity in particular markets, insurance of these activities, and contact with insurance brokers is ensured.

The Department for International Trade offers advice and support on networking, available grants and other incentives, advises on hiring and training employees and shares insights concerning specific markets.

The national promotional institution British Business Bank launches specific credit lines to finance exports and investments of SMEs based in the UK. British Business Bank offers a three-stage support programme for entrepreneurs pursuing international goals, while minimising risk.

- As a first step, the consultants conduct a detailed assessment of the company's readiness to export. This step includes an analysis of the organisational structure of the SME, its financial standing, leadership and commitment to the internalisation plan. Such an analysis enables the companies to prepare for the internalisation plan, overcoming weaknesses and management gaps.
- As a second step, the best market to expand is selected through a structured approach based on cautious analysis and market research.
- As a third step, the advisors assist the company in developing its market entry strategy by: identifying the best partners in the target market and competitors, developing a comprehensive roadmap of activities.

Apart from the specific assistance described above, the Bank offers free of charge content and tools that will facilitate export. The resources offered include video content, numerous articles and an eBook entitled 'How to achieve success'. The guide for entrepreneurs has been developed in cooperation with institutions from other countries, i.e. Export Development Canada and the Canadian Trade Commissioner Service, Canada Tariff Finder. The British Business Bank has recently launched the first phase of the 'Help to Grow' programme, which aims to provide funding for small businesses with the potential for rapid growth and export.

The Small Business Act for Europe (SBA)[1] is fully implemented. The UK has implemented all policy elements related to the EU recommendations which were announced between 2014 and the end of the first quarter of 2015. The Regional Finance Initiative is the only element that has not been completed during the reference period, although the UK Enterprise Bank provides regional lending.

[1] The Small Business Act for Europe (SBA) is the EU's flagship policy initiative to support small and medium-sized enterprises (SMEs). It comprises a set of policy measures organised around 10 principles ranging from 'Entrepreneurship' and 'Responsive administration' to 'Internationalisation'. To improve the governance of the SBA, the 2011 review of it called for better monitoring. The SBA fact sheets, published annually, aim to improve the understanding of recent trends and national policies affecting SMEs. Since 2011, each EU Member State has appointed a high-ranking government official as its national SME envoy. SME envoys spearhead the implementation of the SBA agenda in their countries. The first principle of the SBA is 'Think Small First'. The 'Think Small First' principle is meant to be a guiding principle for all policy- and law-making activities. It requires policymakers to take SMEs' interests into account at the early stages of the policy-making process. The principle also calls for newly designed legislation, administrative rules and procedures to be made simple and easy to apply.

Stage III of support — IT tools to support the internationalisation of SMEs

The Cyber Growth Partnership (CGP) (Apfelthaler, and Lin, 2017) is a partnership between UK industry, government, and academia. The CGP is the UK Government's initiative for business development. The government has recognised cybersecurity as a catalyst for economic growth and exports of services and products. The partners are focused on identifying opportunities and promoting exports, cybersecurity and raising the brand of British companies internationally. Industrial members of the CGP are ARM, Atkins, BAE Systems Applied Intelligence, Becrypt, BT, CISCO, HP, Intercede, L3 TRL, Raytheon, Sophos, and Surevine. Academic partners are members of Queen's University Belfast and the Engineering and Physical Science Research Council. The objectives of the CGP are:

- Increasing UK companies' understanding of and promoting access to export markets for cybersecurity services and products.
- Developing cybersecurity services and products in the UK to meet the demands of international markets.

The CGP runs export workshops to identify the potential of foreign markets and develop appropriate mechanisms to exploit them. The CGP seeks to identify the specific type and level of support for particular sectors to gain access to foreign markets. The UK Government commissions CGP studies that provide data on the security of trade in the global market. The CGP provides statistics for different countries. These studies are made widely available to companies in the UK (the studies are regularly updated). Individual companies may also commission CGP studies on specific countries or market sub-sectors. The UK companies have the possibility to receive the UKTI service — to conduct research aimed at solving specific problems.

The Gulf States, Brazil, India and Malaysia, the USA, China and Japan have been identified as high-growth markets. Companies from the UK are already well established there, as missions and trade events are organised in these markets. Cyber-security and support for the UK companies is especially assured there. Intercede (founder and member of the CGP) provides solutions that enable SMEs to verify their identity and credibility, advice on security, social media analysis, mobile device protection and infrastructure security. With a view to developing and improving its cybersecurity offering, the CGP is providing other companies with accreditation programmes, and has launched an online hub to map and promote UK cybersecurity companies. The CGP has established the UK Cyber demonstration Centre to showcase the latest technology for business. Thanks to the implemented technology solutions, the UK SMEs can offer their services to customers all over the world in real time. The Cyber Programme takes care of the development of the next generation of services. The CGP supports research on innovation and skills in the cybersecurity sector. The CGP organises courses and studies to enhance technical, business and communication skills. The CGP is also engaged in the Cyber Security Challenge UK, which is an organisation that recruits new people for the

cybersecurity industry. Eight universities in the UK have been designated as academic centres of excellence in business cybersecurity research (University of Bristol; Imperial College London; Lancaster University; University of Oxford; Royal University of Belfast; Royal Holloway University London; University of Southampton; University College London).

The results of the CGP/programmes of this partner organisation can be evaluated by means of indicators (share of SMEs in the global market, volume of exports by SMEs, number of the UK SMEs interested and/or involved in exports). The results of CGP can also be estimated in relation to the number of professionals trained in cybersecurity as well as in the flow of innovative cybersecurity products and services.

The CGP has made a significant contribution to the internationalisation of SMEs in the UK in the area of service export and cybersecurity. Through the Cyber Connect portal, SMEs are well aware of activities, events, initiatives and opportunities that support the export strategy of particular sectors (e.g. healthcare, financial services, retail).

IT tools to support SME internationalisation are also regional or local range. Hidden Art is a non-profit organisation that helps SMEs in the project industry in and around London. The aim of the support is to give SMEs access to a competitive, global marketplace. Hidden Art provides a dedicated network platform that connects businesses in the marketplace. Designers are provided with training and information. The Hidden Art Project 'Innovative Networks for Smart Growth' attempts to stimulate the growth of the local design community. Designers can sell their projects or design services worldwide through The Hidden Art e-shop, pop-up stores, international trade fairs. Apart from a dedicated B2B platform, The Hidden Art Project offers tailor-made tips provided by individual advisors. The support model combines the adjustment of the development path, improvement of commercialisation skills and directing to an appropriate community of activities: co-designers, producers or distributors. Project development programmes are arranged to help participants to develop their ideas and bring them to the foreign market. The Hidden Art network is open to all designers and currently has about 2,000 members. About 100 designers have their services/products in the Hidden Art online shop, and about 300 of them have their website in the Hidden Art catalogue. Joint marketing activities, events and programmes are organised or administered by Hidden Art. So far 450 companies have received support. The Hidden Art Project has increased the confidence of foreign customers in the London design community.

Another example of a private platform supporting the internationalisation of service SMEs is the one established by FedEx. SMEs operating on islands require mainly logistical support. The state provides financial support to logistics operators to develop services for SMEs. FedEx allows SMEs to reach new customers and international markets relatively easy. FedEx recognises the global environment, political forces, logistics and transport infrastructure, and distribution opportunities in export markets for SMEs. It provides its customers with information technology (CRM systems, WMF...). In 2016, FedEx IT technology for SME exports was transformed. As a result of the organisational, cultural and technical transformation, SMEs do not feel left alone in the organisation of transport and logistical

operations in cross-border trade. FedEx connects physical and digital networks (taking the next steps in the development of the Internet of Things), which facilitates and drives the growth of cross-border transactions, enabling faster, more cost-effective and more convenient flows. FedEx offers support to SMEs through dedicated, geographically focused industry teams, tailors services to the individual needs of SMEs and prepares various international shipping options such as International Priority shipping service. It educates entrepreneurs, believing they need to be up-to-date with new platforms to maintain competitive advantage and reach global customers. FedEx has prepared convenient order forms and simplified payment methods to work in c-commerce. According to SMEs, it is FedEx that has the best operating platform that provides the highest level of service. The evolving character of FedEx's relationship with SMEs, with new CRM module features and the use of new opportunities offered by the digital economy, improves the indicators of SME internationalisation. According to the 'FedEx export report for SMEs', European SMEs have introduced e-commerce (38% of SMEs with the help of e-commerce reach foreign markets, among them 55% generate revenues using m-commerce and 65% of SMEs use social media for promotion and sales on foreign markets). According to FedEx, the use of e-commerce and the integration of IT systems with an international logistics operator facilitates the start-up and operation of SMEs on an international scale.

4. The effectiveness of internationalisation measures for SMEs

The current and future performance of the UK's SMEs despite Brexit shows that it is the most rapidly growing sector. This is shown in Table 1.

Table 1.
Statistics on the UK's SMEs against SMEs from all the EU countries (2016)

Class size	Number of enterprises			Number of persons employed			Value added		
	United Kingdom		*EU-28*	United Kingdom		*EU-28*	United Kingdom		*EU-28*
	Number	Share	*Share*	Number	Share	*Share*	Billion €	Share	*Share*
Micro	1 757 336	89.3 %	93.0 %	3 401 353	17.5 %	*29.8 %*	250.1	19.0 %	*20.9 %*
Small	175 708	8.9 %	5.8 %	3 834 976	19.7 %	*20.0 %*	210.4	16.0 %	*17.8 %*
Medium-sized	28 832	1.5 %	0.9 %	3 180 868	16.3 %	*16.7 %*	221.7	16.8 %	*18.2 %*
SMEs	**1 961 876**	**99.7 %**	**99.8 %**	**10 417 197**	**53.5 %**	***66.6 %***	**682.2**	**51.8 %**	***56.8 %***
Large	6 482	0.3 %	0.2 %	9 060 255	46.5 %	*33.4 %*	636.1	48.2 %	*43.2 %*
Total	**1 968 358**	**100.0 %**	**100.0 %**	**19 477 452**	**100.0 %**	***100.0 %***	**1318.3**	**100.0 %**	***100.0 %***

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_in_goods_by_enterprise_size#Share_of_SMEs_in_total_trade_.28intra_.2B_extra-EU.29.

Large companies are more pronounced in the UK rankings than in the rest of the EU. This is mainly a statistical phenomenon as companies with a turnover of less than £82,000 are not included in the Register of Companies, while in the rest of the EU the turnover threshold for registration is much lower. However, SMEs generate around half of the total value added and represent just over half of total employment in the 'non-financial business economy'. Due to the under-representation of the smallest SMEs, the share of value added generated by SMEs is currently around five percentage points lower than the EU average. With regard to employment, the share of SMEs is more than ten percentage points lower than the EU average.

The implementation of the Small Business Act for Europe (SBA) has been successful, as shown in Figure 5.

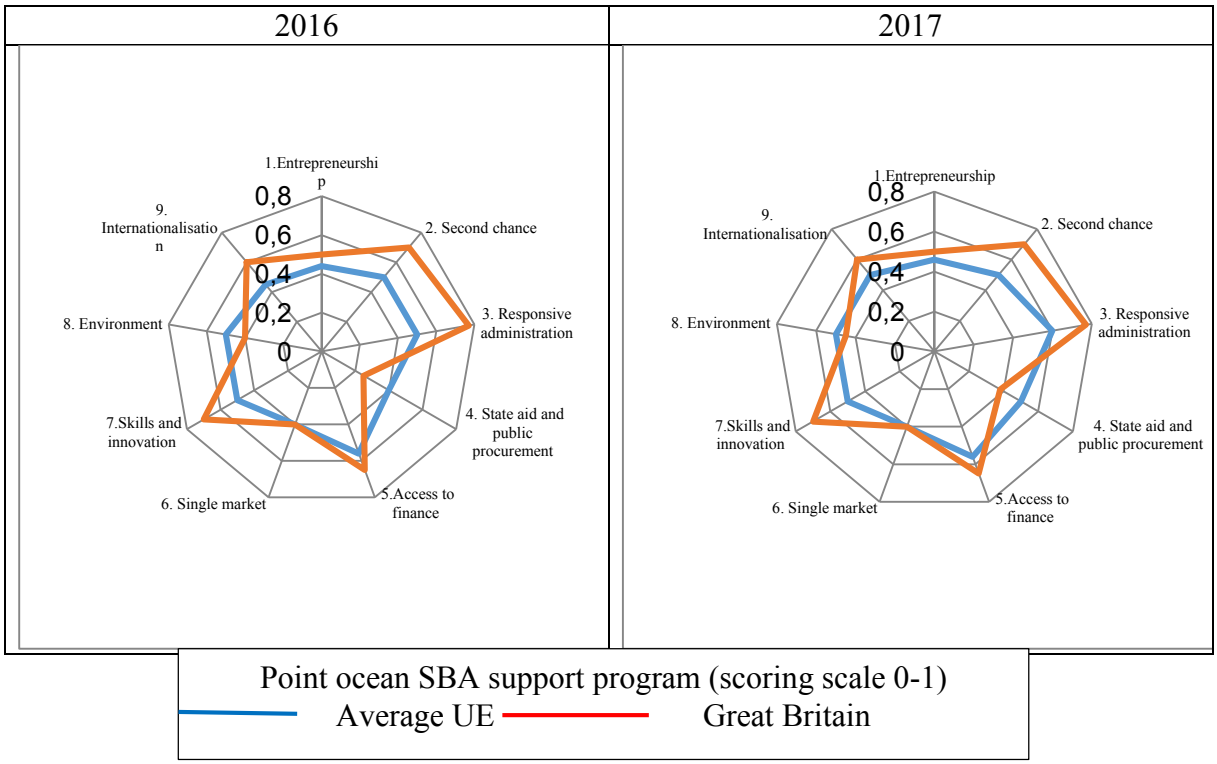


Figure 5. Information on the implementation of the SBA between 2016 and 2017 (1. Entrepreneurship; 2. Second chance; 3. Responsive administration; 4. State aid and public procurement; 5. Access to finance; 6. Single market; 7. Skills and innovation; 8. Environment; 9. Internationalisation) Source: http://www.legislation.gov.uk/ukpga/2015/26/contents/enacted.

Almost half of the domains of the SBA policy implemented in the UK have an advantage over the average rating of this policy in the EU countries. These include 'Second chance', 'Responsive administration', 'Access to finance and skills' and 'Innovation'. There are also areas where further improvements can be made, especially in the areas of 'Public procurement', 'Environment' and 'Internationalisation'.

Since 2008, there has been a significant improvement in conditions in the UK under most of the SBA's policy domains, including the 'Internationalisation' domain. This progress has been driven by the comprehensive policy support offered to SMEs since 2008. The UK Government has also been pursuing its active export support strategy, carried out by: Small Business, Enterprise and Employment Act or 'Exporting is GREAT' initiative. However, further efforts

are necessary to help more SMEs to become exporters, especially in extra-EU markets. The UK's profile in the domain 'Internationalisation' has unfortunately been weakening since the referendum date of 23 June 2016 due to the upcoming Brexit.

Conclusions

The findings of the presented literature research and websites gave an insight into the obstacles encountered during the process of SME internationalisation in the UK. The analysis of statistical data showed the expectations of SMEs for support activities by the government. The study presents government support programmes in response to SME expectations. It also included the most interesting business solutions that facilitate the crossing of national borders by the UK SMEs. The main purpose of the article was to indicate effective programmes supporting SMEs in their internationalisation. And these were: Small Business, Enterprise and Employment Act, 'Exporting is GREAT' initiative. During the implementation of these programmes, the annual evaluations of the 'Internationalisation' area (from the European Small Business Act) in the UK have been increasing year on year (until 2017). The imminent Brexit is currently causing a further decline in the rating for the 'Internationalisation' area. The UK government has been searching for further support programmes for the internationalisation of SMEs. Further discussion about new technologies and platforms and their impact on internationalisation and business development is demanded not only in the UK and will be the subject of another research.

References

1. Alexander, N., Doherty, A.M. (2009). *International retailing.* Oxford: Oxford University Press.
2. Apfelthaler, G., Lin, H. (2017). *Learning from Global Innovative SME Export Assistance Programs.* https://www.researchgate.net/publication/312500278_Learning_from_Global_Innovative_SME_Export_Assistance_Programs, 13.05.2018.
3. Burt, S., Sparks, L. (2002). Corporate branding, retailing, and retail internationalization. *Corporate Reputation Review, 5, no. 2-3*, pp. 194-212. doi: 10.1057/palgrave.crr.1540174.
4. *Business Link, Are you ready to export?* https://opentoexport.com/?utm_medium=cpc&utm_source=google&utm_campaign=Generic%20-%20Export&utm_term=%2Bexports&gclid=Cj0KCQjwibDXBRCyARIsAFHp4fooj-odYwYQnDoMyth7AjOmvpN9TLvirV6bOupMoNZYJi5BAnteWgwaAgUAEALw_wcB#cam=1405SEMGOOGENR

0001A&utm_medium=cpc&utm_source=google&utm_campaign=Generic+-+Export&utm_term=%2Bexports, 02.04.2018.
5. Evans, J., Bridson, K., Byrom, J., Medway, D. (2008). Revisiting retail internationalization: Drivers, impediments and business strategy. *International Journal of Retail and Distribution Management, 36, no. 4,* pp. 260-80. doi: 10.1108/09590550810862679.
6. Feigenbaum, H. (1993). US companies warned on overseas expansion. *Journal of Commerce and Commercial, 18 May,* 4. doi: 10.1080/09593960903233673.
7. Fillis, I. (2001). Small firm internationalization: An investigative survey and future research directions. *Management Decision 39, no. 9,* pp. 767-83. doi: 10.1108/00251740110408683.
8. Foscht, T., Swoboda, B., Morschett, D. (2006). Electronic commerce-based internationalization of small, niche-oriented retailing companies: The case of blue tomato and the snowboard industry. *International Journal of Retail & Distribution Management, 34, no. 7,* 556-572. doi: 10.1108/09590550610673626.
9. Hidden Art, http://hiddenart.co.uk/shop/ and http://hiddenart.co.uk/, 12.08.2018.
10. Holmund, M., Kock, S. (1998). Relationships and the internationalisation of Finnish small and medium-sized companies. *International Small Business Journal, 16, no. 4*, pp. 46-64. doi: 10.1177/0266242698164003.
11. http://www.legislation.gov.uk/ukpga/2015/26/contents/enacted, 02.04.2018.
12. https://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_in_goods_by_enterprise_size#Share_of_SMEs_in_total_trade_.28intra_.2B_extra-EU.29, 02.04.2018.
13. https://www.pwc.co.uk/who-we-are/regional-sites/north-west/press-releases/smes-look-to-post-brexit-opportunities--but-concerns-over-produc.html, 02.04.2018.
14. Hutchinson, K., Quinn, B., Alexander, N. (2006). SME retailer internationalization: Case study evidence from British retailers. *International Marketing Review, 23, no. 1,* pp. 25-53. doi: 10.1108/02651330610646287.
15. Hutchinson, K., Quinn, B., Alexander, N., Doherty, A.M. (2007). Understanding SMEs decisions to internationalise: Qualitative evidence from the retail sector. *Journal of International Marketing, 15, no. 3*, pp. 96-122. doi: 10.1108/03090569310038085.
16. Leonidou, L.C. (1995). Export barriers: Non exporters 'perceptions. *International Marketing Review, 12, no. 1,* pp. 4-25. doi: 10.1108/02651339510080070.
17. Lipow, V. (2002). *All the world's a store, International retail trends*, http://retail.monster.com/ articles/international.
18. Morgan, R.E., Katsikeas, C.S. (1997). Export stimuli: Export intention compared with export activity. *International Business Review, 6, no. 5*, pp. 477-99. doi: 10.1016/S0969-5931(97)00017-6.
19. Mostafa, R., Wheeler, C., Jones, M. (2005). Entrepreneurial orientation, commitment to the Internet and export performance in small and medium-sized exporting firms. *Journal of International Entrepreneurship, 3, no. 4,* pp. 291-302. doi: 10.1007/s10843-006-7857-9.
20. Muniz-Martinez, N. (1998). The internationalization of European retailers in America: The US experience. *International Journal of Retail and Distribution Management, 26, no. 1,* pp. 29-37. doi: 10.1108/09590559810201187.

21. Palmer, M., Quinn, B. (2001). The strategic role of investment banks in the retailer internationalisation process: Is this venture marketing? *European Journal of Marketing, 37, no. 10,* pp. 1391-408. doi: 10.1108/03090560310487167.
22. Rundh, B. (2001). International market development: New patterns in SMEs international market behaviour? *Market Intelligence and Planning, 19, no. 5*, pp. 319-29. doi: 10.1108/EUM0000000005649.
23. Salmon, W.J., Tordjman, A. (2002). The internationalization of retailing. In: A.M. Findlay and L. Sparks (Eds.), *Retailing: Comparative and international retailing* (pp. 84-99). London-New York: Routledge T&F Group.
24. Simpson, E.M., Thorpe, D. (1996). A conceptual model of strategic considerations for international retail expansion. In: G. Akehurst, and N. Alexander (Eds.), *The internationalization of retailing* (pp. 16-24). London: Frank Cass and Company Ltd.
25. Terziovski, M. (2003). The relationship between networking practices and business excellence: A study of small to medium enterprises (SMEs). *Measuring Business Excellence, 7, no. 2,* pp. 78-92. doi: 10.1108/13683040310478011.
26. Tordjman, A. (1994). European retailing: Convergences, differences and perspectives. *International Journal of Retail and Distribution Management, 22, no. 5,* pp. 3-19. doi: 10.1108/09590559410067299.
27. UNCTAD (2017). *World investment report investment and the digital economy 2017*, http://unctad.org/en/PublicationsLibrary/wir2017_en.pdf, 13.09.2018.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

THE IDEA OF A SMART CITY ON THE EXAMPLE OF THE CITY OF GLIWICE

Patrycja SUŁKOWSKA

Graduate of the Silesian University of Technology in 2018; patrycja_sulkowska@o2.pl,
ORCID: 0000-0002-2235-637X

Purpose: The reason for writing the article was the desire to learn about the recently popular topic of smart city and the activities undertaken by cities that strive to become a modern city.
Design/methodology/approach: The article reviews the theoretical literature on the concept of a smart city. The diagnosis was based on available articles, literature and other sources. The main topic of the article was to present the concept of a smart city and examples of activities implemented in this area.
Findings: The concept of a smart city is currently one of the key aspect implemented as part of the city's strategy. The idea is related to improving the lives of the inhabitants of a given local community by carrying out many innovative activities aimed at the continuous development of the city. Technological development causes, that local governments effectively carry out public utility tasks. The idea of a smart city fits perfectly with the concept of sustainable development, because it aims to maintain a balance between economic, ecological and social aspects, and also helps to improve the quality of life of the inhabitants of local communities. The idea of a smart city brings benefits such as economic and technological development. It also brings risks such as a cyber attack. One of the examples of cities that have been successfully implementing tasks in line with the smart city concept is Gliwice.
Originality/value: The idea of a smart city is based on a modern approach to city management. It also allows for the effective use of available technical resources, which contribute to the improvement of the quality of life of the inhabitants.

Keywords: smart city, sustainable development, innovation, quality of life, technology, Gliwice.

Category of the paper: Literature review.

1. Introduction

The concept of a smart city assumes the development of a given city using the latest available technological resources – most often from the ICT industry. Starting with activities in the field of water management optimization and energy, to the constant development of urban

infrastructure, the idea of a smart city is one of the key elements of the city's strategy, the main goal of which is to improve the living conditions of the inhabitants of the local community (Brdulak, 2017).

The idea of a smart city appeared for the first time at the beginning of the 21st century. According to many experts, the process of implementing the concept itself is already at such an advanced level that we can now distinguish 3 phases of the smart city idea development, i.e. (Smart City 3.0, czyli idea…, 2020):

- Smart City 1.0 – the initiators of all changes and development were representatives of the ICT services sector, who largely based their actions on ready-made solutions.
- Smart City 2.0 – the initiators of the changes were local self-government authorities striving to improve the quality of life of their inhabitants. This phase is currently dominant. Local administration focuses primarily on implementing projects and solutions based on diverse technological potential.
- Smart City 3.0 – the latest phase, in which the initiators of changes are the inhabitants of the city themselves. It is their appropriate attitude, combined with cooperation with local authorities, that is crucial in the development of a given region, which in turn results in an increase in the standard of living of the inhabitants and faster implementation of innovative activities.

The aim of the article is to present the concept of a smart city and to indicate innovative activities aimed at improving the quality of life of a given local community. Later in the publication, specific activities implemented by the city of Gliwice as part of the idea of a smart city were presented. All information in this regard comes from publicly available data.

2. Reasons and directions of development of the smart city concept

One of the main reasons for the development of the smart city concept is the improvement of the quality of life of residents by introducing various types of innovative solutions. An appropriate approach to the subject also results in efficient management of cities, which may be heavily overloaded in the coming years. Due to the progressive urbanization, urban agglomerations will have the highest percentage of population in the future. Another aspect is the progressive climate change. At present, we observe many cases of degradation and pollution of the natural environment. It is caused by enormous human interference in the natural environment. In this case, the reorganization of the energy sector may favour the development of the idea of a smart city (e.g. use of renewable energy sources). Digital development can also support the concept itself, as it enables us to reach a larger audience and educate them throughout their lives (Smart city: jak inteligentne…, 2017-2019). It can be assumed that the

concept of a smart city is not only a temporary trend that prevailed in society. Actions taken in accordance with the discussed concept will largely improve life – they will also allow for its huge reorganization in terms of the upcoming social, ecological and technological changes. The idea of a smart city is also part of the concept of sustainable development.

By the concept of sustainable development, we understand socio-economic growth, which consists in constantly meeting the needs of society in such a way as not to limit the possibility of meeting these needs for future generations. According to the definition, the idea of sustainable development aims to protect the natural environment, promote the principles of international solidarity, and treat as interdependent factors such as: ecological, economic and socio-political factors (Encyklopedia PWN). In order to achieve sustainable development, cities decide to use modern technologies that not only provide them with a balance in the above-mentioned aspects, but also improve the quality of their lives – which is in line with the idea of a smart city (Korenik, 2017).

In the context of smart cities, it is often the case that local government units include the concept of sustainable development in their investment plans and budget expenditures. At this point, not only the concept itself is extremely important, but also the conscious approach of employees and their views, which translates into the appropriate implementation of the idea of sustainable development (Brdulak, 2017). Measuring the achieved goals is based on the adopted evaluation criteria, developed indicators or other planning documents. Usually, local government units include specific measures in their strategic plans, which depend on the goals adopted for implementation. One of such measures are indicators of sustainable development. They are the main source used to monitor ongoing activities. The principles of selecting the discussed indicators are carried out through appropriate identification (Wskaźniki zrównoważonego rozwoju…, 2011):

- development principles that are the basis for the selection of indicators,
- target development goals,
- accepted social, economic, environmental and political orders.

The above criteria are only a benchmark that helps to verify whether the accepted measures are actually implemented in terms of sustainable development. For this purpose, it would also be necessary to develop specific measurable strategic goals that we are able to verify with the help of correctly matched indicators (Wskaźniki zrównoważonego rozwoju…, 2011). The next part of the article will discuss the strategic goals of the city of Gliwice in the context of integrated and sustainable development until 2022.

The concept of a smart city focuses on many innovative activities that can significantly improve the life of the local community. Depending on the accepted strategic plans, local authorities strive to improve the city management system, as well as to constantly modernize public services by introducing solutions such as:

- modern energy networks,
- intelligent sewage management systems,
- waste management systems,
- modernization of the lighting system,
- improvement of public transport, etc.

These activities allow not only to reduce the costs related to the implementation of public utility tasks, but also have a positive effect on the image of the city itself, which in the context of innovative activities is perceived as a modern city (Czupich, Kola-Bezka, Ignasiak-Szulc, 2016).

The implementation of the smart city concept involves the necessity to invest an appropriate amount of financial resources, which are not always available to local government units. Local authorities now often use various grants and forms of assistance in the form of regional programs. Another solution is also a public-private partnership, where innovative activities are implemented and financed by representatives of the private sector. Such a division of duties means that local authorities are only responsible for maintaining the investment at an appropriate level (Smart City 3.0…, 2020).

Of course, the concept of a smart city is not without certain risks. As a result of the technological development of the city, there is a risk related to the possibility of a cyber attack. As a result, the operation of the systems may be disrupted, which may result in difficulties in city management. Another example is the fear of theft of personal data that may be used by unauthorized persons (Smart city: jak…). Yet another example is the risk related to the exclusion of certain social groups (i.e. the elderly, the poor, etc.) who do not have the appropriate knowledge, skills or technological resources allowing them to use modern public services (Czupich, Kola-Bezka, Ignasiak-Szulc, 2016).

3. The concept of a smart city on the example of activities carried out by the city of Gliwice

As mentioned earlier, the idea of a smart city focuses primarily on improving people's quality of life. Introducing innovative activities through the use of modern technologies greatly facilitates the life of the local community. Additionally, the activities discussed above take into account the progressive climate change.

In recent years, there has been a significant development of the idea of a smart city, which is reflected in many parts of the world. The conducted research shows that the adopted solutions generate not only enormous profit, but also contribute to the introduction of modern technological solutions. Patterns of innovative solutions on the example of leaders among smart cities (Smart City 3.0…, 2020):

- Barcelona (Spain) – the city has introduced a modern waste management system that allows you to store garbage in special containers that neutralize unpleasant odours and enable easier and more efficient waste collection. Another convenience is a modern travel system, which ensures faster transport between locations.
- Kalasatama (Finland) – this small town on the outskirts of Helsinki has been included in a pilot program implementing an intelligent traffic management project.

Also in our country, you can find examples of smart cities that focus on the development of modern technologies. One of the examples is Warsaw, where it is planned to create the largest project in Europe that allows testing and introducing innovative activities in the environment of residents – including intelligent lighting, parking sensors, etc. (W Warszawie powstaje…, 2016).

There are many more examples of smart cities. The city of Gliwice is one of them that has proudly fit into the concept in question for several years. According to local authorities, the city is introducing modern solutions aimed at making life easier for residents, whose population in urban areas may exceed 60% by 2030 (Smart rozwiązania klimatyczne?..., 2019).

How to check if the city of Gliwice fits in with the smart city concept? One of the key aspects was the selection of an appropriate research method that allowed for a better understanding of the real activities of the city. The appropriate selection of the research method allows for the verification of the accepted goal and enriched the knowledge about the activities carried out by the city. The research method should be clear and understandable for the reader who wants to find out why the city of Gliwice fits into the discussed concept. For this purpose, the focus was on a method that allows for the examination and verification of documents – in this case, publicly available articles. The analysis of these documents allows to get acquainted with the mission, achievements and the way of operation of a given entity (Encyklopedia PWN), which in this case is the city of Gliwice. Another source of information is the Strategy for the Integrated and Sustainable Development of the City of Gliwice until 2022 (Update 2014), which is attached to the to the Resolution No. XLII/880/2014 of the City Council in Gliwice of March 20, 2014. The document is available to the public on the website of the Public Information Bulletin of the City of Gliwice (tab: *Resolutions of the City Council*). The publication is one of the main planning documents that focuses on the local development of the city. The strategy also includes improving people's quality of life. According to the provisions that can be found in the document in question, one of the strategic goals of the city is to increase the satisfaction of residents by improving their quality of life. Building coherence and cooperation between individual city entities also gives an opportunity to coordinate many activities and maintain synergy between implemented projects. The accepted strategy also puts emphasis on cooperation in the economic aspect of the city, which will translate into development opportunities and an increase in the city's competitiveness. The authorities of Gliwice put emphasis on improving the living conditions of the inhabitants and streamlining the city's organizational system. The degree of achievement of these goals can be seen in the annual

reports on the city's condition. The reports contain information such as on activities undertaken for the purpose of cooperation between research units and enterprises, and activities aimed at in order to improve the quality of life of residents. The city of Gliwice, as one of the key members of the Upper Silesian Agglomeration, also focuses on the development of its teaching potential and scientific, which should be one of the main factors of innovative development. Strategic plans also assume cooperation of local authorities with neighboring cities and communes in the context of development activities, such as, for example, preparation of investment projects, use of renewable energy sources, implementation of activities in the context of intelligent transport or waste management system. The vision of the city's development is largely based on (Strategia Zintegrowanego…, 2014):

- economic development,
- development of new technologies,
- the potential of residents who are involved in the city's life,
- increase in the city's competitiveness,
- development of scientific and research potential,
- cooperation of local authorities with residents and the private sector,
- acting in accordance with the principles of sustainable development,
- visible and perceptible changes that are noticeable to residents.

Activities in line with the smart city concept have been implemented by the city of Gliwice for many years – information can be found in the online articles. One example is the construction of an intelligent traffic management system. The investment carried out in 2011-2013 consumed a total of approximately PLN 29 million (85% co-financed by the European Union). The introduced solution enables smooth and faster city driving. It also allows to find a parking space. For this purpose, it is necessary to run the application, available at the link: https://its.gliwice.eu. The data in the system is processed on the basis of information obtained from sensors located in the region (including at crossroads). The accepted solution serves to improve the safety condition thanks to efficient traffic management (Gliwice wdrażają inteligentny…, 2019).

Another example of innovative activities is the introduction from 2009 of a modern alarm and warning system against threats, managed by Centrum Ratownictwa Gliwice (CRG)[1]. The introduced system replaced the obsolete alarm sirens operating on the basis of rotor motors. Modern alarm systems make it possible to transmit verbal messages using radio technology. The earlier solution allowed for the alarm to be triggered only in the place where the event occurred. Currently, it is possible at the CRG headquarters. The investment cost was approximately PLN 900,000. The financial resources came from the city budget (W Gliwicach powstał…, 2010).

[1] Centrum Ratownictwa Gliwice (CRG) is a municipal organizational unit established to carry out the city's own tasks in the field of rescue and crisis response. The unit is supervised by the President of the City of Gliwice.

Another investment is the expansion of the city monitoring system. This task has been carried out for several years by the Śląska Sieć Metropolitalna Sp. z o.o. (ŚSM)[2]. An extensive city monitoring system helps to ensure the safety of residents, as well as to determine the circumstances of various events (such as: hooliganism, accidents, etc.). The cameras can be observed, among others, at Piłsudski Square. It is an investment positively received by the residents (further collection points are constantly added as part of the civic budget) and widely recognized as one of the most innovative in the whole country (Oko na Gliwice…, 2016). The image from the surveillance cameras is stored on a special server for 30 days. Only the representatives of the police and municipal police have access to the source materials (Nowe kamery na…, 2016).

Another example is the intelligent lighting system that has been regularly implemented since 2012. The discussed solution based on LED lamps enables constant management and monitoring of electricity consumption. The electronic lighting control system means that individual lamps can be turned on/off at different times and freely control the level of their exposure. Constant monitoring of the entire system also allows for more efficient localization of possible faults and their quick repair. The City of Gliwice is also planning to implement tasks aimed at responding to the needs of climate change. Work is currently underway to develop an effective system for water status monitoring (Inteligentne rozwiązania ułatwiają…, 2019).

In view of the examples cited, it is clear that the city of Gliwice fits perfectly into the concept of a smart city. The implemented investment activities contribute to the improvement of the inhabitants' quality of life, which results in an increase in their satisfaction. The city is developing, providing the local community with access to the latest innovative solutions. Local authorities strive to ensure safety for residents. into account the progressive climate change. The development strategy of the city of Gliwice is also based on the principles of sustainable development.

4. Summary

The concept of a smart city is now becoming one of the key strategic aspects of a given local community. Innovation and conscious, uninterrupted education of the inhabitants allows not only for a better implementation of modern solutions, but also helps to reorganize the city management system, which results in an increase in satisfaction and improvement in the quality of life of the local community. Compliance of the discussed concept with the principle of sustainable development ensures harmony between various aspects of life and does not limit

[2] Śląska Sieć Metropolitalna Sp. z o.o. (ŚSM) is a company wholly owned by the local government of Gliwice. It carries out tasks related to the development of telecommunications infrastructure and broadband Internet in the area of the Silesian metropolis.

the chances of future generations to benefit from the currently developed solutions. Effective implementation of the idea of a smart city raises the living standards of its inhabitants and affects the economic development of the region. Threats may only result from the imperfections of systems or poor education of the inhabitants, who may not have the appropriate means or resources to learn about new technological trends. Innovative activities should not be based only on modern technologies. To a large extent, it is people who should be the driving force behind the upcoming changes, because it is thanks to their involvement that all innovative activities make sense and contribute to improving the quality of life of the local community.

Conclusion – it can be concluded that the city of Gliwice fits perfectly into the concept of a smart city. The examples perfectly show that local authorities effectively carry out their mission and strive for continuous development of the city. Future research may be conducted in the direction of strategic changes planned for implementation by 2022. After this time, it will be possible to determine which planned activities have been successfully implemented, which should be improved, and which will be implemented in the future. In the coming years, it will also be possible to verify which of the planned new innovative activities have been implemented and how they will contribute to the improvement of the quality of life of the city's inhabitants.

Acknowledgements

At this point, I would like to thank Professor Anna Kwiotkowska, who motivated me to write this article.

References

1. Brdulak, A. (2017). Idea *Smart City* w strategii zarządzania Urzędem Miasta we Wrocławiu. *Urban Studies, vol. 2017 of the WSB University in Wrocław,* doi: 10.25167/sm2017.027.11, 143-154.
2. Czupich, M., Kola-Bezka, M., Ignasiak-Szulc, A. (2016). Czynniki i bariery wdrażania koncepcji smart city w Polsce. *Economic Studies. Scientific Journals of the University of Economics in Katowice, No. 276,* 226-228.
3. *Encyklopedia PWN*. Available online: https://encyklopedia.pwn.pl/, 15.08.2020.
4. *Gliwice wdrażają inteligentny system zarządzania ruchem* (2019). Available online: https://www.slaskibiznes.pl/wiadomosci,gliwice-wdrazaja-inteligentny-system-zarzadzania-ruchem,wia5-4-1184.html, 27.07.2020.

5. *Inteligentne rozwiązania ułatwiają reagowanie na zmiany związane z klimatem. Gliwice tworzą system monitorowania stanu wód* (2019). Available online: https://www.kierunekwodkan.pl/artykul,69004,inteligentne-rozwiazania-ulatwiaja-reagowanie-na-zmiany-zwiazane-z-klimatem-gliwice-tworza-system-monitorowania-stanu-wod.html, 27.07.2020.
6. Korenik, A. (2017). Smart city jako forma rozwoju miasta zrównoważonego i fundament zdrowych finansów miejskich. *Economic Problems of Services, No. 4(129),* doi: 10.18276/epu.2017.129-14, 165-175.
7. *Nowe kamery na osiedlu Baildona* (2016). Available online: http://www.ssm.silesia.pl/blog/2016/12/12/nowe-kamery-na-osiedlu-baildona/, 27.07.2020.
8. *Oko na Gliwice* (2016). Available online: http://www.ssm.silesia.pl/blog/2016/05/15/oko-na-gliwice/, 27.07.2020.
9. *Smart City 3.0, czyli idea, która w końcu dostrzega mieszkańców* (2020). Available online: https://klubjagiellonski.pl/2020/05/06/smart-city-3-0-czyli-idea-ktora-w-koncu-dostrzega-mieszkancow/, 11.07.2020.
10. *Smart city: jak inteligentne miasta poprawiają życie mieszkańców* (2017-2019). Available online: https://ideologia.pl/smart-city-jak-inteligentne-miasta-poprawiaja-zycie-mieszkancow/, 11.07.2020.
11. *Smart rozwiązania klimatyczne? Gliwice tworzą system monitorowania stanu wód* (2019). Available online: https://www.portalsamorzadowy.pl/ochrona-srodowiska/smart-rozwiazania-klimatyczne-gliwice-tworza-system-monitorowania-stanu-wod,133859.html, 27.07.2020.
12. *Strategia Zintegrowanego i Zrównoważonego Rozwoju Miasta Gliwice do roku 2022* (Aktualizacja 2014). Attachment to Resolution No. XLII/880/2014 of the City Council in Gliwice of March 20, 2014. Gliwice: Publisher City Hall in Gliwice.
13. *W Gliwicach powstał nowoczesny system alarmowania* (2010). Available online: https://gliwice.wyborcza.pl/gliwice/1,95519,7914240,W_Gliwicach_powstal_nowoczesny_system_alarmowania.html, 27.07.2020.
14. *W Warszawie powstaje największy w Europie Living Lab* (2016). Available online: https://whatnext.pl/warszawie-powstaje-najwiekszy-europie-living-lab/, 27.07.2020.
15. *Wskaźniki zrównoważonego rozwoju Polski* (2011). Katowice: Publisher: Central Statistical Office in cooperation with the Statistical Office in Katowice.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

HISTORICAL AND CULTURAL HERITAGE IN THE DEVELOPMENT OF LOCAL COMMUNITIES IN PERIPHERAL AREAS IN WESTERN UKRAINE

Aleksandra SYNOWIEC

Silesian University of Technology, Faculty of Organization and Management; aleksandra.synowiec@polsl.pl, ORCID: 0000-0001-8251-2322

Purpose: The objective of this study is to present historical and cultural heritage as a development asset for local communities in peripheral areas in Western Ukraine. The author analyzes how chosen local communities make attempts to use historical and cultural heritage in order to reestablish local development resources.
Design/methodology/approach: In order to achieve the objectives of this paper, the methods of content analysis and virtual ethnography were appointed. The study involved content analysis of secondary data (literature and available reports), ten online semi-structured interviews with local activists, youth workers and workers of the sphere of culture conducted in June 2020 and netnographic study online communities representing chosen research sites.
Findings: The question of peripheral areas development concerns the mobilization of local resources and given examples illustrate, that this process has already started in Ukraine. Analysing the role of cultural and historical heritage in local development in the context of current political, economic and social framework, provides an interesting outlook on the processes of social change and community development. Cultural and historical heritage as an asset contributes both to socio-economic conditions improvement and community building processes.
Research limitations/implications: The limited amount of data collected for this study and limited research methods appointment determines the classification of this study as preliminary. The research question is current and the in-depth study of the issues is needed. Nevertheless, findings contribute to research on social change processes.
Social implications: The rural – urban development disparities in post-Soviet countries are still remarkable, therefore research focused on analysis of overcoming development divisions contributes to the question of social change processes in former Soviet countries.
Originality/value Theoretical and empirical identification of cultural and historical heritage on community development in peripheral areas.

Keywords: local community, historical and cultural heritage, local and regional development, Ukraine.

Category of the paper: Research paper.

1. Introduction

The aim of this paper is to discuss the role of historical and cultural heritage as a tool in building potential of local and regional development in Ukraine. The issues of cultural and historical heritage use in terms of an asset of local revival are examined referring to the cases collected in chosen local communities in Western Ukraine using netnography (Kozinets, 2012; Jurek, 2013) as a one of the research tools. The author analyzes how chosen local communities in peripheral areas make attempts to use historical and cultural heritage in order to reestablish local development resources.

The study entailed content analysis of secondary data and virtual ethnography study of online communities representing chosen existing research sites. The source material is based on already existing data, which consists of selected literature of the subject, available reports and legal acts, research conducted by international and domestic NGO's as well as the authors study concerning the processes of social change in rural areas in Ukraine (Synowiec, 2018; 2019). The author refers to the communities in Khmelnytskyi region, where the research on post-communist legacies and patterns in everyday life was conducted (Synowiec, 2018; 2019). The course of the presented study was expanded by ten online semi-structured interviews with local activists, youth workers and workers of the sphere of culture conducted in June 2020 by means of the Internet communicators. The empirical data was analyzed and interpreted on the ground of the categories selected by the author. Due to the limitations of this text, fragments of the respondents' statements are not quoted, but only the interpretation of the obtained data is given.

The netnographic study involved also an ethnographic approach: content analysis of the websites and social media profiles of local communities with regard to the issues of cultural and historical heritage both material and non-material. The method of virtual ethnography was appointed mainly due to the current situation with COVID-19 pandemic.

The research question, both in the context of the analyzed literature and the author's own study, seems to be important, up to date and certainly require a broader perspective. Last but not least – new efforts to disseminate knowledge about cultural heritage in the conditions of the worldwide pandemic are certainly noteworthy. They require new ways of communication, new formats, as well as improvement of digital skills. The latter aspect seems to be particularly important in case of the peripheral areas development.

2. Framework of the study: main concepts definitions and methodological approach

Despite the technological development of society and changes resulting from globalization processes, both *locality* and *community* remain areas of analysis in the field of social sciences. Nowadays *locality* is an important concept not only from the ethnographical point of view, but also represents a touchstone determining theoretical frames, research perspectives and fields of research; linking traditional sociological perspectives with postmodern approaches (Kurczewska, 2006, p. XI). The interest in locality as a social phenomenon and a subject of analysis has been changing however the concept of locality successfully returned in the 80s due to the importance of locality in the process of social change. Since then locality becomes a dynamic and global problem associated with the activities of individuals, groups, institutions, policies and social processes (Goszczyński, Knieć, Czachowski, 2015, pp. 19-20). Locality is one of the most common descriptive and analytical categories in sociology (Majer, 2011, p. 27). In traditional perspective, locality is strongly related to local community as they both have "common Latin etymology *localis*, meaning a specific place or location; local therefore stand for assigned to a place" (Jałowiecki et. al., 2007, p. 15). Majority of the concepts of locality refer to the significance of territory and space for establishing group identity. Apart from the territory, the most common definitions of locality include the social and psychosocial aspect. (Goszczyński, Knieć, Czachowski, 2015, p. 11).

The local community can be understood as a social group that is therefore "a social community associated with a given territory, which created an internal organization and whose members remain in social interaction" (Gniazdowski, 2006, p. 4).

Due to the political, economic and social changes taking place in former Soviet countries the questions of locality and community development is still up to date. The problem of community development is widely discussed in sociological literature (Kaleta, 1998; Gorlach et al., 2005; Weryński, 2010; Bukraba-Rylska et al., 2013; Rakowski, 2016). In this context mobilization of internal resources becomes a one of the most important challenges. Local resources are defined here as "the resident' ability to organize and mobilize resources to achieve consensually agreed goals" (Weryński, 2010, p. 164).

Analysis of the role of cultural heritage in local and regional development in post-Soviet Ukraine in the context of current political, economic and social framework and particularly the decentralisation reform, provides an interesting outlook on the processes of social change and community development. Regardless of both nationwide and international discussion about decentralisation reform barriers and limitations, it is still perceived as a keystone for social change incentives and social capital revival in order to overcome Soviet legacies, such as the administrative-territorial organization and the distribution of the responsibilities (Myshlovska, 2015, para. 4).

Referring to the category of periphery, it should be noted that in the scientific literature there are several ways of defining. The main criteria include: 1) the geographical criterion, i.e. the distance between the center and a given area, accompanied by the demographic criterion, i.e. the lower density of population; 2) the economic criterion illustrating the level of economic development, domination of resource economy, low level of infrastructure and innovation; 3) the political criterion – which takes into account the religious, cultural or political differences of the inhabitants of a given area; 4) the criterion of socio-cultural dependencies, i.e. diffusion of innovation from the center to peripheral areas (Tuziak, 2011, pp. 101-102).

In case of this study, mainly geographical and economic determinants were taken into account. The author focuses on rural or rural-urban communities with regard to the ratio of the rural population within the administrative boundaries of a given region, distance from a large urban center and distance from popular tourist attractions. Western regions with the highest rate of the rural population (for example Zakarpattia with 63%, Chernivtsi and Ivano-Frankivsk with around 56% of rural inhabitants in relation to urban dwellers) were excluded from the focus of interest, because at the same time they remain very attractive tourist destinations, what affects the use of cultural heritage in more commercialized way. Eastern Carpathians, Transcarpathian Ruthenia, Volhynian Polissia are the regions with great tourist potential while Polish tourists traditionally visit Lviv, historical locations around Ternopil' and places associated with Henryk Sienkiewicz novels (Kruczek, 2008, pp. 194-195). Therefore touristic places do not fully meet economic criteria of what is and what is not the periphery. The choice of more peripheral communities was also influenced by less aggressive – if compared to flagship places in western oblasts – use of co-called ethnic marketing, understood as commodification of a local tradition, its attractive packaging and selling (Comaroff, and Comaroff, 2011). However, as noted by social anthropologists, the choice of research site is always burdened with the arbitrary point of view and in fact it is impossible to find a typical or statistical place (Trzeszczyńska, 2012, p. 55). Thus, to achieve the objectives of this paper the author decided to go back virtually to the communities in Khmelnytskyi region, which were studied under previous scientific project (Synowiec, 2018; 2019). For decision justification two reasons were considered: 1) criteria of peripherality; 2) previous familiarization with the research area and facility to reach interlocutors.

Socio-cultural perception of peripherality is related to the particular context. "Defining a place with the adjective 'peripheral' entails a number of negative associations - apart from terms that are relatively neutral, such as 'located far from the center' or 'small', they bring to mind highly evaluative opinions (Kukołowicz, 2018, pp. 66-67). Assigning different values in order to identify cultural relationships between center and periphery, urban and rural or local and mass is still of great importance (Kukułowicz, 2018, p. 65). Not only in Polish context, the social construct of rural areas is built upon *cliché* categories of peripherality, an "inferior" place with no access to culture (Rakowski 2016), conservatism and backwardness (Shuldiner 2020), lack of agency among inhabitants and resistance to social change (Synowiec,

2018). The adjective 'rural' has a pejorative connotation and often becomes a simple label, social stigma (Goffman, 2007) that reflects the stereotypical division of society into groups of higher and lower status (Bukraba-Rylska, 2013).

Cultural and historical heritage is understood as both material (movable and non-movable items of cultural property such as historical sites, buildings, monuments, museums) and non-material (customs, traditions, cultural memory) (Kukułowicz, 2018, pp. 68-69).

Cultural heritage in post-Soviet area, as highlighted in *Cultural Code for Eastern Partnership* report (2015) can become an effective tool used for "the promotion of key values: human rights, freedom of expression, historical memory, intercultural dialogue, democracy and others" (p. 4). Significant impact of cultural heritage as a development instrument is underlined both by policy makers, international organizations and domestic NGO's. "Ukrainian society is in the need of forming and practicing the culture of open and responsible social dialogue, which is essential for mutual trust, respect, understanding and cooperation" (Cultural Code for Eastern Partnership, 2015, p. 26).

With regard to the complex problems faced nowadays by inhabitants of rural areas, it becomes increasingly important to mobilize the resources of the local environment for self-development (Kaleta, 1998, p. 7) and improvement of life quality in peripheral areas.

3. Culture heritage and local communities development – findings

Due to international obligations and internal Ukrainian regulations, the state is obliged to protect objects that constitute a cultural value. "The protection of cultural heritage influences the formation of the nation's mentality, ensures the continuation traditions and values transfer, and supports the development of society" (The condition, problems and prospects for the protection of cultural heritage in Ukraine, 2018). As far as material heritage is concerned, the legal system of regulations in the field of historical heritage protection includes: the Constitution, the Civil Code, the Land Code of Ukraine, two special bills on the protection of cultural and archaeological heritage and several dozen other legal acts. The document mention the number of 130,000 objects of cultural heritage remaining in the ministerial register (The condition, problems and prospects for the protection of cultural heritage in Ukraine, 2018). However, many relics of the past of the non-ethnic inhabitants of Ukraine – mainly Polish and Jewish – decay without funds on refurbishment. Much of the remains of the former Polish cultural heritage in Ukraine is constantly deteriorating or disappearing. The reasons are as follows: lack of state finance for renovations, funds donated by Poland are to meager to meet the needs, the low level of conservation work, lack of awareness that heritage of cultures inhabiting the area of contemporary Ukraine is in fact a common heritage (Konończuk, 2017).

Dealing with the issues of the non-material historical and cultural heritage on the local level is connected with overcoming communism legacies. Memory have become an important field of research interest due to multidimensional processes of social change taking place in Central and Eastern Europe after 1989 in terms of the process of knowledge production (Tismenau, 2000). Reestablishing national identity in post-communist countries may sometimes lead to a kind of pathology – Bobrownicka (2006) argues, that "the more mature the nation is, the more it demonstrates the ability to autocratic objectivism, to liberate itself from the convention of mythologized thinking about its past. It mostly does not happen especially to nations full of complexes and insecure (rightly or wrongly) and therefore willing to succumb to the populist slogans of demagogic compensation or claims (p. 7).

Like many similar places in Central and Eastern, the studied communities can be metaphorically called "places without memory", i.e. places where absence of past has destructive impact on local identity and sense of belonging (Trzeszczyńska, 2012, pp. 77-79). According to the interviewees, a priority in rural and semi-rural areas development is to find innovative solutions to create appropriate conditions in social, cultural and spiritual spheres. In their opinion culture and subjectivity are crucial for contemporary Ukrainian countryside. One of interlocutors expresses explicitly that during transition period, culture in rural areas was an abandoned sphere due many reasons such lack of finance, but also the dominative role of Russian pop-culture in media sphere, lack of interest in domestic "culture products" and negative associations with folklore of local communities.

Historical and cultural awareness as a part of culture has to be restored after years of oblivion and displacement from official memory built upon Soviet narrative. According to people involved in the civil activities, building awareness of cultural heritage contributes to the integration of the local community and create social bonds between generations. For example in one of the research sites, a former noble house was nationalized and assigned for different purposes after the October's Revolution, i.e. for the local committee of communism party premises, school or hospital. The memory of the place was successfully erased, and the previous form of culture was wiped out, but the process of memory restoration has already started within events familiarizing the community with old traditions. As one of the interviewees underlines – the awareness of roots among inhabitants is essential for the real transformation of rural areas in Ukraine. This process can be named as symbolical return to the place, i.e. "regaining its subjectivity, what is related to the will to participate as part of intentional cooperation and in the spirit of community solidarity" (Łaguna-Raszkiewicz, 2015, p. 181). The interviews show that local leaders are focused on supporting the socio-economic development of the community by renewing cultural traditions and mobilizing local resources. According to the interviewees, community development can be realized through the deep analysis of possibilities and potential – including human resources. The cultural and historical heritage undoubtedly contributes to the development opportunities. The share of tourism industry in the structure of Ukraine's GDP has been constantly growing. Only in 2017, 39.6 billion UAH was transferred to the Ukrainian budget from tourism and related industries (services, food, transport), and investments in

tourism reached the amount of 7.9 billion UAH (Ukrinform.net, 2017). The western region in Ukraine is leading in rural tourism development – here the largest number of farmsteads is located. Rural tourism may support the rural areas development in several ways as follows: 1) increasing income and employment rate in rural population; 2) improving living conditions in the countryside; 3) establishing positive image of Ukraine; 4) improving the infrastructure of villages; 5) supporting preservation of historical and cultural heritage (Diuk, and Burlaka, 2018). Socio-economic transformation has brought unwanted effects such as loss of status, pauperization, degradation for many social groups, including rural dwellers. Till the adoption of regulations on land privatization, state farms operating in Ukraine provided not only employment, but supplied local communities with social facilities, organized transport, housing and even cultural life (European Commission Joint Research Centre, 2013). Rural tourism is one of the possible ways of local communities development and successful management of cultural and historical heritage becomes and important asset. The content analysis of virtual exemplification of communities portraits in Facebook social network shows the increasing need of managing local resources (including cultural and historical heritage) in terms of attracting tourists attention.

Categorization of interviewees statements allows to distinguish four aspects of historical and cultural memory revival to be considered: 1) the quality of culture products available nowadays and the ability to target audience with historical and cultural content; 2) use of information and communication technologies in order to popularize historical and cultural "product"; 3) difficulties in undertaking issues of Polish and Jewish heritage in Ukraine; 4) depopulation of countryside and youth out-migration to the cities or abroad. The material heritage of non-ethnic Ukrainian groups, as it was already mentioned, is being destroyed or deteriorated, as such, in the peripheral areas there is a significant problem with the co-called material base. What was highlighted in the interviews – local leaders find many formats of cultural and educational activities outdated and ineffective. According to the interlocutors young people are excluded from decision-making processes, including the preservation and restoration of historical and cultural heritage. Thus, the way to address the community with the issues of cultural heritage should take place through the announcements in social media and direct communication, like searching for people who are ready to share their own family stories in the context of community history. Another way of presenting cultural heritage in attractive way involves information and communication technologies (ICT) – the range of activities may include: mapping historical sites with QR codes, organizing workshops on family archives, workshops on traditions and customs of different ethnic groups, workshops on Hebrew language, virtual excursions to historical sites and cemeteries, introducing basics of genealogy, organizing workshops on documental theatre etc.

Peripheral areas in post-Soviet counties have been struggling with a set of problems requiring solutions, ranging from living conditions improvement, through issues related to the protection of the natural environment and cultural heritage, to the issue of social involvement and a change of approach in thinking about the local community organization. "According to

many researchers, local communities are the main subject and animator of a particular process of change, called local or endogenous development, because the role of intra-system factors is emphasized in there (...)" (Jałowiecki, Szczepański, 2002, p. 19).

One of the interlocutors emphasizes the importance of small communities development in order to establish the overall picture of Ukrainian transition. Peripheral areas cannot remain discounted from both the worldwide and nationwide discussions on smart development – "Without making the village smarter, the nation cannot grow and be progressive" (Fajrillah et al., 2018, p. 5). As underlined both in interviews and content analysis of virtual material – culture and historical heritage is perceived as an asset, contributing to community development in two ways: first – supporting tourism industry development and though improving life quality; second – building social bonds within the community.

4. Conclusions

The aim of this study was to present historical and cultural heritage as a development asset for local communities in peripheral areas in Western Ukraine – mainly in rural areas. The author referred to the examples of using historical and cultural heritage in chosen local communities in order to reestablish local development resources. Presented study is of preliminary character, however the data collected during the research process enable to identify the directions for further analysis.

The course of study and collected materials revealed that historical and cultural heritage can be considered in terms of development asset in two dimensions: 1) as a factor contributing to the socio-economic development of peripheral areas and 2) as an important aspect of the community building. Historical and cultural heritage is regarded as a strength that should be used in order to minimalize or overcome the main barriers or rural development in Ukraine, such as high unemployment rate. In turn, reference to the historical and cultural heritage is considered as an effective tool contributing to the intercultural dialogue, collective memory restoration, and civil society reconstruction. It is also important to arouse the interest in historical and cultural heritage among the inhabitants of rural areas - to show it as an alternative of economic activity.

The main prospects for further research with regard to the presented results may involve research on socio-economic performance in rural areas, such as entrepreneurship, rural tourism, and heritage tourism. Also the role of the leaders of local communities in peripheral areas, their motivation and willingness to act for social change appears current and important question, especially taking into account modern discourse of sustainable development.

References

1. Bobrownicka, M. (2006). *Patologie tożsamości narodowej w postkomunistycznych krajach słowiańskich.* Kraków: Universitas.
2. Bukraba-Rylska, I. (2013). *Socjologia wsi polskiej*. Warszawa: PWN.
3. Comaroff, J.L., Comaroff, J. (2011). *Etniczność sp. z o.o*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
4. *Cultural Code of Eastern Partnership* (2015). Document prepared as a part of the 'Culture coding EaP' project, implemented in Belarus, Moldova, and Ukraine from July to November 2015. Retrieved from: http://www.kultura.org.ua/wp-content/uploads/Publication_concept_road-maps_eng.pdf, 15.07.2020.
5. Diuk, A.A., Burlaka, N.I. (2018). Development of green tourism in Ukraine. *Efektyvna ekonomika, No. 12*. Doi: 10.32702/2307-2105-2018.12.118.
6. European Commission Joint Research Centre (2013). Keyzar M.A., Merbis M. D., Witt R., Heyets V., Borodina O., Prokopa I. *Farming and rural development in Ukraine: making dualization work*. Luxembourg: Publications Office of the European Union.
7. Fajrillah, F., Mohamad, Z., Novarika, W. (2018). Smart city vs smart village. *Jurnal Mantik Penusa*, *vol. 22, no. 1,* 1-6.
8. Gniazdowski, A. (2006). Wspólnota i świat. Tożsamość społeczności lokalnej jako temat fenomenologii. In: J. Kurczewska (ed.), *Oblicza lokalności. Tradycja i współpraca*. Warszawa: Wydawnictwo IFiS PAN, pp. 2-24.
9. Goffman, E. (2007). *Piętno. Rozważania o zranionej tożsamości*. Gdańsk: Gdańskie Wydawnictwo Psychologiczne.
10. Gorlach, K., Foryś, G. (Eds.) (2005). *W obliczu zmiany: wybrane strategie działania mieszkańców polskiej wsi*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
11. Goszczyński, W., Knieć, W., Czachowski, H. (2015*). Lokalne horyzonty zdarzeń. Lokalność i kapitał społeczny w kulturze (nie)ufności na przykładzie wsi kujawsko-pomorskiej*. Toruń: Muzeum Etnograficzne.
12. Jałowiecki, B., Szczepański, M.S. (2002). *Rozwój lokalny i regionalny w perspektywie socjologicznej*. Tychy: Śląskie Wydawnictwa Naukowe WSZiNS.
13. Jałowiecki, B., Szczepański, M.S., Gorzelak, G. (2007). *Rozwój lokalny i regionalny w perspektywie socjologicznej*. Tychy: Śląskie Wydawnictwa Naukowe WSZiNS.
14. Jurek, K. (2013). Badania społeczne w Internecie. Wirtualna etnografia w teorii i praktyce. *Półrocznik Nauka i Szkolnictwo Wyższe, 1/41*, pp. 86-98.
15. Kaleta, A. (1998). *Rewitalizacja obszarów rustykalnych. Tom III: Aktywizacja społeczności lokalnych.* Wrocław-Warszawa-Kraków: Zakład Narodowy im. Ossolińskich.
16. Konończuk, W. (2017). Wspólne dobro, polska bolączka. *New Eastern Europe, 04.01.2017*, http://www.new.org.pl/2864-wspolne-dobro,-polska-bolaczka, 20.07.2020.

17. Kozinets, R. (2012). *Netnografia: badania etnograficzne online*. Warszawa: PWN.
18. Kruczek, Z. (2008). *Europa. Geografia turystyczna.* Kraków.
19. Kukołowicz, T. (2018). Ukryte zasoby. O tym co zasłania kategoria peryferyjności. In: M. Jacyno, T. Kukołowicz, M. Lewicki (eds.), *Kultura na peryferiach* (pp. 64-84). Warszawa: Narodowe Centrum Kultury.
20. Kurczewska, J. (ed.) (2006). *Oblicza lokalności. Tradycja i współpraca*. Warszawa: Wydawnictwo IFiS PAN.
21. Łaguna-Raszkiewicz, (2015). Powrót do wspólnoty miejsca i ludzi – zadanie współczesnej edukacji. *Pedagogika Społeczna*, *nr 2(56),* pp. 179-187.
22. Majer, A. (2011). Lokalność w cieniu globalizacji. *Annales Universitatis Mariae Curie-Skłodowska*, vol. XXXVI, 2, pp. 27-46.
23. Myshlovska, O. (2015). Democratising Ukraine by Promoting Decentralisation? A Study of Swiss-Ukraine Cooperation "International Development Policy". Retrieved from: http://journals.openedition.org/poldev/2010, 15.06.2020.
24. Rakowski, T. (2016). Działania edukacyjne w przestrzeniach wsi. Odkrywanie podmiotowości środowisk wiejskich. In: K. Kojder, E. Pajestka (Eds.), *Nasze miejsce. Inspirator do pracy z lokalnością*. Warszawa: Stowarzyszenie „Pracownia Etnograficzna" im. W. Dynowskiego.
25. Shuldiner, A. (2020). The smart village. *IEEE Pervasive Computing, 19(1),* 83-86.
26. Synowiec, A. (2018). Perspektywy i zagrożenia dla zrównoważonego rozwoju obszarów wiejskich na Ukrainie w świetle badań terenowych w obwodzie chmielnicki. *Zeszyty Naukowe Politechniki Śląskiej Seria Organizacja i Zarządzanie*, *129*, pp. 581-594.
27. Synowiec, A. (2019). Homo (post) sovieticus syndrome and civic awareness development in rural areas in Ukraine in Khmelnytskyi region. *Zaszyty Naukowe Politechniki Śląskiej Seria Organizacja i Zarządzanie, no. 141,* pp. 395-403.
28. *The condition, problems and prospects for the protection of cultural heritage in Ukraine, 2018*. The Cabinet of Ministers of Ukraine, 18.04.2018. Retrieved form: https://www.kmu.gov.ua/diyalnist/vzayemodiya-z-vr-ukrayini/parlamentski-sluhannya-u-verhovnij-radi-ukrayini/2018-rik__/pro-parlamentski-sluhannya-na-temu-stan-problemi-ta-perspektivi-ohoroni-kulturnoyi-spadshini-v-ukrayini-18-kvitnya-2018-roku.
29. Tismenau, V. (2000). *Wizje zbawienia. Demokracja, nacjonalizm i mit w post-komunistycznej Europie.* Warszawa: Warszawskie Wydawnictwo Literackie Muza SA.
30. Trzeszczyńska, P. (2012). Miejsca bez pamięci. O niemocy przeszłości w świetle badań Chrisa Hanna i badań ponownych. *Zeszyty Etnologii Wrocławskiej, nr 2(17),* pp. 55-80.
31. Tuziak, A. (2011). Innowacyjność a rozwój obszarów peryferyjnych. In: H. Podedworna (ed.), *Nowe inspiracje socjologii wsi* (pp. 101-122). Warszawa: Wydawnictwo Naukowe Scholar.

32. *Ukrinform.net* (2017). Tourism accounts for 1.5% of Ukraine's GDP in 2017. Economic Development Ministry, available online: https://www.ukrinform.net/rubric-economy/2442369-tourism-accounts-for-15-of-ukraines-gdp-in-2017-economic-development-ministry.html, 16.07.2020.
33. Weryński, P. (2010). *Wzory uczestnictwa obywatelskiego Polaków*. Warszawa: Wydawnictwo IFiS PAN.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

COMMUNICATION IN THE THIRD DIMENSION. LEGAL ASPECTS OF USING DRONES IN THE CITY AREA

Tomasz SZEWC

Silesian University of Technology; Tomasz.Szewc@polsl.pl, ORCID: 0000-0001-6326-4626

Purpose: A new regulation concerning drone flights is entering into force from the January 1, 2021 and the public administration uses drones to carry out public tasks more and more often. This poses new challenges for the public administration to adapt to new rules. This article presents new regulation concerning drone operations from the public administration management perspective.
Design/methodology/approach: A study of the literature and legal acts was made.
Findings: Public administration bodies can freely use drones to carry out public tasks and do not need a specific legal basic to this, but it involves considering the form of drone use – by themselves or in cooperation with specialized company. The main problem seems sharing the airspace with other users, since the law do not confer priority for public use of drones.
Practical implications: The research shows some limits and obstacles while public administration bodies uses drones to carry out public tasks as well as ways to overcome them.
Social implications: What will be the impact on society of this research? How will it influence public attitudes? How will it influence (corporate) social responsibility or environmental issues?
Originality/value: This is one of the first analysis of new drone law from the public administration bodies point of view in the Polish scientific literature. It may came into handy for local self-government management, especially for cities.

Keywords: drone, unmanned aircraft, public tasks, public administration.

Category of the paper: Research paper.

1. A drone in the city area

A drone is a colloquial name for the unmanned aerial vehicle (UAV), i.e. a vehicle lifting in the air without a human being on the board. Lately, these devices are becoming more and more popular. Also in Poland efforts are being made to utilize this technology most efficiently. According to the Polish government's plans, the Silesian Voivodship is expected to become the Polish "Silicon Valley" in terms of drones usage, and drones are planned to be used by the

public administration. This possibility is being tested under so-called "Żwirko and Wigura Programme" (Darowska, 2019).

Ease and low cost of accessing hard-to-reach places as well as the possibility of image transfer are the main reasons for the rising drones' popularity. These features allow the drones to replace humans in various activities. Autonomous operation is an extra ability of the drones, thanks to which the UAVs can be used in monitoring or inspection of any object, air quality testing, geodetic or thermovision measurements, crop inventory, transportation of diversified loads, as well as in supporting firefighting or rescue operations (Dziekański, 2019). One cannot forget also recreational or sport use of the UAVs.

The city creates a specific environment for the drones. On the one hand, the city has its particular needs. On the other hand, there are certain impediments, making the drones' use more difficult and complicated.

When it comes to the city needs, by transferring communication to the third dimension (air) the drones help in solving the problems of the traffic congestion and communication limits (i.e. limited capacity of roads, railroads, bottlenecks, etc.). Moreover, the drones can perform their tasks between high buildings and in vast industrial areas. Thanks to the real-time data transfer to computing centers, UAVs perfectly fit the Smart City concept which assumes the use of information technology and digital data transfers to rationalize management of city resources and hence, obtain sustainable development and many other positive effects, including social, ecological, and economic. All these above utilities of drones can be integrated. This holistic approach will lead to the faster city development (Appio et al., 2019; Höjer, and Wangel, 2015; Jonek-Kowalska, and Wolniak, 2019) as well as to the decrease in city management costs (Anttiroiko et al., 2014).

When it comes to the impediments hindering the use of drones in the city, we need to mention several risk factors, including high barriers, chances to lose visual and/or control over a UAV, possibility of a collision with people or objects, and the need to reduce noise emission. Also, we must note that the number of drones is rising, and additionally, recreational flights are becoming more and more popular, hence we may expect the drone traffic in the cities to intensify.

Users of drones can be divided into 3 groups:

a) business entities using drones to run businesses,
b) official authorities performing public tasks,
c) private persons using drones to satisfy their needs.

Since the volume of this article is strictly limited, we will refer mostly to using drones by the city authorities in the light of new EU regulations. This is one of the latest practical and theoretical issues in the field of city area management (especially Smart City), at the same less recognized in the literature.

2. Drones in the light of the law

Numerous legal provisions are specifying the rules of drone flights. Most of all, drone as an airship is a subject to the aviation law. Until the end of 2020, specific national regulations governing drone flights are in force in each country of the EU. This is going to change on the 1st of January 2021 when the national laws will be repealed and replaced by the common EU regulations. Furthermore, if a drone is equipped with a camera allowing to register a person's image while flying, it will be subject to the rules concerning personal data protection.

There are also certain laws directly allowing public administration institutions to perform public tasks with the help of drones. We can mention e.g. art. 49 paragraph 3a of the Entrepreneurs Law Act and art. 9 paragraph 2 point 2 of Environmental Protection Inspection Act. But the most important legal act governing this field is the Regulation 2019/947, describing the rules and procedures of the unmanned aircraft operation. This legal act specifies the requirements for the drone operators determined solely on the risk involved in the operation (they are presented e.g. in points 3, 6, and 9 of the preamble). Thus, the nature of the drone operation (commercial or recreational) and the character of the operator carrying out the operation (representing the public or private sector) become irrelevant. Consequently, the above-mentioned act distinguishes three categories of drone operations: open, specific, and certified.

An "open" category includes operations with the lowest risk level. Such an operation should meet all the following requirements:

1. a drone complies with requirements laid down in separate provisions, particularly it belongs to one of the classes indicated in this regulation,
2. its take-off weight does not exceed 25 kg,
3. a drone is kept at a safe distance from people,
4. a drone does not fly over assemblies of people,
5. a drone does not drop any materials,
6. a drone does not carry any dangerous goods (i.e. articles or substances that are capable of posing a hazard to health, safety, property, or the environment in the case of an incident or accident, e.g. explosives, flammables, toxic or infectious substances),
7. a remote pilot maintains full control over a drone all the time (meaning that the drone is in the pilot's visual line of sight at all times except when flying in the follow-me mode or when using an aircraft observer remaining in constant contact with the pilot),
8. during the flight, the drone is maintained within 120 meters from the closest point of the surface of the earth, except when overflying an obstacle. This relates to another requirement, particularly important in the city environment and described in part A of the Annex to the regulation, recommending that while flying within a horizontal distance of 50 meters or less from an artificial obstacle taller than 105 meters, the maximum height of UAV operation may be increased up to 15 meters above the height of the obstacle, if the entity responsible for the obstacle demands it.

Performing an operation classified into the open category does not require any permission, however, a remote pilot[1] should possess proper qualifications, depending on the subcategory of the performed flight. There are three subcategories: A1, A2, and A3. Subcategory A1 is for operations performed by drones the maximum take-off weight of which does not exceed 900 grams when a remote pilot does not overfly assemblies of people. Furthermore the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies uninvolved persons. In subcategory A2, including drones with a take-off weight up to 4 kilograms, operations within the minimum distance of 30 meters from uninvolved people are allowed. This distance can be reduced to 5 meters only if a drone has an active low-speed mode and a remote pilot is able to consider weather conditions, the performance of the aircraft, and segregation of the overflown area in an adequate way. Subcategory A3 in turn includes drones with a take-off weight up to 25 kilograms, performing operations outside residential, industrial, commercial and recreational areas where the remote pilot reasonably expects that no uninvolved person will be endangered by the aircraft during the entire time of the operation. For this UAV type, a horizontal distance of at least 150 meters should be maintained between them and any other objects.

To be allowed to perform an operation of A1 and A3 subcategory a remote pilot should complete an online training course and pass an online exam except if a drone is lighter than 250 grams (hence, in fact flying a drone below this weight does not require any formal qualifications from a remote pilot). Unlike the previous ones, in the case of performing A2 operation, extra requirements must be met by the pilot. In addition to completing the course, self-practical training must be performed and confirmed by the future pilot's declaration. Moreover, the pilot should pass an additional theoretical exam provided by the competent authority and allowing to assess the remote pilot's knowledge of the technical and operational mitigations for ground risks.

If an operation performed by an unmanned aircraft operator does not meet even a single requirement set out for the open category or is not considered to be the last one (explained further in the text), it becomes an operation of the second, i.e. "specific" category. Such an operation can be legally performed in three ways. Firstly, on the grounds of an operational authorization from the competent authority (which in Poland is the Civil Aviation Authority, CAA). The subject of an operational authorization can be an operator or a model aircraft club and association. Secondly, an operator can hold a LUC certificate (which stands for the Light UAV Operator Certificate). In such a case an operator is authorized to certify an operation by themselves (Ostrihansky, and Szmigiero, 2020). Thirdly, an operator can submit a declaration to the CAA where they declare that the operation will comply with a standard scenario, setting out specific condition of flight (being an appendix to the Annex B to the resolution 2019/947).

The operation belongs to the third category, the "certified" one, in two cases. The first situation is when a drone is certified under separate regulations and the operation is performed over assemblies of people, or involves the transportation of people or dangerous goods, which may result in high risk for third parties in case of an accident. The second situation happens when an operation is assessed by the CAA as too risky to be performed abiding by rules set out for a specific category. Certified operations involve certification of the operator, the aircraft, and the licensing of a remote pilot. In practice, it means that the requirements are increased up to the level characteristic for the manned flights (Ostrihansky, adnd Szmigiero, 2020).

3. Carrying out public tasks of the city with the benefit of drones

Having regarded the general principles of drone flights, we should refer to utilizing drones in performing city tasks. Concerning this topic, we can base on the concept presented by M. Dziekański who describes various examples of drones usage by the territorial self-government entities (Dziekański, 2019). Even though they are different tasks, the ways the drones are used in the city are very similar. In most cases, they allow approaching places that are difficult or impossible to access in another way, and/or capturing and sending pictures or videos. So, which type of drones and which type of operations can be used for these purposes?

Drones with a maximum take-off weight lower than 250 grams (remote piloting of which does not require any confirmed qualifications), seem to be inappropriate to perform these tasks because of a too short range. They can spend in the air only from a couple to several minutes which may be insufficient, e.g. to inspect a big bridge. Moreover, the open category can not be taken into account when planning the task of carrying goods, especially dangerous ones. Such a danger may pose e.g. transportation of blood samples from a hospital to a laboratory that in fact represents one of the typical public tasks performed in the city. One can easily imagine the consequences of a potential crash of the UAV carrying e.g. infected blood. This category is unsuitable also because it requires performing flights within a visual line of sight and it is difficult to meet this criterion because there are tall buildings in the city and a drone can be obscured by them. Furthermore, it is worth noting that it is autonomous flights that are expected to be the most commonly used type of drone operations in the future (Przybylski, 2020; Jóźwiak, and Ławnicka, 2019) but autonomous flights can not be performed under open category.

The above notions lead to the conclusions that drones heavier than 250 grams should be used to carry out public tasks and that the city authorities will mostly perform operations representing a specific or even certified category. These categories in turn bring much higher requirements not only for the drone pilots (i.e. demand their higher qualifications) but also for their operators (set out in the Annex A to the Regulation 2019/947). The authorities of the city

should meet them by themselves, which incurs additional expenses, or establish cooperation with an external operator. To make this decision, careful financial analyses should be performed, considering the costs of acquiring drones, staff training, elaboration of the necessary documentation, versus the costs of hiring the external operator. If the city decides to cooperate with a specialized enterprise, this collaboration may have various legal bases in the light of Polish law. It may be treated as the provision of services within the frameworks of either public procurement, public-private partnership, or even concessions for construction works and services.

Considering the legal basis of using the drones (i.e. by the city itself or provided by an external operator) it is worth noting that there is an obstacle to hire remote pilots by local self-government entities. This obstacle derives from rules specifying positions and qualification requirements set for them in the local self-government. These rules do not establish such a position as a remote pilot in the local self-government authority (the government regulation from May 15, 2018, on the remuneration of local government employees, Journal of Laws, item 936 with amendments). Hence, only people already working for the city and occupying other positions (e.g. a city warden or an employee in a city conservation authority) may become remote pilots and accept more duties after extending their qualifications.

There are only a few provisions setting up the possibility of using drones to carry out public tasks as mentioned above. This causes the problem of finding a legal basis to make flights. M. Dziekanski drew attention to this fact (Dziekański, 2019) by pointing out the article no. 7 of the Polish Constitution. In the light of this provision, public authorities act on a basis and within the limits of the law. So, when there is a specific rule, the flights carrying out public tasks can be performed. But what to do when a case is unregulated? This question can be explained and solved by a concept of legal forms of administrative activity elaborated by the administrative law doctrine. This form is a "legally set out type of specific activity of an administrative body" (Starościak, 1969, p. 231). For example, administrative authorities carrying out the imposed tasks perform different activities: lay down legal acts, make administrative decisions, keep registers, take various actions: technical (e.g. building a new road), organizational (e.g. preparing a public tender), and managerial ones (e.g. maintain cleanliness) (Ochendowski, 2005). These forms can be divided into legal acts (involving a declaration of a will prepared with an intention to produce legal effects) and physical acts (with no such intention). Only the first group of actions requires a directly expressed legal basis. Therefore a rule establishing general competence of an authority to perform some tasks is sufficient to perform physical acts (Zimmermann, 2016), e.g. local public transport or infrastructure monitoring, (Dziekański, 2019). There is no doubt that a drone flight is a physical activity because it does not cover a declaration of will, and depending on the purpose, the flight can be a technical action (e.g. emission measurement), or organizational action (e.g. transportation of goods), or managerial action (e.g. infrastructure monitoring). Consequently, there is no fear that a lack of an expressed legal basis makes drone flights performing public tasks of the city illegal.

4. Summary

Unmanned aircraft represents technology able to considerably change the shape of modern society, including the way public tasks are performed. It is understandable that the public administration, constantly looking for efficient ways to carry out their tasks, begins to reach for drones. Their use as a means of performing public administration actions is generally not regulated by the law (with few exceptions), this, however, does not pose a greater obstacle because this type of administrative activity does not need a specific legal basis. However, the administrative body using a UAV should abide by rules specific to this communication means, i.e. the aviation law. Additionally, it is local authorities' employees (directed to work with drones) who will be obliged to develop adequate qualifications.

The main obstacle the cities using drones need to face is the necessity to share the airspace with many other users from both the commercial and private sectors. For that reason, it is worth conferring priority for an unmanned aircraft performing public tasks. Below there are some ways to ensure such a priority resulting from the currently binding law:

a) assigning geographical zones[2] reserved only for drones carrying out public tasks in selected areas of the city;
b) the ban to fly close to or inside areas where an emergency response effort is ongoing without permission to do so from the responsible emergency response services, set out in the Annexe A to the Regulation 2019/947;
c) securing possibility to make in domestic law an exemption for the specific and certified operations performed in the field of traffic surveillance, environment protection, medical or evacuation flights from the requirements set out in Regulation 923/2012, laying down the common rules of the air and operational provisions regarding services and procedures in air navigation (Ostrihansky, and Szmigiero, 2020). However, it is worth to mention that the scope of these exemptions is still very narrow).

In concluding we may note that the EU lawmakers seem not to consider performing public tasks with the use of drones as deserving the priority in comparison with other flights. Hence, a high volume of private flights can be expected. Consequently, a detailed map of routes for drones as well as an efficient drone traffic management system should be created. They should regard obstacles, strategic and dangerous-to-fly-over facilities, or noise emission requirements (Miasta, 2018). Such works are carried out within the U-Space Demonstrator program (Darowska, 2019).

References

1. Anttiroiko, A.V., and Valkama, P., and Bailey, S. (2014). Smart Cities in the New Service Economy: Building Platforms for Smart Services. *AI & Society, Vol. 29*, pp. 323-334.
2. Appio, F.P., Lima, M., Paroutis, S. (2019). Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. *Technological Forecasting and Social Change, Vol. 142*, pp. 1-14.
3. Commission Implementing Regulation (EU) 2019/947 describing the rules and procedures of the unmanned aircraft operation. Official Journal L152, p. 45 (2019).
4. Commission Implementing Regulation (EU), No 923/2012, laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010, Official Journal L281, p. 1 (2012).
5. Darowska, M. (2019). Kierunek rozwoju rynku dronów. *IT w administracji*, *Vol. 11*, pp. 16-20.
6. Dziekański, M. (2019). Wykorzystanie dronów przez administrację samorządową. *IT w administracji, Vol. 11*, pp. 20-22.
7. Entrepreneurs Law Act, Journal of Laws 2019, item 1292 (2018).
8. Environmental Protection Inspection Act, Journal of Laws 2020, item 995 (1991).
9. Höjer, M., and Wangel, J. (2015). Smart Sustainable Cities: Definition and Challenges. In: L.M. Hilty, and B. Aebisch (eds.), *ICT Innovations for Sustainability. Advances in Intelligent Systems and Computing* (pp. 333-349). Zurych: Springer International Publishing.
10. Jonek-Kowalska, I., and Wolniak, R. (2019). Holistyczne podejście do rozwoju inteligentnych miast. In: I. Jonek-Kowalska (ed.), *Wyzwania i uwarunkowania zarządzania inteligentnymi miastami* (pp. 23-39). Zabrze: Wydawnictwo Politechniki Śląskiej.
11. Jóźwiak, Z., and Ławnicka, B. (2019). Trzeci wymiar miasta, czyli dronostrada pełna podniebnych usług. *Gazeta Prawna, Iss. 28.06.2019*.
12. Miasta będą musiały zapanować nad dronami. *Gazeta Prawna, Iss. 28.11.2008*.
13. Ochendowski, E. (2005). *Prawo administracyjne*. Toruń: TNOiK.
14. Ostrihansky, M., and Szmigiero, M. (2020). *Prawo dronów. Bezzałogowe statki powietrzne w prawie Unii Europejskiej oraz w prawie krajowym*. Warszawa: Wolters Kluwer.
15. Polish Constitution, Journal of Laws, 1997, No. 78, item 483 (1997).
16. Przybylski, R. (2020). Otwarte niebo dla bezzałogowców. Małgorzata Darowska o wspieraniu nowych technologii. *Rzeczpospolita, Iss. 20.05.2020*.
17. Starościak, J. (1969). *Prawo administracyjne*. Warszawa: PWN.
18. Zimmermann, J. (2016). *Prawo administracyjne*. Warszawa: Wolters Kluwer.

Footnotes

[1] We should make a distinction between a remote pilot, who is a person who pilotes a drone and an operator who is an entity who uses (operates) drones in its activity as an owner or leasee. It can be a legal or a natural person.

[2] Geographical zone is a portion of airspace that facilitates, restricts or excludes drones operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment (art. 2, point 4 or regulation 2019/947).

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

SOCIAL IMPACT INVESTMENTS AS A TOOL FOR FUNDING SOCIAL ENTERPRISES

Audrone URMANAVICIENE[1*], Kulamini Dilanka MENDIS[2]

[1] Tallinn University, School Of Governance, Law And Society; aurmana@tlu.ee, ORCID: 0000-0003-1621-0101
[2] Tallinn University, School Of Governance, Law And Society; kulamini@tlu.ee,
ORCID: 0000-0003-1916-5967
* Correspondence author

Purpose: Social impact investments are essential to support and promote social entrepreneurship development. This article aims to identify the factors that could develop the local impact investment market in Sri Lanka as a tool for funding social enterprises.
Design/methodology/approach: The methods of research are an analysis of scientific literature, experts' interviews, and generalization.
Findings: In order to accelerate the impact investment as a tool of funding, the impact investors, social enterprises, government and society must work collectively. Necessary social, cultural, and policy changes should be carried out, and specific recommendations have been made accordingly.
Originality/value: This research study is essential in terms of sustaining and promoting impact investments in Sri Lanka as a tool of funding social enterprises and developing the ecosystem.

Keywords: social enterprise, social impact investing, impact investments, finance, investors.

Category of the paper: Research paper.

1. Introduction

Impact Investment is a concept that is directly connected with social enterprises or social entrepreneurship, and its roots run to the centuries back where the old tradition held the wealthy responsible for the welfare of the impoverished communities. In the 17th century, England tried to align their investment and purchase decisions with their values and norms. Also, in the 1800s, Colonial America launched businesses aligned with their social values to fund religious communities (Bugg-Levine, and Emerson, 2011). Furthermore, more recently, fair trade and socially responsible investments also have followed this old tradition. After the 21st century, this practice got a boost and identified and named it "impact investment" and currently plays a significant role in the socio-economic development of the world.

When it comes to Sri Lankan context, impact investment and social entrepreneurship can be identified as emerging topics. Nevertheless, without knowing it as concepts, Sri Lanka has been using these concepts practically for many years. As a result of it, according to the British Council "The State of Social Enterprises in Sri Lanka" 2018 report (British Council, 2018) there are nearly 11,000 small and medium social enterprises located around the country, and they are addressing different environmental and social problems. Since the country itself is still developing and has to be concerned about social as well as ecological facts, the existence of social enterprises is essential. This same report has mentioned that these social enterprises are struggling to survive due to a lack of resources. Therefore the concept of impact investment can be used positively in order to address the issues faced by social enterprises.

Throughout the past 10 years, researchers and scholars and organizations such as GIIN (2009), Monitor Institute (2009), Bugg- Levine and Emerson (2011), Cohen & Bannick (2014), Allman & Nogales (2015), Finkelman & and Huntington (2017), Barclays (2018), IFC (2019), OECD (2019) have contributed their research and findings to the impact investment concept. Mainly, in Sri Lanka, not enough research has been done relating to either social entrepreneurship or impact investment. Nevertheless, research (Gunawardena, and Mudalige, 2019; British council, 2018; Amaradiwakara, and Gunatilake, 2016; Nishanthi, 2014) that focused on social entrepreneurship and social enterprises have paid slight attention to the concept of impact investing.

The concept of impact investment expanded, and researchers (Cohen, & Bannick, 2014; Bugg-Levine, and Emerson, 2011; Allman, & Nogales, 2015; Finkelman, & and Huntington, 2017; GIIN, 2009; Monitor Institute, 2009; Barclays, 2018; IFC, 2019; OECD, 2019) have carried out empirical and theoretical studies for the development of the concept. These findings and results are especially important to accelerate impact investments by understanding the intentions, motivation, and incentives of the impact investors.

Global Impact Investment Network (hereinafter referred to as GIIN) has continuously followed up the progress made in the impact investment industry. The research carried out by Monitor Institute in 2009 on behalf of GIIN, "Investing for Social and Environmental Impact" (Monitor Institute Report, 2009) outlined the infrastructure, resources, and tools required to take impact investing through various stages of development. In GIIN Road Map For Future Impact Investment report 2018 (GIIN report, 2018), they have looked back on the findings of the 2009 report (Monitor Institute Report, 2009) and researched the development of the concept over the last decade.

In the Sri Lankan context, researchers (Gunawardena and Mudalige, 2019) have found access to finance as one of the main challenges that social entrepreneurs are facing, although not enough studies have been done to find solutions to overcome this challenge. British Council "The State of Social Enterprises in Sri Lanka" 2018 report (British Council, 2018) has recommended to do policy changes and introduce financial and loan facilities for social enterprises to overcome the challenge of access to finance. But the study has not paid attention

to accelerate impact investing to support social enterprises financially. Ultimately, there is not enough research carried out in regards to impact investing acceleration. The focused research problem of this research is accelerating impact investments as a solution for the challenge of access to finance for social enterprises in Sri Lanka. Therefore, this study aims to identify the factors that could develop the local impact investment market in Sri Lanka as a tool for funding social enterprises. The research question of the article is as follows: How to accelerate the local impact investments to fund social enterprises in Sri Lanka.

2. Impact Investing

According to Finkelman & and Huntington (2017), impact investing – "Investing with the intention to generate positive social or environmental impact alongside a financial return." Monitor Institute (2009) underlines that impact investing – "Actively placing capital in businesses and funds that generate social and/ or environmental good and at least return nominal principal to the investor". GIIN (2009) emphasizes that impact investing is "Investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return". OECD (2019) states that: "Social Impact Investment provides finance to organizations addressing social and/or environmental needs with the explicit expectation of measurable social and financial returns, and it is a way of channeling new resources towards the sustainable development goals". Thus, different stakeholders have different understanding of what social impact investment is. After analyzing different definitions of impact investing (GIIN (2009), Monitor Institute (2009), Cohen & Bannick (2014), Allman & Nogales (2015), Finkelman & and Huntington (2017), Barclays (2018), IFC (2019), OECD (2019) it can be stated that impact investment focuses on three main facts: the intention to tackle social and environmental challenges; seek for financial return; commitment to measure the impact.

Moreover, OECD has paid attention to the use of impact investing in sustainable development and collaborates with those two concepts. Seeking for financial return is the margin line which makes impact investment different from charity and philanthropy. Further, in impact investing, investors are making their investment intending to see a clear and measurable social or/and environmental impact. Generally, investors assume lower financial returns from impact investing than traditional investments. Furthermore, impact investors also can be divided into two groups, based on their priority of returns; namely 1. "financial first" investors, 2. "impact first" investors.

The financial first investors focus more on the financial return of their investments. They are more likely to invest in CRS companies or other traditional profit-making businesses who are doing charity laterally. „They are typically commercial investors who seek out sub-sectors that offer market-rate returns while achieving some social or environmental good.

They may do this by integrating social and environmental value drivers into investment decisions, by looking for outsized returns in a way that leads them to create some social value (e.g., clean technology), or in response to regulations or tax policy (e.g., the Green Funds Scheme in the Netherlands or affordable housing in the U.S.)" (Monitor Institute, 2009). Impact investors always focus on creating social and/or environmental impact and pay less attention to the profit. This type of investors mostly invests in social enterprises and socially driven businesses. According to the finding of Monitor Institute report (2009), in some circumstances, the above mentioned financial first and impact first investors work together and are described as "YIN-YANG" deals.

Moreover, the Investment spectrum indicates different modes of investments according to the desires of the investors and businesses. Investors can choose to invest in different kinds of organizations: from charities to traditional business organizations. Investors who are keen on creating positive social and environmental impact, invest in social enterprises, or socially-driven business. When it comes to socially-driven business, investors get a higher profit. Nevertheless, in social enterprises sometimes there could be no financial return for the investor due to the profit re-investing or the profit is not sufficient to do a financial return (the profit is only enough to cover the expense). But those types of impact investments hardly motivate impact investors, and it does not accommodate the basic requirements of the concept of impact investment. Therefore, regardless of the model of the business, successful impact investment should return a profit for the investor and should create a positive social impact. Decisively, impact investors expect for social return and sub-market or market-rate financial return, and it has been proved from the investors' surveys (GIIN, 2019).

According to OECD (2019) report, the global impact investing market is proliferating, and it attracts mainstream finance sources such as asset managers, institutional investors, and multinational companies. Moreover, this report shows that the estimated current size of the global impact investment market is $502 billion (GIIN, 2019). The impact investors use different methods for financing social enterprises. In the private equity and debt market the investors generally take one of three approaches (Finkelman, & Huntington, 2017). The first approach is to invest in companies that generate impact as enhanced corporate philanthropy. For instance; Toms' shoes donates a pair of shoes for a child in need from every pair of shoes they sell. The second approach is to invest in companies that address social and environmental issues through their products or services. Ex: "Belu-Natural Mineral Water" manufactures and sells only the glass water bottles as it can be recycled successfully. The third approach is to invest the financial return to generate impact, for example providing financial support to small businesses, providing low-interest loans to low-income people. *While it is clear that this approach to investing has become more widespread in recent years, the lack of clarity about which investment strategies and assets should be considered to be impact investment makes the total size of the market difficult to establish. Instead, we identify some classes of investors whose mandates align with the definition of impact investing.* (IFC, 2019). According to Bugg-Levine

et al. (2012), the impact investors and social enterprises have realized that current methods of financing social enterprises are insufficient and investors are examining and exercising new methods. Table 1 shows the traditional and modern methods of impact investing.

Table 1.
Traditional & Modern Methods of Impact Investing

Traditional Methods	**Modern Methods**
● Private debt and equity ● Corporate Engagement & Shareholder Action	● Loan Guarantees ● Quasi-equity debt ● Pooling ● Social Impact Bonds

Source: Compiled by the authors based on IFC (2019), Bugg-Levine et al. (2012) & Finkelman & Huntington (2017).

Loan guarantees provide assurance to the lender. This lowering lender risk allows social entrepreneurs to access reasonably priced debts. This is a new method which is used by investors in order to finance social enterprises. Quasi-equity debt is a useful method of funding social enterprises that cannot attract share capital due to the structure of the organization, such as non-profit organizations. Quasi-equity debt is a typical loan, and financial returns are calculated as future revenue of the company. Pooling funds also can be identified as a modern way of funding social enterprises. *The pooling model has spread globally, with innovators such as IFMR Trust, in Chennai, engaged in the securitization and structured finance of microfinance loan portfolios in which they retain an investment share* Bugg-Levine et al. (2012). A social impact bond is a contract between social enterprises, investors, and the government. Social enterprises or non-profit organizations are contracted to deliver a social impact, and investors fund it. If the project succeeds, the government pays for the project. These modern methods of funding social enterprises not only give more options for investors but also provide higher freedom to social enterprises to perform and create maximum social and environmental impact.

However, despite all these new methods, impact investors are still struggling to invest in social enterprises. The impact investors usually are motivated by their personal values and attitudes. If ethical values or interests to solve social problems didn't drive impact investors, they might only concentrate on traditional investments and on maximizing financial returns. According to Mavra (2011), funders and investors do not trust that community-based businesses have the potential for dynamic growth. Since investors are making investments for financial returns, this less confidence restrains them from making impact investments in social enterprises.

3. Social Entrepreneurship in Sri Lanka

The concept of social entrepreneurship is authentically combined with Sri Lankan business culture and practice, although the term "social enterprises and social entrepreneurship" is new to the country. The business culture of the country has an influential connection with the concept of socially responsible business for many years in the country and focused on creating a positive impact on low-income people and helping them to overcome poverty.

The Social Enterprises ecosystems in South-Asian Association for Regional Cooperation Countries report of World Bank Group, 2017 (World Bank Group, 2017) states that Sri Lanka is in the Nascent level of the social enterprise ecosystem. *SE space in Sri Lanka is nascent. Many enterprises working with the low-income population do not classify themselves as SEs. The capital infrastructure and enabling ecosystem for SE development is very limited* (World Bank Group, 2017). The concept is new to the literature, and only a few researches (Gunawardena, & Mudalige, 2019; British Council, 2018; World Bank Group, 2017) have been carried out in the Sri Lankan context. According to both the British Council (2018) and World Bank Group (2017) reports, Sri Lanka doesn't have a clear and confirmed definition or criteria about operations of social enterprises. The British Council report (2018) states that 11,000 social enterprises are existing all over the country, covering 25 districts. These social enterprises are focused on different sectors such as agriculture, renewable energy, healthcare, childcare, education, hospitality, tourism & leisure, social care, housing, creative industries, fisheries, employment, and skills, etc. Furthermore, SL social enterprises are focused on objectives of social and environmental goals such as creating employment opportunities, providing eco-friendly products and services, protecting the environment, supporting vulnerable groups, etc. According to the British Council (2018) report, the majority of social entrepreneurs' primary beneficiary group is women, and many others target low-income people. Further, SL social enterprises are carrying out impact evaluation and contemplative practice. *Sri Lanka's social enterprise sector has predominantly evolved from three main sources: social organisations (i.e. grassroots societies), co-operatives, and local NGOs. Professional organisations are also now becoming important players, providing the much-needed professional skills development that is crucial for the social enterprise sector. First and second generation family businesses and a new generation of MSMEs are now showing interest in adopting the concept of social enterprise* (British Council, 2018).

According to the World Bank Group (2017) report, SL social enterprises are highly performing in the fields of agriculture and renewable energy. According to the British Council research report (British Council, 2018), the majority (75% of the respondents) of social entrepreneurs/social enterprises have a clear vision and understanding of the concept. 41% of the respondents only have social and environmental goals, and they do not consider the financial returns. 59% of the respondents focused on both social impacts as well as the financial

return. While international research shows that youth is more interested in social entrepreneurship, SL statistics show that people between 45-64 are more interested in social enterprises. Furthermore, the majority of social enterprises have been founded by men and most interestingly, the majority of social entrepreneurs are highly educated. According to the report (British Council, 2018), the majority of social enterprises have been founded between the years 2000-2010.

Although there is no specific policy and legal framework for social enterprises in Sri Lanka, the criteria regarding small and medium enterprises apply to social enterprises. Among other responsibilities, the SL government has focused on providing better welfare service as a foremost duty. Therefore appealing policies and action plans are enforced to promote and uphold small and medium enterprises in the country. The SME policy framework covers 6 main areas; **figure 1** below further demonstrates the policy framework.

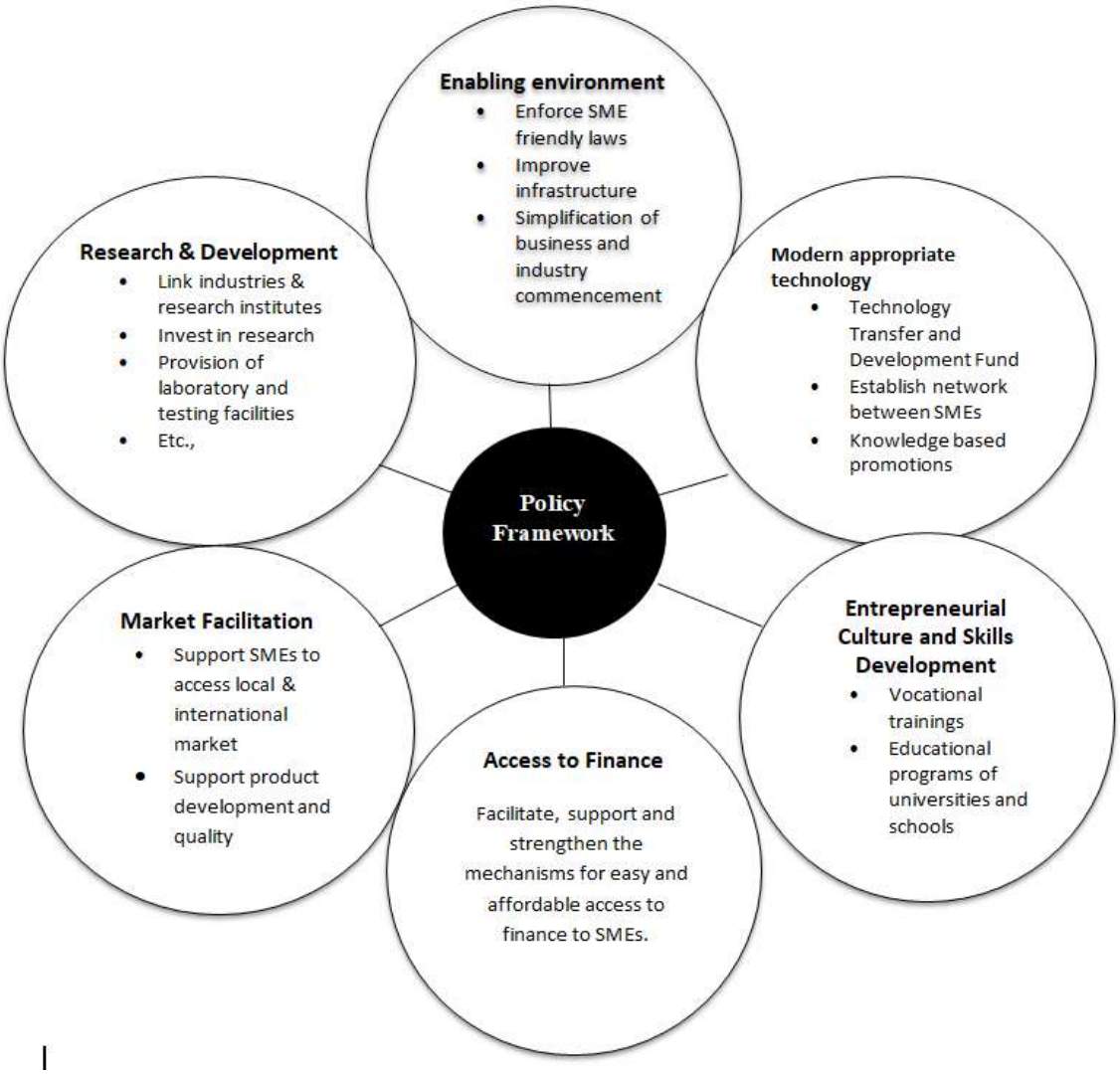


Figure 1. Policy Framework. Source: Compiled by the authors based on National Policy Framework, 2016.

Moreover, other national policies such as national economic policy, rural development policy, agriculture policy, trade policy, environmental policy, solid water management policy, etc., also committed to uphold and promote SMEs and social enterprises in Sri Lanka. There are no specific acts or legal provisions relating to social enterprises in Sri Lanka. Social enterprises can incorporate and register their business activities under the Companies Act of 2007. According to the British Council (2018) recommendations, further developments for the policy and legal framework have to be carried out for the expansion of the social enterprises in SL.

Social enterprises in SL mostly start with personal investments of the founder, and then they spend their 1st, 2nd or 3rd years searching investments for scaling up their business activities. Moreover, most social enterprises use bank loans as a funding method for their business activities. Venture capital is hardly used as a capital source, and impact investing also can be considered quite a new concept and practice to the country. There are many emerging supporting systems for social enterprises in SL, not only the government organizations such as the *Industrial Development Board* but also private organizations such as *Lanka Social Venture*, *Lanka Impact Investing Network*, *Social Enterprise Lanka*, etc. are providing incubation programs for social enterprises. The government universities who are conducting entrepreneurship degree programs are also providing advisory and incubation services for social enterprises. Further, the *Good Market* and *Kapruka Sri Lanka*, *Grasshoppers Sri Lanka*, are motivating social entrepreneurs by helping them to bring their products to the local and international levels. Major international development agencies and financial institutions are also playing a key role to promote small business activity in the country. For instance, the Small and Medium Enterprises Development Facility Project run by the World Bank is aiming to improve access to finance for small and medium enterprises affected by the global financial crisis in Sri Lanka (World Bank Group, 2017).

SL social enterprises are facing different challenges, and the British Council (2018) report and Gunawardena & Mudalige (2019) have discussed these challenges. Social enterprises are also facing the same challenges that SMEs' and corporates face (British Council, 2018). The British council (2018) has identified obtaining finance as a common barrier among social enterprises. **Figure 2** below shows the other challenges identified by the research carried out by the British Council (British Council, 2018).

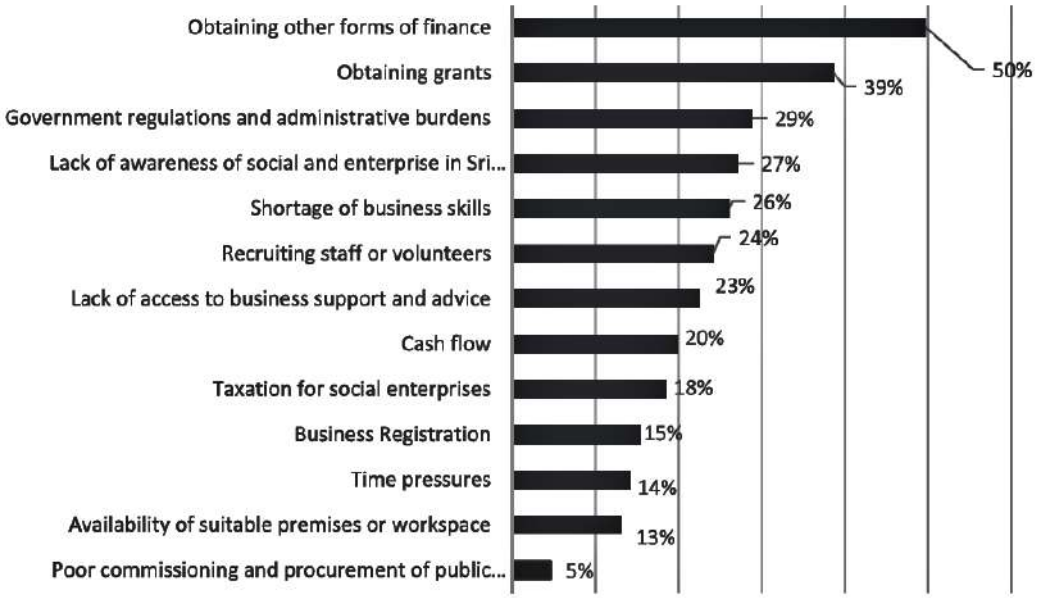


Figure 2. Challenges Faced By the Social Enterprise in SL. Source: The British Council (2018).

The research conducted in 2019 (Gunawardena, & Mudalige, 2019) also identified access to finance as the foremost challenge faced by the social enterprises in SL. *There is a significant effect of access to finance and the growth of social enterprises and on the other hand, the descriptive statistics show a lower level of access to finance among Sri Lankan social enterprises. Hence, the improvement of financial facilities for social enterprises is very much essential* (Gunawardena, & Mudalige, 2019). Among other significant recommendations for upholding social enterprises in SL, the British Council (2019) recommends creating easy access to market and capital in order to increase the supply of finance. Moreover, the report indicates the requirement of increasing private and philanthropic investments in social enterprises.

4. Impact Investment In Sri Lanka

Sri Lanka has a short history of the concept of impact investing as the concept has come to the discussion only after 2015. However, the institutional venture capital, development finance institutions (DFIs), and international financial institutions (IFIs) have performed in the capital market for many years. The concept is also new to the research field. The authors have carried out the theoretical analysis of impact investing based on research carried out by GIIN (2015), findings of Lanka Impact Investing Network (LIIN). According to the GIIN (2015), *Sri Lanka has a large number of actors and varies investor types with a mix of both local and international players*. Moreover, rather than local investors, a significant number of international investors (IFIs, DFI) are in the investment market. High net-worth individuals and family officers are active in the local impact investment market in Sri Lanka. Although according to GIIN (2015),

local investors are more prone to commercially oriented investments rather than impact investments. **Table 2** below indicates the estimated number of impact investors and impact-related investors existed as of 2015.

Table 2.
Impact Investors and Impact Related investors in SL

Type of Investors	Estimated Number	Details of Investors in Sri Lanka
Funds Managers	13	Ten international funds (that have invested only a Small share of their capital in SL), one domestic fund, and 2 regional funds are currently making investments, and a few are scoping and preparing to launch in Sri Lanka.
DFIs & IFIs	12	All DFIs & IFIs are making direct investments into enterprises in SL, and a few are also channeling through commercial banks for SME lending and investing small amounts in foreign funds.
Foundations	1	Only 1 international foundation is making investments in SL, as many have existed the country with Sri Lanka being considered a middle income country and facing concerns about human right violations during the recently concluded civil war
HNWIs & Family Offices	70+	Over 70 HNWIs and family offices are members of domestic angel networks, and several HNWIs have pledge capital to upcoming domestic funds. Family and friends are prominent informal source for seed and venture stage capital
Institutional Investors	7 banks 1 pension fund	Seven commercial banks are lending to SMEs with capital provided by DFIs. 1 pension fund is potentially backing a domestic fund.

Source: GIIN, 2015.

According to the GIIN (2015), DFIs and IFIs have contributed nearly USD 386 million to the impact investment market while high net-worth individuals and family offices have deployed less than USD 100,000. Moreover, the majority of the investments have been allocated to large corporations and, SMEs have received less attention (0.3% of total capital) from the investors. Both local and international impact investors are investing in different sectors such as financial services, manufacturing, tourism, health care, agriculture, traditional handicraft, etc. Further, most investors are interested to invest in the early stages of the enterprises. According to the GIIN (2015) report, SL impact investors use established measurements to measure the impact. Social impact is measured by the metrics such as the number of jobs created, products sold, etc.

The first impact investing network in Sri Lanka was founded in 2015 namely, the LIIN (Lanka Impact Investing Network). This organization is networking high net-worth individuals and investors and facilitating social enterprises to find investors for their business activities.LIIN is currently creating Sri Lanka's first investment funds to address the challenge of financing for social enterprises. The first is a USD 5 million impact investment fund to support social enterprise through a Sri Lankan TV program similar to the "shark tank" in the USA. Second, USD 20 million a social impact fund to support existing medium and large enterprises in SL. LIIN, together with Social Enterprise Lankan and Independent Television Network, has already hosted 2 seasons of the TV show called “Ath Pavura" and invested in many social enterprises around the country.

The impact investing market of SL is facing different challenges and barriers. According to the GIIN (2015) report, there are 3 main barriers. Lack of entrepreneurial culture is the main challenge faced by the impact investing market, and this discourages investors. Furthermore, there is a considerable misalignment between the financial demands of the enterprises and the investments of the investors. This avoids creating a better understanding among investors and enterprises. Secondly, poor financial management and operational skills also are an identified challenge faced by the impact investment market. Unexpected financial losses discourage investors. GIIN (2015) report suggests providing mentorship and selected entrepreneurs for funding to overcome this challenge. Thirdly, lack of information and poor networking is a barrier faced by the impact investment market. There is no better connection and network between investors, incubation programs, social enterprises, government, and other main actors of the industry. LIIN also identifies this as a significant barrier and works towards building networks for the development of the impact investment industry.

5. Methodology

The research methodology: 6 semi-structured in-depth interviews with experts from 3 main fields: social entrepreneurship, academia, and impact investing, that are relevant to the subject of the research study, have been carried out. The authors have selected experts according to these criteria: 1) Investors, who have a minimum of 5 impact investments; 2) Scholars, who serve as a senior lecturer of commerce or entrepreneurial studies department of a government university in SL or have a minimum of 5 years experience as a researcher in investment and/or impact investments and/or social entrepreneurship fields. 3) Social Entrepreneurs, who have been invested by local impact investors within the last 5 years or have completed 5 years as an active social entrepreneur in SL. The 3 main categories have been more explained in detail in **table 3**.

Table 3.
Background Information of the Interviewees

The experts were encoded as follows	Category	Personal Profile
Expert_1	Scholar	Serving for 25 years as a senior lecturer in the Entrepreneurial Studies Department of a Government University, Sri Lanka
Expert_2	Scholar	Serving for 12 years as a senior lecturer in the Entrepreneurial Studies Department of a Government University, Sri Lanka
Expert_3	Investor	Invested in 9 social enterprises and having 5 years of experience in the impact investing field

Cont. table 3.

Expert_4	Investor	Invested in 13 social enterprises and having 4 years of experience in the impact investing field
Expert_5	Social Entrepreneur	Social Entrepreneur, Public Speaker and an Activist with 14 years of experience in the field
Expert_6	Social Entrepreneur	The founder of an award-winning social enterprise that was found in 2012

Source: created by authors.

These in-depth interviews assisted the researchers in collecting richly descriptive information. Mainly, the researchers developed 6 interview questions that covered the research question. The questionnaire included the following questions:

- How do you understand and describe the role of local impact investors in the impact investment market in Sri Lanka?
- What are the factors that may encourage local investors to make impact investments to social enterprises?
- What are the activities/ criteria that social enterprises should follow to attract investors?
- What do you think about impact investing as a tool for funding social enterprises?
- What are the social, economic, and political factors that could develop the impact investment ecosystem in Sri Lanka?
- What are your suggestions to improve the local impact investment market in Sri Lanka to develop social entrepreneurship?

The invitations for the interviews have been sent via email during the 1st week of April 2020. The interviews were carried out from the 27th of April - 5th of May 2020 via Zoom and Whatsapp. Each interview lasted from 45 minutes to 3 hours, and the full conversation was recorded by using a phone recorder and zoom with the consent of the interviewees. The methodology of qualitative research recommends that experts choose for themselves whether to remain anonymous or to publish their names. Depending on the request of many experts, the names of the experts are not provided, and when quoting the expert's statement, his/her number is indicated. The list of experts and the description of the characteristics supporting their competence are presented in **Table 3.** It should be noted that when describing experts to ensure their anonymity, experts are described using the masculine gender, as accepted by reference to positions, degrees, or other depersonalized data.

6. Empirical analysis

The interviewees have mentioned both encouraging and discouraging factors that affect impact investing in SL. According to all interviewees, the majority of the factors are discouraging factors. Furthermore, interviewees mentioned suggestions to alleviate the discouraging factors. Since the impact investing and social enterprises go hand in hand, all the interviewees pointed out the importance of enhancing social enterprises. Having a well-grown social enterprise that gives good financial return, as well as a high amount of positive impact, would be an encouraging factor for impact investing. *Without having good social enterprises, we can't build an impact investing market. So, on one side, social enterprises should rise, and then in parallel to that, impact investors should expand by investing seeds to the SE* (Expert 5). According to all interviewees networking with leadership, having adequate procedures and systems encourage investors to get into the impact investment market. Currently, there are no such kinds of networking systems nor proper systems to connect social enterprises and impact investors. According to Expert 6, *It must be practical, and we need good leadership to build and maintain the systems. Of course, we need a proper network among social enterprises, investors, government bodies such as the agriculture department.* Furthermore, 2 interviewees suggested solutions for the above-mentioned networking, leadership, and procedures. They are as follows *I believe that we lack networking and middle persons to connect investors and SE. For example, if we could create an impact investing fund with the involvement of the experts to work as middle persons and connect investors and social entrepreneurs, it would be useful for the development of both fields* (Expert 4). *We can build online platforms where SE can showcase their ideas to attract impact investors. The idea evaluation process should be impartial, and we should technically evaluate social enterprises to filter non-sustainable projects. If we can build all these things, we can use impact investing as a useful tool of funding* (Expert 2). According to all interviewees, having an adequate understanding of the concept encourages impact investors to make investments. The concept is still emerging, and people do not have adequate knowledge about the concept. Therefore interviewees emphasized the importance of providing enough information to traditional investors, prospective investors, and society. *I believe only the high-end knows these concepts and the low level of the country doesn't have any idea about these concepts. So we should educate investors, society, and especially our future generation* (Expert 6). *If the prospective investors are not aware of this impact investing concept, then we can't develop this in the SL market as a tool for funding SE. Our traditional investors might think that impact investing is not a wise decision. This is our attitude. So the attitude or the behavioural tendency is based on the information available to you. Therefore we must keep our traditional investors informed by providing information about the concept of impact investing* (Expert 1). Having a good market for the products and services of social enterprises is also a factor that encourages impact

investors. 4 interviewees indicated this fact: *If we have a good market, then investors also would pay their attention to our enterprises and will provide funds. People should understand the importance of social entrepreneurship and should support social enterprises by buying products from us and not going for cheap and low quality imported goods* (Expert 6). *We must control the entering of low quality and cheap imported goods to the SL market, then our SE can have a good share in the market, and this will encourage investors to invest in social enterprises* (Expert 3). In order to attract impact investments, the criteria that should be followed and standards that must be met by the social enterprises are as follows; according to all the interviewees, the SE must have a good balance between the profit and the impact. Therefore to attract investors, social enterprises must have marketable products and services and demonstrate the positive social and environmental impact.

All the interviewees mentioned the importance of having a clear business model and revenue model and 2 interviewees (Expert 2, Expert 3) emphasized the importance of having multiple revenue models. According to the interviewees, social enterprises do not pay enough attention to the business model, revenue model, and the sustainability of their business. Moreover, all the interviewees highlighted the importance of having responsible financial management. Also, according to all the interviewees, social enterprises must have a strong marketing plan which currently, they have not paid enough attention to. *Having an innovative and competitive business idea and business model is also an important fact. Social enterprises must have a clearly defined revenue model. Most importantly, those revenue models must be strong enough for the long term existence of the business* (Expert 4); *They can find other revenue models through electronic media such as youtube, Facebook, websites and these multiple revenue models are good support for the sustainability of the social enterprise* (Expert 2). All the interviewees highlighted the importance of ensuring continuous growth and commitment towards creating impact. *After starting the business, some of our social enterprises forget their goal of creating social impact. This must be changed and SE must continuously focus on their impact creating process* (Expert 1). *Then the continuous growth should be ensured. If the enterprise is not showing any growth, there will be not any attraction of the investors in the future actions* (Expert 2). 5 interviewees pointed out the value of being truthful. According to the interviewees, most of the social enterprises are not truthful and trustworthy, and this is a reason for the mistrust and misunderstanding between the SE and the impact investors. The interviewees describe it as follows; *Some cunning people sugar coat their businesses as Social Enterprises and they try to attract impact investors and get the money* (Expert 5). *Some businesses try to define themselves as social enterprises and ask for investments. That is fine if they truly create a social impact, but unfortunately, most of them do not create any impact at all* (Expert 4). Having enough business literacy has been emphasized by 4 interviewees (Expert 1 and 2, Expert 3 and 4). According to them, SL social entrepreneurs do not have enough business literacy. Moreover, some programs have been implemented by the interviewees to increase the business literacy of the entrepreneurs. But still, they see the need

for engaging more participants for these educational programs. *Most of our social entrepreneurs don't have enough knowledge in marketing, business administration, finance management, etc. So, first of all, we need to educate them and keep them updated with modern technologies, markets, systems, and other business-oriented subjects* (Expert 4). Furthermore, all the interviewees pointed out the importance of readiness to learn and being open to negotiations. Conclusively the criteria and recommendation for social enterprises are; maintaining the balance between the profit and the impact, having an effective business model, having robust revenue model, sound financial management, implementing effective marketing plans, truthfulness, trustworthiness, ensuring the continuous growth, having enough business literacy, and being open for negotiations. According to all the interviewees, SL needs cultural evolution not only for the development of the impact investing market but also for the betterment of the social entrepreneurs. All interviewees suggested changing the banking system in the country. SL banks give high-interest rates (6-12%) for the fixed and other deposits, and this discourages people from investing in businesses. *Our banking rate is very high, so people don't have to go for risky investments. They can just deposit their money in the bank accounts and get huge interest. So we need to think about reducing the interest rates of fixed and other bank deposits* (Expert 2). All the interviewees have emphasized the requirement for national policy changes and the need for defining the concepts. Moreover, the interviewees pointed out the importance of giving national level recognitions to these 2 concepts. *We have done a lot of ground-level development. Now we need policy-level development and legal recognition for these concepts. If we can't get this in the next 5 years, it will be challenging for us to make any significant change in the impact investment market* (Expert 5). 4 interviewees (Expert 1; Expert 2, Expert 4; Expert 5) pointed out the value of introducing an appreciation mechanism for impact investors and social enterprises with the involvement of the government. *There should be some appreciation mechanism, awarding schemes, government recognition, and support in order to get more participation* (Expert 2). *The government should create systems that help impact investments and impact investors. These could be tax reliefs, rewards, etc. Also, the government should take coordinated efforts to the business and investment development of the country* (Expert 1). Expert 2, has mentioned the requirement of enacting rules and regulations to control malpractices in social enterprises and impact investing market; *If people are misusing impact investments, there should be a way to control them*. Moreover, Expert 5, highlighted the need for developing a system where social entrepreneurs are obligated to report their impact creation to the government. This will encourage impact investors to make impact investments towards SE. Also, according to Expert 5, this reporting system will help to identify the social enterprises for rewarding schemes. *If we legally recognize SE, then it is mandatory to report your impact just like how you report your annual finances to the National registrar of Companies. This will be a massive help for investors as they can select the right social enterprises by seeing their performance reports* (Expert 5).

The findings of this study also confirmed the results in the research study of Global Impact Investing Network (GIIN, 2015) that the lack of networking and information, poor financial management, and lack of entrepreneurial culture can be identified as significant challenges for impact investing acceleration in Sri Lanka. The experts distinguished leadership as an important aspect to build and maintain networks between SE and impact investors in SL. Also, this study revealed that a lack of legal recognition and national policy can be recognized as significant challenges too. In the British Council (2018) report, the requirement of legal influence has been mentioned but has not given a specific way of influencing. According to the empirical findings of this study, giving legal recognition to the impact investing concept and social entrepreneurship concept is necessary for the betterment of both concepts. The legal recognition will compel the social enterprises to record their performance to the government. This reporting system can be used for multiple purposes. One is that it will be useful for rewarding social enterprises. The second is that this will provide better information to the investors about the social enterprises and their performance. Having access to the information would encourage traditional investors to enter the impact investment market, and also it will encourage impact investors to accelerate their investments. Ultimately this will not only improve the impact investment market in Sri Lanka but also will help to uphold social enterprises. The government must play a vital role to develop the local impact investments to uphold social enterprises. The concept of social entrepreneurship and impact investing has not been recognized at the national level. Therefore, the policy changes must be carried out within a reasonable time for the enhancement of both concepts. This includes changing national banking policy to reduce high-interest rates of savings and deposits and encouraging people to invest money in social enterprise for financial and moral returns. Further, by giving tax reliefs, rewards, etc., the government can motivate investors towards impact investing.

According to the statistical data of FT (2018) report, the impact investors prefer to invest in social enterprises that are in the venture stage. This also conforms to the context of SL; while social enterprises require seed finance, the local impact investors in SL are looking for well-grown social enterprises to invest their money. Since the social enterprises in SL are still in their thriving stage, unless correcting this discrepancy, the impact investments cannot accelerate. As stated in Bugg-Levine et al. (2012), since the old methods are insufficient and less effective, the impact investors and social enterprises in the international impact investment market realized the need to examine new methods for impact investing. Therefore, using modern methods such as Loan Guarantees, Quasi-equity, and Debt Pooling has been encouraged. However, Sri Lankan impact investors have not paid enough attention to modern methods and only prefer to make equity investments. Therefore, there is a crucial necessity using modernized and efficient methods to make impact investments towards social enterprises. To overcome this limitation, information and insight regarding the concept, must be provided to local impact investors in SL.

The experts emphasized the importance of the role of social enterprises in the acceleration of impact investing. According to the respondents, social enterprises' demonstration and improvement of their financial results and social impacts would encourage investors to make their investments in SE. Also, an adequate awareness of the concept is a crucial factor for making impact investments. Further, the exact mechanism that connects the stakeholders and having reliable and effective platforms and systems is also a foremost factor that encourages local impact investors to enter into the impact investment market. Being come from an entrepreneurial culture is also essential to encourage impact investors. Moreover, having recognition and appreciation would also encourage local impact investors to make impact investments in social enterprises.

The social enterprises, impact investors, society, and the government, should work collectively to improve the local impact investment market in Sri Lanka (**See Figure 3**).

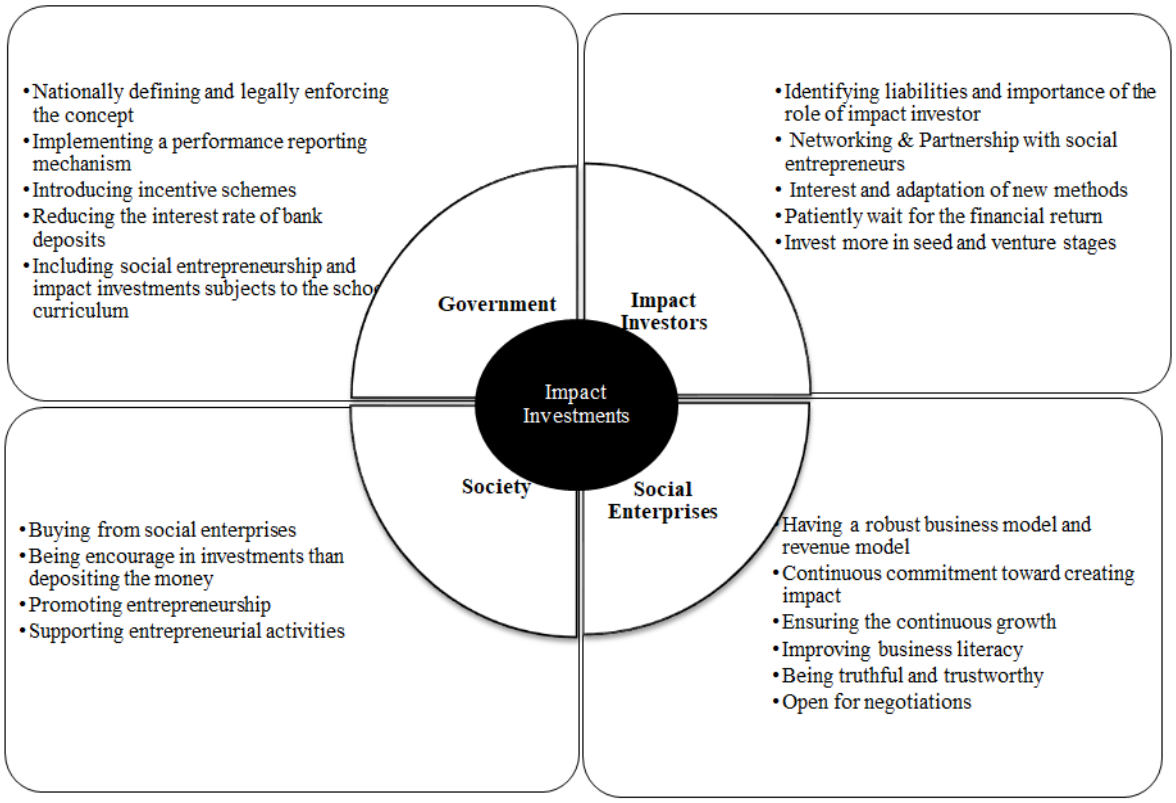


Figure 3. Acceleration model of local impact investments in SL. Source: Compiled by authors.

Since the concepts of impact investment and social entrepreneurship go hand in hand, there is an immense need for developing social enterprises in the country. To enhance social enterprises, the business literacy of social entrepreneurs must be increased. It will assist them to manage and maintain their social enterprise with a stable balance between profit and impact. Social enterprises must be self-sustainable, and continuous growth should be ensured. Truthfulness, trustworthiness, and readiness to learn are also crucial facts for the development of social enterprises. The investors should understand their role in the impact investments market and should fulfill their responsibilities accordingly to improve the local impact

investment market in SL. The society must be given entrepreneurial education to create an entrepreneurial culture, and the people must value and appreciate the roles of social enterprises and impact investors. Moreover, people should consider investing their money in a social enterprise where they can get both financial and moral returns rather than saving or depositing in a bank. The government should make policy changes to recognize the impact investing and social entrepreneurship concepts legally. Further, the influence of creating a market for social enterprises, doing policy changes for the banking sector, and introducing an appreciation system for both social entrepreneurs and impact investors, adding these concepts to school education, would improve the impact investment market in Sri Lanka.

7. Conclusion

Our study analysed accelerating local impact investment market in Sri Lanka as a tool for funding social enterprises. Sri Lanka has an emerging social entrepreneurial ecosystem. Impact investing and venture capital are new concepts to the country, most social enterprises are using traditional funding methods such as bank loans to find investments. As it has been found by the research, access to finance is a significant barrier to the growth of social enterprises in Sri Lanka. Sri Lanka is still adapting the impact investing as a successful tool for funding social enterprises. Apart from foreign funds and bank investments, the participation of private investors is comparably low.

We believe that there are several significant contributions to the literature made by our paper. Our research revealed many challenges for impact investment in SL: lack of leadership, networking and information, poor financial management, and lack of entrepreneurial culture, lack of legal recognition of concepts. Accelerating impact investment is based on the improvement of the impact investment market and the commitment of the stakeholders. The existence of a market that the impact investors can enter with high confidence of getting expected finance together with the satisfaction of creating a positive impact on the society will encourage the investors to get into the impact investing market. Therefore, having a lucrative and secure impact investment market and successful and sustainable social enterprises are the foremost factors for accelerating impact investments in SL. Social enterprises should be with the aims to become more sustainable, improve their revenue models, business skills, be open to learning and negotiations. In order to build a lucrative and attractive market – society, social enterprises, impact investors, and the government should operate collectively. By facilitating and giving encouragement to the local impact investors, the gap between the interest and the action would be filled, and the financial support to social enterprises would increase. Ultimately, enforcing the factors that encourage impact investors, ensuring the development of

social enterprises, providing the required government influence, and making the required social changes will accelerate the local impact investments.

Our paper also has some limitations. We have used purposive sampling that comes under the non-probability sampling. Since the sample is selected based on the researchers‘ ascertainments and criteria, the sampling was judgemental. There was a reasonable probability of having uncontrolled variability and bias in the estimations of the sampling. Despite these limitations, however, we believe that the experts' interviews have allowed us to find out the factual circumstances in the sector analysed.

In the future, the research studies should be carried out regarding executing national policies in impact investing and social entrepreneurship development in Sri Lanka. Furthermore, more research studies are necessitated to finding effective methods to connect impact investors with social enterprises through a proper networking mechanism.

References

1. Allman, K., & Nogales, X.E.D. (2015). *Impact Investment, A Practical Guide to Investment Process and Social Impact Analysis.* Hoboken, New Jersey: John Wiley & Sons, Inc.
2. Amaradiwakara, A.U., Gunatilake, M.M. (2016). Factors Affecting Growth of Small and Medium Enterprises in Sri Lanka. *Journal of Business & Economic Policy, Vol. 3,* pp. 62-71.
3. Barclays (2018). *Investor motivations for impact: A behavioural examination*. Barclays Bank UK PLC, IBIM8354.
4. British Council (2018). The State of Social Enterprises in Sri Lanka. Colombo, Sri Lanka: British Council.
5. Bugg-Levine, A., Emerson, J. (2011). *Impact investing: Transforming how we make money while making a difference*. San Francisco: Jossey-Bass.
6. Bugg-Levine, A., Kogut, B., & Kulatilaka, N. (2012). A New Approach to Funding Social Enterprises. *Harvard Business Review, January-February*.
7. Cohen, R., & Bannick, M. (2014). *Is Social Impact Investing The Next Venture Capital?* Forbes.com, Available at: http://onforb.es/1tFmwxF, 22.03.2020.
8. Finkelman, J., & Huntington, K. (2017). *Impact Investing History and Opportunities*. Athena Capital Advisors LLC: Lincoln-Massachusetts, America.
9. FT (2019). *The Individual Imperative: Retail Impact Investing Uncovered*. Longitude, and FT Group company.
10. GIIN (2015). *The Landscape For Impact Investing In South Asia*.
11. GIIN (2019). *Annual Impact Investor Survey*. Global Impact Investing Network.
12. GIIN (2009). *Core Characteristics of Impact Investing*. Global Impact Investing Network.

13. GIIN (2018). *Global Impact Investing Network. Roadmap for the Future of Impact Investing: Reshaping Financial Markets*. Global Impact Investing Network.
14. Gunawardena, L.H.T.K., and Mudalige, D.M. (2019). *Factors Affecting For Growth Of The Social Enterprises In Western Province, Sri Lanka*. Colombo, Sri Lanka: University of Moratuwa.
15. IFC (2019). Creating Impact: The Promise of Impact Investing. Washington: International Finance Corporation.
16. Jackson, E.T. (2012). Accelerating Impact. New York-USA: Rockefeller Foundation.
17. Mavra, L. (2011). *Growing social enterprise: research into social replication*. A report from the Social Enterprise Coalition. London, UK.
18. Monitor Institute (2009). *Investing for Social and Environmental Impact. A Design for Catalyzing an Emerging Industry.* The Monitor Institute.
19. National Policy Framework (2016). Ministry of Industry and Commerce, Colombo, SL.
20. Nishanthi, H. (2014). Analysis of Entrepreneurial traits of the Small Business Owners in Sri Lanka. *International Journal of Scientific and Research Publications, Vol. 4,* pp. 1-7.
21. OECD (2019). *Social Impact Investment 2019: The Impact Imperative For Sustainable Development.* Paris: OECD Publishing.
22. UNDP (2016). Financing Solutions for Sustainable Development.
23. World Bank Group (2017). Social Enterprises ecosystems in South-Asian Association for Regional Cooperation Countries report. Washington, USA: The World Bank.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

INTERNAL AUDIT AND MANAGEMENT REVIEW IN ISO 9001:2015

Radosław WOLNIAK

Politechnika Śląska, Wydział Organizacji i Zarządzania, Instytut Ekonomii i Informatyki; rwolniak@polsl.pl, ORCID: 0000-0003-0317-9811

Purpose: The aim of the paper is to analyze the problems connected with internal audit and management review within the organization in the ISO 9001:2015 implementation process.
Design/methodology/approach: Critical literature analysis. Analysis of international literature from main databases and polish literature and legal acts connecting with researched topic.
Findings: To achieve good functioning level of Quality management system we need to do periodically the internal audits and management reviews. Audit is the examination or inspection of various books of accounts by an auditor followed by physical checking of inventory to make sure that all departments are following documented system of recording transactions. Audits are very useful tool to analyses the organization functioning and improve it's performance. On the basis of the conducted analysis we can say that the main activities needed in the internal audit process are: interview personnel, observe operations, review documents and records and examine records. In the audit process is especially important for auditor to have appropriate qualities. They should be according to ISO 19011 requirements. The best solution for the analysis of the performance of ISO 9001 system can be done when we not only use internal audits but also management reviews in our managerial practice.
Originality/value: Detailed analysis of all subjects related to internal audits and management reviews in ISO 9001:2015.

Keywords: quality management, ISO 9001:2015, ISO 9001, audit, management review.

Category of the paper: literature review.

1. Introduction

To achieve good functioning level of Quality management system we need to do periodically the internal audits and management reviews. Audit is the examination or inspection of various books of accounts by an auditor followed by physical checking of inventory to make sure that all departments are following documented system of recording transactions (Horodecka, and Wolniak, 2015; Pacana, 2014; Pacana et al., 2014, 2017; Pacana, and Stadnicka, 2006, 2017; Wolniak, 2011; Wolniak, and Sułkowski, 2015, 2016; Wolniak et al.,

2019; Wolniak, and Skotnicka-Zasadzień, 2008, 2011, 2019; Novakova et al., 2016; Stawiarska et al., 2020). It is done to ascertain the accuracy of financial statements provided by the organization (Hillson, 2001; Gębczyńska, and Wolniak, 2018; Juszczak-Wiśniewska, and Ligarski, 2015, 2016; Łuczak, and Wolniak, 2016; Sułkowski and Wolniak, 2016, 2018; Szczucka-Lasota, and Wolniak, 2018). Audit can be done internally by employees or heads of a particular department and externally by an outside firm or an independent auditor. The idea is to check and verify the accounts by an independent authority to ensure that all books of accounts are done in a fair manner and there is no misrepresentation or fraud that is being conducted (ISO 9001:2015; Chen et al., 2016; Cholewicka-Goździk, 2016; Łagowski and Żuchowski, 2016; Wolniak, and Hąbek, 2015; Wolniak, and Skonicka-Zasadzień, 2010; Wolniak, and Sułkowski, 2015; Wolniak, 2020).

The aim of the paper is to analyze the problems connected with the audit and management review within the organization in the ISO 9001:2015 implementation process.

2. Internal audit

To assess the functioning of the implemented quality management system organization should conduct internal audits at planed intervals to provide information on whether the quality management system (ISO 9001:2015, Egonsson et al., 2013):

- conforms to:
  - the organization's own requirements for its quality management system;
  - the requirements of this International Standard;
- is effectively implemented and maintained.

Internal audit is a very strong tool by which an organization can make substantial improvement in its systems and performance. The sincerity of the management and staff in religiously following the process of internal quality audit is the key factor for getting the full advantage of the system (Purushothama, 2015). Basic definitions connected with auditing quality management system are in the table 1.

Table 1.
Terms connected with auditing quality management systems

Term	Definition
Audit	Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled Internal audits, sometimes called first party audits, are conducted by the organization itself, or on its behalf, for management review and other internal purposes (e.g. to confirm the effectiveness of the management system or to obtain information for the improvement of the management system). Internal audits can form the basis for an organization's self-declaration of conformity. In many cases, particularly in small organizations, independence can be demonstrated by the freedom from responsibility for the activity being audited or freedom from bias and conflict of interest. External audits include second and third party audits. Second party audits are conducted by parties having an interest in the organization, such as customers, or by other persons on their behalf. Third party audits are conducted by independent auditing organizations, such as regulators or those providing certification.
Audit criteria	Criteria set of policies, procedures or requirements used as a reference against which audit evidence (3.3) is compared.
Audit evidence	Records, statements of fact or other information which are relevant to the audit criteria and verifiable.
Audit findings	Results of the evaluation of the collected audit evidence against audit criteria.
Audit conclusion	Outcome of an audit, after consideration of the audit objectives and all audit findings.
Audit client	Organization or person requesting an audit.
Auditee	Organization being audited.
Auditor	Person who conducts an audit.
Audit team	One or more auditors conducting an audit, supported if needed by technical experts.
Technical expert	Person who provides specific knowledge or expertise to the audit team.
Observer	Person who accompanies the audit team but does not audit.
Audit plan	Description of the activities and arrangements for an audit.

Source: own work on basis: (ISO 19011:2011. Guidelines for auditing management system, Hoyle, 2009; Locher, 2008).

The internal audit has four primary objectives (Philips, 2015; Misztal, 2013):

- To verify conformance to applicable standards.
- To verify conformance to documented processes and procedures.
- To verify effectiveness of business processes.
- To identify opportunities to improve the quality management system.

The objectives of audit can be based on (ISO 19011:2011; Mitra, 2016):

- management priorities;
- commercial and other business intentions;
- characteristics of processes, products and projects, and any changes to them;
- management system requirements;
- legal and contractual requirements and other requirements to which the organization is committed;
- need for supplier evaluation;
- needs and expectations of interested parties, including customers;
- auditee's level of performance, as reflected in the occurrence of failures or incidents or customer complaints;
- risks to the auditee;

- results of previous audits;
- level of maturity of the management system being audited.

In this case organization should (ISO 9001:2015; Natarjan, 2017; Novakova et al., 2016):

- plan, establish, implement and maintain an audit programme(s) including the frequency, methods,
- responsibilities, planning requirements and reporting, which shall take into consideration the importance of the processes concerned, changes affecting the organization, and the results of previous audits;
- define the audit criteria and scope for each audit;
- select auditors and conduct audits to ensure objectivity and the impartiality of the audit process;
- ensure that the results of the audits are reported to relevant management;
- take appropriate correction and corrective actions without undue delay;
- retain documented information as evidence of the implementation of the audit programme and the audit results.

The audit programme should include information and resources necessary to organize and conduct its audits effectively and efficiently within the specified time frames and can also include the following points (ISO 19011:2011; Pokosińska et al., 2002):

- objectives for the audit programme and individual audits;
- extent/number/types/duration/locations/schedule of the audits;
- audit programme procedures;
- audit criteria;
- audit methods;
- selection of audit teams;
- necessary resources, including travel and accommodation;
- processes for handling confidentiality, information security, health and safety, and other similar matters.

Internal auditors often only rely upon documents and records as evidence of process conformity and don't adequately interview personnel and observe operations (Szkiel, 2016). To change this and attain conformity internal auditors should use four activities described in the table 2.

There is no perfect number of auditors an organization must have to perform effective internal audits (Vogt, 2010). Some organizations, particularly those in the medical and aerospace industries are fortunate enough to have full-time internal auditors. most, however, call on employees who are already fully utilized in other roles. The number of auditors the organizations should to use depend on several facts (Philips, 2015):

- The size of the organization.
- The type of product or service produced.

How you define the scope of each audit. Auditors and the person managing audit programme should (ISO 19011:2011):

- perform their work with honesty, diligence, and responsibility;
- observe and comply with any applicable legal requirements;
- demonstrate their competence while performing their work;
- perform their work in an impartial manner, i.e. remain fair and unbiased in all their dealings;
- be sensitive to any influences that may be exerted on their judgement while carrying out an audit.

Table 2.
Activities in audit to ensure conformity

Activity	Characteristic
Interview personnel	Based on your audit planning and checklist questions, ask employees about their jobs. Listen to what they tell you and see if their explanations match the defined process. Use open-ended questions to elicit more complete responses. Do not be afraid to challenge and probe or follow an audit trail to see where it leads you. Talking to people is the best possible way to test their understanding and knowledge about the processes and sub-processes in which they are involved.
Observe operations	Aid your own understanding of the process by watching it being performed. See if the observed practices comply with requirements. You will discover the persons being interviewed are more relaxed when you allow them to demonstrate their jobs. In addition, internal audits will be less disruptive since work is actually being completed.
Review documents and records	Ask the persons being interviewed what documents and records are used in their work. You may find documents, records and forms beyond those identified in your audit planning. See if the documents are adequately controlled and available for use. Refer to the documents and records to help you follow the work being shown. Verify the records described in the documents are being properly collected and controlled. Also challenge the need for documentation and always try to find better and more effective ways of managing and controlling the processes being audited.
Examine records	Auditors cannot interview every person, observe every activity, look at every document, and evaluate every record. You should strive for representative samples that allow you to make informed judgements. Since audits are limited due to sampling, non-conformities may continue to exist in the system beyond those identified and reported. However, with time and well planned audits you can feel confident that you have thoroughly reviewed your system and its performance.

Source: own work on basis: (ISO 9001, 2020).

The ISO 19011 standard specifies the required auditors qualities (ISO 19011:2011):

- Ethics: An auditor will possess personal characteristics like credibility, integrity, and honesty and provide reliable information and results regarding the unit the auditor is auditing.
- Open-minded: An auditor will be willing to listen, learn, and accept new ideas and to reflect them on the situations or requirements. Sometimes auditor may encounter new approaches or opinions. An auditor must have the ability to assess and accept different points of view as long as they achieve the requirements.
- Diplomatic: An auditor will be polite and well-mannered; an auditor serves as the representative of the top management.

- Observer: An auditor will have the ability to recognize and evaluate what he or she sees and to understand and interpret events without deep interrogation.
- Perspective: An auditor will have the ability to evaluate situations beyond the person's appearance, with a systematic view of things, and will have the ability to understand the organizational consequences of the evidence he or she finds.
- Versatile: An auditor will have the ability to mobilize from one situation to another without losing direction. One moment the auditor may audit one field; the next moment it may be another. An auditor must be able to stay focused.
- Structured: An auditor will advance and progress the audit according to a defined method or plan and within the boundaries of the scope.
- Persistence: An auditor must be persistent with their objectives, so that when they ask a question, they must receive an answer to it and not be diverted by interferences or disturbances.
- Independent: An auditor shall have their own opinions on things, will not be influenced by the environment, and will be free from conflict of interest.
- Decisive: An auditor must be ready to make decisions even when they are hard or will not satisfy the auditee.

Any findings during the audit shall be indicated with one of the following classifications (Abuhay, 2017):

- Conformity – the process or product sampled was in accordance with the relevant requirements and criteria.
- Opportunity for improvement – in the auditor's opinion, an improvement can be applied to the matter, and the organization may or may not adopt this opportunity and submit it to the control of opportunities as required in clause —Actions to address risks and opportunities.
- Nonconformity – the process sampled was not according to the requirements and the audit criteria.
- If the organization feels the need to add another classification suitable to its nature or processes, it may do that.

3. Management review

Next method of assessment quality's management system functioning is management review. In this case top management should to review the organization's quality management system, at planned intervals, to ensure its continuing stability, adequacy, effectiveness and alignment with the strategic direction of the organization (Ząbek, 2016; Żemigła, 2017).

The management review shall be planned and carried out takin into consideration following points (ISO 9001:2015):

- the status of actions from previous management reviews;
- changes in external and internal issues that are relevant to the quality management system;
- information on the performance and effectiveness of the quality management system, including trends in:
  - customer satisfaction and feedback from relevant interested parties;
  - the extent to which quality objectives have been met;
  - process performance and conformity of products and services;
  - nonconformities and corrective actions;
  - monitoring and measurement results;
  - audit results;
  - the performance of external providers;
- the adequacy of resources;
- the effectiveness of actions taken to address risks and opportunities;
- opportunities for improvement.

The outputs of the management review shall include decisions and actions related to[1]:

- opportunities for improvement;
- any need for changes to the quality management system;
- resource needs.

The main inputs to analyze in the management review were characterized in the table 3.

Table 3.
Management review inputs

Input	Characteristic
Actions from Previous Reviews	The outputs of management review are mostly in the form of action points, assigned to relevant process owners with time schedule for completion. The status of the action points of the previous management reviews is discussed until they are closed. Evidences for the implementation of the action points are maintained.
Changes in External and Internal Issues	Monitoring the changes in external and internal issues that are relevant to organization is assigned to appropriate process owners during management reviews. The results of monitoring the issues are presented by the process owners during the reviews. The results are discussed and appropriate actions are decided for improving the quality management systems of organization.

[1] ISO 9001:2015. Quality management systems – Requirements.

Cont. table 3.

Results of Performance Evaluation	Information on the performance and effectiveness of the quality management systems is discussed in management review. The sources of information are the outputs of monitoring, measurement, analysis and evaluation, customer satisfaction and internal and external audits. Monitoring the needs and requirements of external providers is assigned to appropriate process owners during management reviews. Feedback from external providers is presented by the process owners: • Quality objectives, process performance, conformity of products and services and performance of external providers with monitoring and measurement results. • Internal audit results and external audit reports • Performance of external providers.
Other Inputs	The additional requirements for people, infrastructure, operating environment and enhancing organizational knowledge and competence of personnel are presented by process owners for the implementation of the quality management systems. The effectiveness of the action taken to address risks and opportunities are also presented by relevant process owners. The inputs from process owners are reviewed. New opportunities for improving the quality management systems are identified during the review.

Source: own work on basis: (Natarajan, 2017).

4. Conclusion

Audits are very useful tool to analyses the organization functioning and improve it's performance. On the basis of the conducted analysis we can say that the main activities needed in the internal audit process are: interview personnel, observe operations, review documents and records and examine records. In the audit process is especially important for auditor to have appropriate qualities. They should be according to ISO 19011 requirements. The best solution for the analysis of the performance of ISO 9001 system can be done when we not only use internal audits but also management reviews in our managerial practice.

References

1. Abuhav, I. (2017). ISO 9001:2015. *A Complete Guide to Quality Management Systems*, London: CRC Press.
2. Chen, C.K., Lee, J.D., Dahlgaard, J.J. (2016). A stepwise ISO-based TQM implementation approach using ISO 9001:2015, *Management and Production Engineering Review*, *4*, 65-75.
3. Cholewicka-Goździk, K. (2016). Struktura normy ISO 9001:2015, podstawowe wymagania. *Problemy Jakości, 1*, 25-30.

4. Egonsson, E., Bayarsaikhan, K., Ting, Ly, T. (2013). *After-sales services and customer relationship marketing: a multiple case study within Swedish heavy equipment machinery industry.* Kalmar: Linneus University.
5. Gębczyńska, A., Wolniak, R. (2018). *Process management level in local government.* Philadelphia: CreativeSpace.
6. Hillson, D. (2001). *Effective strategies for exploiting opportunities*. Nashville: Tennessee.
7. Horodecka, A.M., Wolniak, R. (2015). Valutazione delle non conformita nell'esempio di un Azienda Italiana. In: J. Kaźmierczak (ed.), *Systemy Wspomagania Inżynierii Produkcji. Review of problems and solutions* (pp. 18-31).
8. Hoyle, D. (2009). *ISO 9000. Quality systems handbook*. Boston: Elsevier.
9. ISO 19011:2011. *Guidelines for auditing management system*.
10. *ISO 9001 Quality Management Systems. tips for Internal Auditing*, bsi, https://www.google.pl/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjj0ZOjs63ZAhULKFAKHQKDD6MQFggzMAA&url=https%3A%2F%2Fwww.bsigroup.com%2FLocalFiles%2Fen-AE%2FPerformance%2FISO%25209001%2FISO%25209001%2520Internal%2520Audit%2520Tips%2520Hi-Res%2520MEA.pdf&usg=AOvVaw0cPzBYm8HYg_fDsu8zy7a0, 17.09.2020.
11. *ISO 9001:2015. Quality management systems – Requirements*.
12. Juszczak-Wiśniewska, A., Ligarski, M. (2015). Weryfikacja przydatności opracowanego narzędzia badawczego do analizy problemów w systemach zarządzania jakością. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie, 80,* 133-141.
13. Juszczak-Wiśniewska, A., Ligarski, M. (2015). Analysis of the causes the quantitative changes and trends in conferred ISO 9001 certificates in Poland Research based on the data from audits. *Systemy Wspomagania w Inżynierii Produkcji, 1,* 42-50.
14. Juszczak-Wiśniewska, A., Ligarski, M. (2016). Akredytacja i certyfikacja systemów zarządzania jakością w placówkach medycznych w Polsce – wyniki badań. *Systemy Wspomagania w Inżynierii Produkcji, 2,* 163-171.
15. Łagowski, E., Żuchowski, J. (2016). Aktualizacje normy ISO 9001 w aspekcie bieżących potrzeb gospodarczych. *Problemy Jakości, 10,* 15-22.
16. Ligarski, M. (2013). Problems examination in quality management system. *Acta Technologica Agriculture, 4,* 108-112.
17. Ligarski, M. (2014). Diagnoza systemu zarządzania jakością w polskich organizacjach. *Problemy Jakości, 5,* 14-22.
18. Locher, D. (2008). Value Stream Mapping for Lean Development. New York: Taylor & Francis.
19. Łuczak, J., Wolniak, R. (2016). Integration of quality environment and safety management systems in a foundry. *Metalurgija, 4,* 843-845.
20. Misztal, A. (2013). When you need validation of the process? *Machines Technology Materials, 11,* 53-67.

21. Mitra, A. (2016). Fundamentals of Quality Control improvement. New Jersey: Wiley & Sons.
22. Montgomery, D.C. (2009). *Introduction to statistical quality control.* New York: Wiley & Sons.
23. Natarajan, D. (2015). *Reliable design of electronic equipment: an engineering guide.* Bangalore: Springer.
24. Natarajan, D. (2017). *ISO 9001. Quality Management Systems.* Bangalore: Springer.
25. Novakova, R., Cekanova, K., Paulikova, A. (2016). Integration management system – new of requirements of ISO 9001:2015 and ISO 14001:2015 standards. *Production Engineering Archives*, *4,* 35-40.
26. Olkiewicz, M., Wolniak, R., Grebski, E.M., Olkiewicz, A. (2019). Comparative analysis of the impact of the business incubator center on the economic sustainable development of regions in USA and Poland. *Sustainability*, *1*, 1-22.
27. Pacana, A. (2014). *Synteza i doskonalenie wdrażania systemów zarządzania jakością zgodnych z ISO 9001 w małych i średnich organizacjach*. Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
28. Pacana, A., Gazda, A., Bednárová, L. (2014). The impact of quality information on innovatory environment of the public administration. *International Journal of Interdisciplinarity in Theory and Practice*, *4,* 25-26
29. Pacana, A., Ingaldi, M., Czajkowska, A. (2017). *Projektowanie i wdrażanie sformalizowanych systemów zarządzania*. Rzeszów: Wydawnictwo Politechniki Rzeszowskiej.
30. Pacana, A., Lew, G., Kulpa, W. (2017). Rating the quality of implementation of environmental management systems. *Journal of Business & Retail Management Research*, *11(2),* 165-169
31. Pacana, A., Stadnicka, D. (2006). *Wdrażanie i audytowanie systemów zarządzania jakością zgodnych z normą ISO 9001:2000.* Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
32. Pacana, A., Stadnicka, D. (2017). *Nowoczesne systemy zarządzania jakością zgodne z ISO 9001:2015.* Rzeszów: Wydawnictwo Politechniki Rzeszowskiej.
33. Philips, A.W. (2015). *ISO 9001:2015. Internal autits made easy. Tools, techniques and Step-by-Step Guidelines for Successful Internal Audit.* Milwaukee: ASQ.
34. Poksińska, P., Dahlgaard, J.J., Marc, A. (2002). The state of ISO 9000 certification. A study of Swedish organizations. *The TQM Magazine, 5,* 297-305.
35. Purushothama, B. (2015). *Implementing ISO 9001:2015.* New Delhi: Woodhead Publishing India.
36. Stawiarska, E., Szwajca, D., Matusek, M., Wolniak, R. (2020). *Wdrażanie rozwiązań przemysłu 4.0 w wybranych funkcjonalnych obszarach zarządzania przedsiębiorstw branży motoryzacyjnej: próba diagnozy.* Warszawa: CeDeWu.

37. Sułkowski, M., Wolniak, R. (2016). Przegląd stosowanych metod oceny skuteczności i efektywności organizacji zorientowanych na ciągłe doskonalenie. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacja i Zarzadzanie*, *67*, 63-74.
38. Sułkowski, M., Wolniak, R. (2018). *Poziom wdrożenia instrumentów zarządzania jakością w przedsiębiorstwach branży obróbki metali.* Częstochowa: Oficyna Wydawnicza Stowarzyszenia Menedżerów Produkcji i Jakości.
39. Szczucka-Lasota, B., Wolniak, R. (2018). Control plan and research supply as a tool in the process of decision making. *Zeszyty Naukowe Politechniki Ślaskiej. Seria Organizacja i Zarządzanie*, *115,* 439-447.
40. Szkiel, A. (2016). Orientacja na klienta w wymaganiach normy ISO 9001:2015. *Marketing i Zarządzanie, 3,* 83-93.
41. Vogt, K. (2010). *Human as an important factor in process production control.* 7th international BAAAM Baltic Conference.
42. Wolniak, R., Sułkowski, M. (2015). Motywy wdrażanie certyfikowanych Systemów Zarządzania Jakością. *Problemy Jakości*, *9*, 4-9.
43. Wolniak, R., Skotnicka-Zasadzień, B. (2014). The use of value stream mapping to introduction of organizational innovation in industry. *Metalurgija*, *53(4),* 709-713.
44. Wolniak, R. (2011). *Parametryzacja kryteriów oceny poziomu dojrzałości systemu zarządzania jakością.* Gliwice: Wydawnictwo Politechniki Śląskiej.
45. Wolniak, R. (2013). A typology of organizational cultures in terms of improvement of the quality management. *Manager*, *17(1),* 7-21.
46. Wolniak, R. (2013). Normalizacja zarządzania jakością a wymiary kulturowe kraju. *Problemy Jakości*, *9,* 19-25.
47. Wolniak, R. (2013). Projakościowa typologia kultur organizacyjnych. *Przegląd Organizacji, 3,* 13-17.
48. Wolniak, R. (2013). W kierunku ISO 9001:2015. *Problemy Jakości, 2,* 10-14.
49. Wolniak, R. (2014). Korzyści doskonalenia systemów zarządzania jakością opartych o wymagania normy ISO 9001:2009. *Problemy Jakości, 3*, 20-25.
50. Wolniak, R. (2016). Kulturowe aspekty zarządzania jakością. *Etyka biznesu i zrównoważony rozwój, Interdyscyplinarne studia teoretyczno-empiryczne*, *1*, 109-122.
51. Wolniak, R. (2016). *Metoda QFD w zarządzaniu jakością. Teoria i praktyka*. Gliwice: Wydawnictwo Politechniki Śląskiej.
52. Wolniak, R. (2017). Analiza relacji pomiędzy wskaźnikiem innowacyjności a nasyceniem kraju certyfikatami ISO 9001, ISO 14001 oraz ISO/TS 16949. *Kwartalnik Organizacja i Kierowanie, 2,* 139-150.
53. Wolniak, R. (2017). Analiza wskaźników nasycenia certyfikatami ISO 9001, ISO 14001 oraz ISO/TS 16949 oraz zależności pomiędzy nimi. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie*, *108,* 421-430.

54. Wolniak, R. (2017). The Design Thinking method and its stages. *Systemy Wspomagania Inżynierii Produkcji, 6,* 247-255.
55. Wolniak, R. (2017). *The use of constraint theory to improve organization of work*. 4th International Multidisciplinary Scientific Conference on Social Sciences and Arts. SGEM 2017, 24-30 August 2017, Albena, Bulgaria. Conference proceedings. Book 1, *Modern science. Vol. 5, Business and management*. Sofia: STEF92 Technology, 1093-1100.
56. Wolniak, R. (2019). Context of the organization in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *133*, 121-136.
57. Wolniak, R. (2019). Downtime in the automotive industry production process – cause analysis. *Quality, Innovation, Prosperity*, *2,* 101-118.
58. Wolniak, R. (2019). Leadership in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *133*, 137-150.
59. Wolniak, R. (2019). Support in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *137*, 247-261.
60. Wolniak, R. (2019). The level of maturity of quality management systems in Poland-results of empirical research. *Sustainability*, *15*, 1-17.
61. Wolniak, R. (2020). Design in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *148*, 769-781.
62. Wolniak, R. (2020). Operations in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *148*, 783-794.
63. Wolniak, R. (2020). Quantitative relations between the implementation of industry management systems in European Union countries. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *142*, 33-44.
64. Wolniak, R., Sułkowski, M. (2015). Rozpowszechnienie stosowania Systemów Zarządzania Jakością w Europie na świecie – lata 2010-2012. *Problemy Jakości*, *5,* 29-34.
65. Wolniak, R., Grebski, M.E., Skotnicka-Zasadzień, B. (2019). Comparative analysis of the level of satisfaction with the services received at the business incubators (Hazleton, PA, USA and Gliwice, Poland). *Sustainability*, *10,* 1-22.
66. Wolniak, R., Hąbek, P. (2015). Quality management and corporate social responsibility. *Systemy Wspomagania w Inżynierii Produkcji*, *1,* 139-149.
67. Wolniak, R., Skotnicka, B. (2011).: *Metody i narzędzia zarządzania jakością – Teoria i praktyka, cz. 1.* Gliwice: Wydawnictwo Naukowe Politechniki Śląskiej.
68. Wolniak, R., Skotnicka-Zasadzień, B. (2008). *Wybrane metody badania satysfakcji klienta i oceny dostawców w organizacjach.* Gliwice: Wydawnictwo Politechniki Śląskiej.
69. Wolniak, R., Skotnicka-Zasadzień, B. (2010). *Zarządzanie jakością dla inżynierów.* Gliwice: Wydawnictwo Politechniki Śląskiej.

70. Wolniak, R., Skotnicka-Zasadzień, B., Zasadzień, M. (2019). Problems of the functioning of e-administration in the Silesian region of Poland from the perspective of a person with disabilities. *Transylvanian Review of Public Administration*, *57E,* 137-155.
71. Wolniak, R., Sułkowski, M. (2016). The reasons for the implementation of quality management systems in organizations. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie, 92,* 443-455.
72. Ząbek, J. (2016). ISO 9001:2015. Wybrane problemy zarządzania z perspektywy nowej normy. *Ekonomika i Organizacja Przedsiębiorstwa*, *2,* 14-25.
73. Żemigała, M. (2017). Tendencje w badaniach nad normą ISO 9001. *Problemy Jakości*, *3*, 2-9.

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2021
ORGANIZATION AND MANAGEMENT SERIES NO. 151

PERFORMANCE EVALUATION IN ISO 9001:2015

Radosław WOLNIAK
Politechnika Śląska, Wydział Organizacji i Zarządzania, Instytut Ekonomii i Informatyki; rwolniak@polsl.pl,
ORCID: 0000-0003-0317-9811

Purpose: The aim of the paper is to analyze the problems connected with the performance evaluation realized within the organization in the ISO 9001:2015 implementation process.
Design/methodology/approach: Critical literature analysis. Analysis of international literature from main databases and polish literature and legal acts connecting with researched topic.
Findings: The organization shall evaluate the performance and the effectiveness of the quality management system. it should retain appropriate documented information as evidence of the results. To achieve good performance evolution level in organization which have ISO 9001:2015 quality management system we need to implement appropriate monitoring system. Especially useful system is a system based on KPIs indicators which can measure particular activities of the organization. If we use good and broad system of KPIs indicator we can measure almost all aspect of functioning of quality management system. Then we could use those measure in the process of quality management system improvement. It lead to better performance of the system, better quality and better customer satisfaction.
Originality/value: Detailed analysis of all subjects related to performance evaluation in ISO 9001:2015.

Keywords: quality management, ISO 9001:2015, ISO 9001, performance, KPI.

Category of the paper: literature review.

1. Introduction

The using of quality management system is now widely widespread in almost all counties (ISO 9001:2015; Chen et al., 2016; Cholewicka-Goździk, 2016; Łagowski, and Żuchowski, 2016; Wolniak, and Hąbek, 2015; Wolniak, and Skonicka-Zasadzień, 2010; Wolniak, and Sułkowski, 2015; Wolniak, 2020). New version of implemented standards need the impelemntation of performance evaluation processes (Hillson, 2001; Gębczyńska, and Wolniak, 2018; Juszczak-Wiśniewska, and Ligarski, 2015, 2016; Łuczak, and Wolniak, 2016; Sułkowski, and Wolniak, 2016, 2018; Szczucka-Lasota, and Wolniak, 2018). This evaluation is widely used in organization to achieve the increase of effectiveness of quality management

system implemented in particular organization (Horodecka, and Wolniak, 2015; Pacana, 2014; Pacana et al., 2014, 2017; Pacana, and Stadnicka, 2006, 2017; Wolniak, 2011; Wolniak, and Sułkowski, 2015; Wolniak, and Sułkowski, 2016; Wolniak et al., 2019; Wolniak and Skotnicka-Zasadzień, 2008, 2011, 2019; Novakova, et al., 2016; Stawiarska, et al., 2020).

The organization shall evaluate the performance and the effectiveness of the quality management system. it should retain appropriate documented information as evidence of the results.

The aim of the paper is to analyze the problems connected with the performance evaluation realized within the organization in the ISO 9001:2015 implementation process.

2. The scope of performance evaluation

To do a proper performance evaluation the organization shall to determine (ISO 9001:2015; Ząbek, 2016):

- what needs to be monitored and measured;
- the methods for monitoring, measurement, analysis and evaluation needed to ensure valid results;
- when the monitoring and measuring shall be performed;
- when the results from monitoring and measurement shall be analyzed and evaluated.

The processes of the quality management system should be improved. The main processes under improvement are (Natarajan, 2017; Egonsson et al., 2013):

- General requirements.
- Nonconformity and corrective action.
- Continual improvement.

Evaluating the customer's performance firstly the organization should to measure the customer satisfaction (Pokosińska et al., 2002; Szkiel, 2016; Żemigła, 2017). The organization shall determine the methods for obtaining, monitoring and reviewing this.

We can define customer satisfaction as (Wolniak, 2018; Hoyle, 2009; Montgomery, 2009):

- customer satisfaction measure how well the expectation of a customer concerning a product or service provided by company have been met,
- the degree of satisfaction provided by the goods or services of a company as measured by the number of repeat customers,
- a feeling of satisfaction felt by customer with a product or service obtained from a business,

- customer satisfaction indicates the fulfillment that customers derive from doing business with a firm. In other words, it's how happy the customers are with their transaction and overall experience with the company,
- satisfaction is as a judgment following a consumption experience – it is the consumer's judgment that a product provided a pleasurable level of consumption-related fulfillment.

3. Monitoring and measuring

The organization shall analyze and evaluate appropriate data and information arising from monitoring and measurement (Locher, 2008; Misztal, 2013; Mitra, 2016; Vogt, 2010). The results of analysis should be used to evaluate following activities (Wolniak, 2018):

- conformity of products and services;
- the degree of customer satisfaction;
- the performance and effectiveness of the quality management system;
- if planning has been implemented effectively;
- the effectiveness of actions taken to address risks and opportunities;
- the performance of external providers;
- the need for improvements to the quality management system.

Monitoring and measuring the performance of quality management system processes generate data. The data is analyzed and the results of analysis are used to evaluate the performance of processes. The planning of monitoring, measurement, analysis and evaluation actives are presented in the figure 1.

The definitions of the terms used in the figure are as follows (ISO 9001:2015):

- Monitoring—a continuous inspection or observation of process performance or process output for a special purpose through a defined scope (e.g., with a sample size or over a period of time) and maintaining records of those observations.
- Measurement—the activity of delivering data to a method in order to define objectively a quantitative or qualitative measure and capturing a situation without any references to the significance.
- Analysis—a set of techniques for examining trends and tendencies of measurements of an output (process or product).
- Evaluation—the action of comparing a process or process output measurements against given criteria to determine the performance of the process or conformity of a process output.

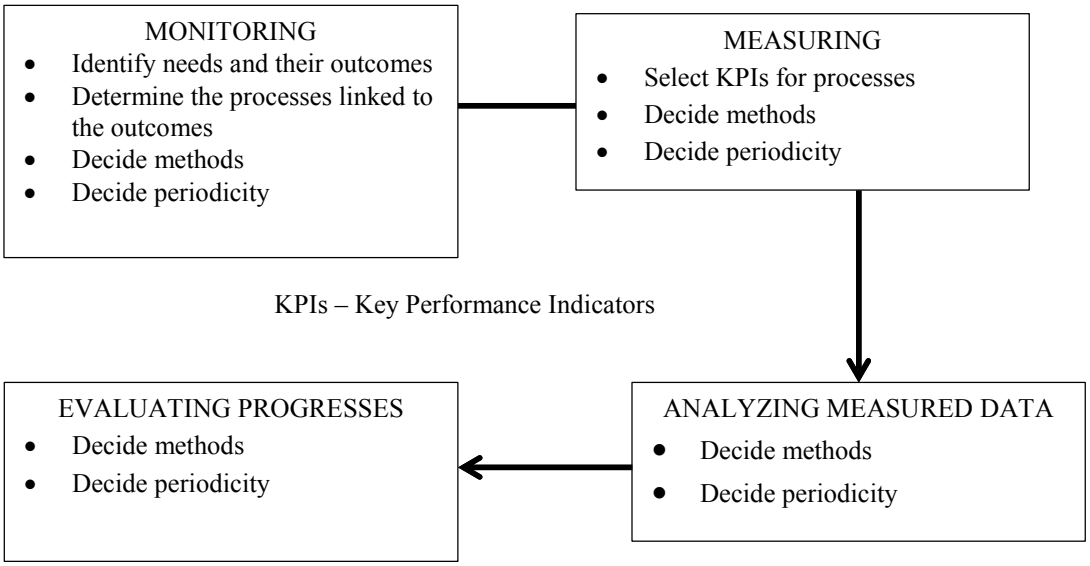


Figure 1. Planning of monitoring, measurement, analysis and evaluation. Source: (Natarajan, 2017).

The standard measure of functioning quality management systems are KPIs – Key Performance Indicators. They are used in the organization to evaluate the effectiveness of a system. Monitoring and measuring KPIs present the performance of processes, operations and activities related to KPIs. When choosing the KPIs suitable for particular organization we should consider following points (Natarajan, 2017):

- The KPIs shall be related to the needs and expectations of interested parties, for example, KPIs may be part of the customer satisfaction or product performance objective.
- The KPIs shall be aligned with organizational strategies and drive the organization to achieve its quality objectives, for example, KPIs shall relate to quantity of nonconformities or level of customer satisfaction.
- KPIs should focus on a few high-value activities that reflect effectiveness of the process and that will deliver the most adequate data.
- KPIs shall provide critical information and data. In other words, changes that will be based on results of monitoring and measuring the KPI will induce changes and reactions on the organization.
- KPIs may be based on standard definitions, rules, and calculations, in order to enable a better analysis of the data they provide.
- For each KPI, an individual, a group, or a specific person shall be held responsible, for example, a process owner.
- KPIs shall be practical, which means it will be possible to draw conclusions from the data that are delivered.

- KPIs should relate to the activities and operations of the quality management systems, and the relevant personnel may understand how they may influence them.
- The KPIs shall indicate points and events in a process that must be analyzed and evaluated.
- KPIs shall relate to the business activities and will make it possible for employees to know and identify when their intervention is needed when nonconformities are detected.
- Different KPIs should reinforce each other and not compete, contradict, or arouse conflicts with other KPIs.

The decisions on what is to be achieved and monitored should be derived from the risks and opportunities the organization face in successfully running the activities and improve further. Whatever we measure should help to (Purushothama, 2015):

- demonstrate the conformity of goods and services to requirements,
- evaluate the performance of processes,
- ensure the conformity and effectiveness of the quality management,
- system, and evaluate customer satisfaction.

Each monitoring and measuring activity should be conducted according to a defined method. The goal is to identify for each process, the parameters of output that affect its quality and determine the activities necessary to ensure valid results, activities that will ensure that the monitoring and measurement deliver results that can be analyzed and evaluated. When we monitor a process, the following issues should be referred (Abuhay, 2017):

- Identification of the processes or process outputs that must be monitored and measured.
- Identification of those parameters or outputs that may indicate how the process behaves.
- Identification of the function or the role responsible for conducting the activities of measurement (designated employees, a certain department, organizational unit, etc.).
- Definition of parameters for monitoring such as process conditions, interval, sampling rates, batch loads, and quantities.
- Description of the stages during the process where measurement activities shall be undertaken.
- Tools, equipment, or software required to perform or assist in the measurement.
- The activities and the use of techniques of measuring the process.
- Where and how the results must be documented.
- The criteria necessary for the evaluation of the results (the objectives).
- Action required in case nonconformities are detected.

4. Conclusion

To achieve good performance evolution level in organization which have ISO 9001:2015 quality management system we need to implement appropriate monitoring system. Especially useful system is a system based on KPIs indicators which can measure particular activities of the organization. If we use good and broad system of KPIs indicator we can measure almost all aspect of functioning of quality management system. Then we could use those measure in the process of quality management system improvement. It lead to better performance of the system, better quality and better customer satisfaction.

References

1. Abuhav, I. (2017). ISO 9001:2015. *A Complete Guide to Quality Management Systems*, London: CRC Press.
2. Chen, C.K., Lee, J.D., Dahlgaard, J.J. (2016). A stepwise ISO-based TQM implementation approach using ISO 9001:2015, *Management and Production Engineering Review*, *4*, 65-75.
3. Cholewicka-Goździk, K. (2016). Struktura normy ISO 9001:2015, podstawowe wymagania. *Problemy Jakości, 1*, 25-30.
4. Egonsson, E., Bayarsaikhan, K., Ting, Ly, T. (2013). *After-sales services and customer relationship marketing: a multiple case study within Swedish heavy equipment machinery industry.* Kalmar: Linneus University.
5. Gębczyńska, A., Wolniak, R. (2018). *Process management level in local government.* Philadelphia: CreativeSpace.
6. Hillson, D. (2001). *Effective strategies for exploiting opportunities*. Nashville: Tennessee.
7. Horodecka, A.M., Wolniak, R. (2015). Valutazione delle non conformita nell'esempio di un Azienda Italiana. In: J. Kaźmierczak (ed.), *Systemy Wspomagania Inżynierii Produkcji. Review of problems and solutions* (pp. 18-31).
8. Hoyle, D. (2009). *ISO 9000. Quality systems handbook*. Boston: Elsevier.
9. *ISO 9001:2015. Quality management systems – Requirements*.
10. Juszczak-Wiśniewska, A., Ligarski, M. (2015). Weryfikacja przydatności opracowanego narzędzia badawczego do analizy problemów w systemach zarządzania jakością. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie, 80,* 133-141.
11. Juszczak-Wiśniewska, A., Ligarski, M. (2015). Analysis of the causes the quantitative changes and trends in conferred ISO 9001 certificates in Poland Research based on the data from audits. *Systemy Wspomagania w Inżynierii Produkcji, 1,* 42-50.

12. Juszczak-Wiśniewska, A., Ligarski, M. (2016). Akredytacja i certyfikacja systemów zarządzania jakością w placówkach medycznych w Polsce – wyniki badań. *Systemy Wspomagania w Inżynierii Produkcji, 2,* 163-171.
13. Łagowski, E., Żuchowski, J. (2016). Aktualizacje normy ISO 9001 w aspekcie bieżących potrzeb gospodarczych. *Problemy Jakości, 10,* 15-22.
14. Ligarski, M. (2013). Problems examination in quality management system. *Acta Technologica Agriculture, 4,* 108-112.
15. Ligarski, M. (2014). Diagnoza systemu zarządzania jakością w polskich organizacjach. *Problemy Jakości, 5,* 14-22.
16. Locher, D. (2008). Value Stream Mapping for Lean Development. New York: Taylor & Francis.
17. Łuczak, J., Wolniak, R. (2016). Integration of quality environment and safety management systems in a foundry. *Metalurgija, 4,* 843-845.
18. Misztal, A. (2013). When you need validation of the process? *Machines Technology Materials, 11,* 53-67.
19. Mitra, A. (2016). Fundamentals of Quality Control improvement. New Jersey: Wiley & Sons.
20. Montgomery, D.C. (2009). *Introduction to statistical quality control.* New York: Wiley & Sons.
21. Natarajan, D. (2015). *Reliable design of electronic equipment: an engineering guide.* Bangalore: Springer.
22. Natarajan, D. (2017). *ISO 9001. Quality Management Systems.* Bangalore: Springer.
23. Novakova, R., Cekanova, K., Paulikova, A. (2016). Integration management system – new of requirements of ISO 9001:2015 and ISO 14001:2015 standards. *Production Engineering Archives*, *4,* 35-40.
24. Olkiewicz, M., Wolniak, R., Grebski, E.M., Olkiewicz, A. (2019). Comparative analysis of the impact of the business incubator center on the economic sustainable development of regions in USA and Poland. *Sustainability*, *1*, 1-22.
25. Pacana, A. (2014). *Synteza i doskonalenie wdrażania systemów zarządzania jakością zgodnych z ISO 9001 w małych i średnich organizacjach*. Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
26. Pacana, A., Gazda, A., Bednárová, L. (2014). The impact of quality information on innovatory environment of the public administration. *International Journal of Interdisciplinarity in Theory and Practice*, *4,* 25-26
27. Pacana, A., Ingaldi, M., Czajkowska, A. (2017). *Projektowanie i wdrażanie sformalizowanych systemów zarządzania*. Rzeszów: Wydawnictwo Politechniki Rzeszowskiej.

28. Pacana, A., Lew, G., Kulpa, W. (2017). Rating the quality of implementation of environmental management systems. *Journal of Business & Retail Management Research*, *11(2),* 165-169
29. Pacana, A., Stadnicka, D. (2006). *Wdrażanie i audytowanie systemów zarządzania jakością zgodnych z normą ISO 9001:2000.* Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej.
30. Pacana, A., Stadnicka, D. (2017). *Nowoczesne systemy zarządzania jakością zgodne z ISO 9001:2015.* Rzeszów: Wydawnictwo Politechniki Rzeszowskiej.
31. Philips, A.W. (2015). *ISO 9001:2015. Internal autits made easy. Tools, techniques and Step-by-Step Guidelines for Successful Internal Audit.* Milwaukee: ASQ.
32. Poksińska, P., Dahlgaard, J.J., Marc, A. (2002). The state of ISO 9000 certification. A study of Swedish organizations. *The TQM Magazine, 5,* 297-305.
33. Purushothama, B. (2015). *Implementing ISO 9001:2015.* New Delhi: Woodhead Publishing India.
34. Stawiarska, E., Szwajca, D., Matusek, M., Wolniak, R. (2020). *Wdrażanie rozwiązań przemysłu 4.0 w wybranych funkcjonalnych obszarach zarządzania przedsiębiorstw branży motoryzacyjnej: próba diagnozy.* Warszawa: CeDeWu.
35. Sułkowski, M., Wolniak, R. (2016). Przegląd stosowanych metod oceny skuteczności i efektywności organizacji zorientowanych na ciągłe doskonalenie. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacja i Zarzadzanie*, *67*, 63-74.
36. Sułkowski, M., Wolniak, R. (2018). *Poziom wdrożenia instrumentów zarządzania jakością w przedsiębiorstwach branży obróbki metali.* Częstochowa: Oficyna Wydawnicza Stowarzyszenia Menedżerów Produkcji i Jakości.
37. Szczucka-Lasota, B., Wolniak, R. (2018). Control plan and research supply as a tool in the process of decision making. *Zeszyty Naukowe Politechniki Ślaskiej. Seria Organizacja i Zarządzanie*, *115,* 439-447.
38. Szkiel, A. (2016). Orientacja na klienta w wymaganiach normy ISO 9001:2015. *Marketing i Zarządzanie, 3,* 83-93.
39. Vogt, K. (2010). *Human as an important factor in process production control.* 7th international BAAAM Baltic Conference.
40. Wolniak, R., Sułkowski, M. (2015). Motywy wdrażanie certyfikowanych Systemów Zarządzania Jakością. *Problemy Jakości*, *9,* 4-9.
41. Wolniak, R, Skotnicka-Zasadzień, B. (2014). The use of value stream mapping to introduction of organizational innovation in industry. *Metalurgija*, *53(4),* 709-713.
42. Wolniak, R. (2011). *Parametryzacja kryteriów oceny poziomu dojrzałości systemu zarządzania jakością.* Gliwice: Wydawnictwo Politechniki Śląskiej.
43. Wolniak, R. (2013). A typology of organizational cultures in terms of improvement of the quality management. *Manager*, *17(1),* 7-21.

44. Wolniak, R. (2013). Normalizacja zarządzania jakością a wymiary kulturowe kraju. *Problemy Jakości, 9,* 19-25.
45. Wolniak, R. (2013). Projakościowa typologia kultur organizacyjnych. *Przegląd Organizacji*, *3*, 13-17.
46. Wolniak, R. (2013). W kierunku ISO 9001:2015. *Problemy Jakości, 2,* 10-14.
47. Wolniak, R. (2014). Korzyści doskonalenia systemów zarządzania jakością opartych o wymagania normy ISO 9001:2009. *Problemy Jakości*, *3,* 20-25.
48. Wolniak, R. (2016). Kulturowe aspekty zarządzania jakością. *Etyka biznesu i zrównoważony rozwój, Interdyscyplinarne studia teoretyczno-empiryczne*, *1*, 109-122.
49. Wolniak, R. (2016). *Metoda QFD w zarządzaniu jakością. Teoria i praktyka*. Gliwice: Wydawnictwo Politechniki Śląskiej.
50. Wolniak, R. (2017). Analiza wskaźników nasycenia certyfikatami ISO 9001, ISO 14001 oraz ISO/TS 16949 oraz zależności pomiędzy nimi. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie*, *108,* 421-430.
51. Wolniak, R. (2017). The Design Thinking method and its stages. *Systemy Wspomagania Inżynierii Produkcji, 6,* 247-255.
52. Wolniak, R. (2017). *The use of constraint theory to improve organization of work*. 4th International Multidisciplinary Scientific Conference on Social Sciences and Arts. SGEM 2017, 24-30 August 2017, Albena, Bulgaria. Conference proceedings. Book 1, *Modern science. Vol. 5, Business and management*. Sofia: STEF92 Technology, 1093-1100.
53. Wolniak, R. (2019). Context of the organization in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *133*, 121-136.
54. Wolniak, R. (2019). Downtime in the automotive industry production process – cause analysis. *Quality, Innovation, Prosperity*, *2,* 101-118.
55. Wolniak, R. (2019). Leadership in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *133*, 137-150.
56. Wolniak, R. (2019). Support in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *137,* 247-261.
57. Wolniak, R. (2019). The level of maturity of quality management systems in Poland – results of empirical research. *Sustainability*, *15*, 1-17.
58. Wolniak, R. (2020). Design in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series, 148*, 769-781.
59. Wolniak, R. (2020). Operations in ISO 9001:2015. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *148*, 783-794.
60. Wolniak, R. (2020). Quantitative relations between the implementation of industry management systems in European Union countries. *Silesian University of Technology Scientific Papers. Organization and Management Series*, *142*, 33-44.

61. Wolniak, R., Sułkowski, M. (2015). Rozpowszechnienie stosowania Systemów Zarządzania Jakością w Europie na świecie – lata 2010-2012. *Problemy Jakości*, *5,* 29-34.
62. Wolniak, R., Grebski, M.E., Skotnicka-Zasadzień, B. (2019). Comparative analysis of the level of satisfaction with the services received at the business incubators (Hazleton, PA, USA and Gliwice, Poland). *Sustainability*, *10,* 1-22.
63. Wolniak, R., Hąbek, P. (2015). Quality management and corporate social responsibility. *Systemy Wspomagania w Inżynierii Produkcji*, *1,* 139-149.
64. Wolniak, R., Skotnicka, B. (2011). *Metody i narzędzia zarządzania jakością – Teoria i praktyka, cz. 1.* Gliwice: Wydawnictwo Naukowe Politechniki Śląskiej.
65. Wolniak, R., Skotnicka-Zasadzień, B. (2008). *Wybrane metody badania satysfakcji klienta i oceny dostawców w organizacjach.* Gliwice: Wydawnictwo Politechniki Śląskiej.
66. Wolniak, R., Skotnicka-Zasadzień, B. (2010). *Zarządzanie jakością dla inżynierów.* Gliwice: Wydawnictwo Politechniki Śląskiej.
67. Wolniak, R., Skotnicka-Zasadzień, B., Zasadzień, M. (2019). Problems of the functioning of e-administration in the Silesian region of Poland from the perspective of a person with disabilities. *Transylvanian Review of Public Administration*, *57E*, 137-155.
68. Wolniak, R., Sułkowski, M. (2016). The reasons for the implementation of quality management systems in organizations. *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacji i Zarządzanie*, *92,* 443-455.
69. Ząbek, J. (2016). ISO 9001:2015. Wybrane problemy zarządzania z perspektywy nowej normy. *Ekonomika i Organizacja Przedsiębiorstwa, 2,* 14-25.
70. Żemigała, M. (2017). Tendencje w badaniach nad normą ISO 9001. *Problemy Jakości*, *3*, 2-9.

REVIEWERS

PhD **Michaline GREBSKI**, Northampton Community College, USA
Prof. **Wiesław GREBSKI**, The Pennsylvania State University, USA
PhD **Jacques de JONGH**, North-West University Vanderbijlpark, South Africa
Prof. **Anita KOLNHOFER-DERECSKEI**, Obuda University Keleti Faculty of Business and Management, Hungary
Prof **Aleksandra KUZIOR**, Silesian University of Technology, Poland
Prof. **Aleksander LOTKO**, Kazimierz Pułaski University of Technology and Humanities in Radom, Poland
Prof. **Rafał MATWIEJCZUK**, Opole University of Technology, Poland
Prof. **Andrzej PACANA**, Rzeszów Technical University, Poland
PhD **Adam PAWLICZEK**, University of Economics, Prague, Czech Republic
PhD **Regina REICHER**, Óbuda University, Kelety Faculty of Business and Management, Hungry
Prof. **Anatoliy SACHENKO**, Ternopil National Economic University, Ukraine
Prof. **Sebastian SANIUK**, University of Zielona Góra, Poland
PhD **Bożena SKOTNICKA-ZASADZIEŃ**, Silesian University of Technology, Poland
Prof. **Adam SKRZYPEK**, Siedlce University of Natural Sciences and Humanities, Poland
Prof. **Cecilia SZIGETI**, Szechenyi University, Hungary
Prof. **Nataliia TRUSHKINA**, Institute of Industrial Economics of the NAS of Ukraine, Ukraine
Prof. **Victar VASILEU**, Belarudian State Agricultural Academy, Belarus
Prof. **Radosław WOLNIAK**, Silesian University of Technology, Poland