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FOREWORD

Presented number of Silesian University of Technology. Scientific Papers. Organization and Management Series. Contemporary management. Presented papers contain result of researches conducted by authors from Ukraine and Poland. The number consists of 40 papers.

The papers presented in the number concentrate on many topics connected with organization and management. The authors of paper concentrate on problems connected with: logistics, marketing, innovation management, human resources management, strategic management, production management, quality management, circular economy, technology management, management in health care, entrepreneurship, smart city, Industry 4.0, sustainable development.

Radosław Wolniak

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ORGANIZATION AND MANAGEMENT SERIES NO. 155

NEW INFRASTRUCTURES IN ENHANCING MOBILITY IN THE CITY OF NAIROBI

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Purpose: The main aim of this paper is to show how the new, especially the current development in infrastructure in the urban setup, in this case, the capital city of Kenya, Nairobi, improves the movement within the city. Furthermore, it also examines the various ways in which these new infrastructures have improved or improved the quality of life of the city residents.

Design/methodology/approach: Nairobi city was chosen as it is the biggest and largest city in east and central Africa. The literature theories used in this paper were gathered from various internet sources such as the website of Nairobi city authority and also from the website of different media companies. In addition to these, some literature sources and books were also used to gather information for the paper as well as audio-visual sources like YouTube. Personal experience about the country and the city was also used as the author comes from the country and the city being talked about in this paper.

Findings: The outcome of this theoretical paper was that indeed the efficient mobility within a city depends on how well the infrastructures are efficient. These include transport, technology, environmental and social infrastructures. These infrastructures help to improve mobility to a higher level as compared to the previous ones. The new ones being implemented by the city authorities and the central government play a crucial role in improving the living standard of the city residents by easy and efficient movement within the city. The new infrastructures range from physical infrastructures, technologies, the organization to the management of the whole city as all must be combined for efficient mobility.

Originality/value: This article deals with how the new infrastructures help in improving mobility within urban settings especially in a developing world like Kenya. It also looks at the past, current, and future plans for the city's infrastructural development to enhance mobility. These also include the political, social, and economic will of the authorities concerned.

Keywords: Mobility, infrastructure, quality, Nairobi city.

Category of the paper: A literature review.

1. Introduction

Nairobi is the largest and most developed city in east and central Africa. It is also the financial and logistics hub in that region. It is the headquarter of many global organizations such as UNEP(United Nations Environment Program). As the capital city of Kenya, it is the main place of employment where everyone would like to live and work especially after graduating from the educational institutions. As a result of all these, the mobility infrastructures of the city together with the social amenities become under intense pressure from the faster-growing population. Being an important city in the region and with the modernity, the population has trooped into the city over the years hence there was to improve and develop new infrastructures to cater for the demands. Mobility infrastructures in any place on earth are always one of the most expensive investments countries do make.

Most of the mobility infrastructures under the pressure of the growing population were designed in the 1960s to accommodate a smaller population of less than a million which has currently increased to more than 4.4 million considering the visitors of the city. An increase in population together with the rise in the economic development of Nairobi led to more demand for transportation. This led to the increase in the number of buses, cars, and vans on the road. Meanwhile, the commuter train started to break down due to poor services hence putting more pressure on the existing road infrastructures. All these were happening while the existing mobility infrastructures remained unchanged. As a result, serious traffic jams started to emerge in Nairobi and got worse as time passes by. These problems could not make the city smart in terms of mobility thus the demand for proper modern development in transport infrastructures.

The following are some of the challenges the city faces today: managing growth, reducing traffic, creating sustainable development, making smart transportation, and many others. New urban infrastructure is a development strategy by the cities to combat the above challenges by creating city communities that are livable, walkable, and sustainable while increasing the quality of life. (Kemp & Stephani, 2015). The current form of growth, outward expansion development, and constant increased need for more transportation capacity threaten the quality of life as passengers spend more time in their cars and buses and the quality of the environment as more carbon gas is emitted by the stationary vehicles. This problem of traffic is quite serious and has reached a dangerous level as mobility and quality of life within the city has decreased. The occurrence of these problems within the city betrays plans for having a smart city with smart mobility as the aim of being smart is to improve the quality of life. In Nairobi, nearly everyone agrees that traffic congestion is one of the top quality of life complaints apart from unemployment. Within the city itself, the noise from the vehicles and the touts, the thick smoke (as no serious regulation for exhaust fumes from the vehicles) produced by the congested vehicles and the dust caused by the same vehicles are constant daily environmental problems faced by the city community. The combustion of petrol and diesel by engines gives the following emissions: carbon monoxide, carbon dioxide, hydrocarbons, nitric oxides, some sulphur oxides which are present in the exhaust gases from the fuels containing sulphur (Low

& Gleeson, 2003). These exhaust gases accelerate the greenhouse effects and have effects on the health of the city residents thus, reducing the quality of life in the city. As it is known that a city living on total automotive dependence becomes dysfunctional, inefficient and inconvenient for life. The goal of the transport system is to move people, not vehicles or trains (UNECE, 2020).

Therefore, there is a need to develop new transport infrastructures that will give the city convenience, reliability, comfort, speed and safety it needs to enhance mobility.

2. Mobility in Nairobi

At the beginning of the development of the city in the 19th century, the most common means of transport has been vans, trucks, buses, bicycles and motorcycles. By that time, the population was low and commuting time was short and efficient because of less traffic. In the 1960s, the mode of transport within Nairobi were private vehicles, buses and public service vehicles which were mainly transporting passengers from the city suburbs to the city center where many offices were located and to the industrial area of Nairobi for workers. Towards the mid-1960s, privately-owned vans known as 'matatu' started to ferry passengers (Sclar & Alexander, 2007). Initially, they were illegal and popular because they were charging cheap fares. Currently, they are the dominant means of transport within Nairobi where and other major cities (Salon & Gulyani, 2019). Since then, the authorities accepted and gave them the license to do transport business.

The Matatu has a formal and informal extensive network covering a large geographical area within Nairobi. Some buses offer an alternative to Matatus. Most bus routes converge at the city center from the suburbs. They have terminals within the city center which they use. The commuter train operated by the Kenya Railway corporation was also being used to transport passengers within the city. Even though it did not have an extensive rail network, the rail routes it plied were the cheapest of all the means of transport. Currently, the city authority has brought a light-rail system operated as Nairobi Commuter Rail Service to use the existing rail route to improve the transport mobility within Nairobi.

Another common means of transport within Nairobi is the use of taxis. They have designated terminals. With the improvement of technology, there are currently many taxis application and car-sharing mobile applications which most experts preferred. The global one, Uber, is also available. The use of motorcycles to transport passengers has become a great force in the transport industry in Nairobi since motorcycles are not prone to traffic snarl-ups within Nairobi. The use of personal cars is also common especially for those who can afford to buy. Cycling is also gaining popularity even though it is the most underutilized mode of transport. Surprisingly, the majority still prefer walking especially those who live adjacent to the central business district.

Table 1.
The table shows the distribution of use of major means of transport in Nairobi

Mode	Percentage (%)
Public Service Vehicle (PSV)	29
Private Vehicles	15
Motorcycles	6
Train	1
Walking	47
Others	1

3. Mobility Problem in Nairobi

In any urban center, the efficiency and availability of transport is always a major factor in the development of urban centers, especially cities. In Nairobi city, the urban mobility transport is usually characterized by congestion, environmental pollution (noise, smoke and dust), less route network, accessibility, poor demand management, poor safety, insecurity, bad fare policy, worn out and inadequate transport and mobility infrastructures, management and institutional problems and ignorance to quality need (Aligula.E.M, et al., 2005). In 2004, when the new traffic law came to force and was being implemented, the matatu (public service vehicles) operators went on strike protesting the new regulation despite the residents having more expectations that the traffic congestion and chaos in the city transport sector would be over. The congestion in Nairobi increased so rapidly. This problem of public transport in Nairobi shows a significant challenge in respect to ensuring the mobility of the city residents. Furthermore, this challenge affects the ability of the private sector to create more jobs for the city population.

The mobility system in Nairobi generally has unending problems such as high demand gap, expensive fares, high road traffic accidents rates, pollution and unregulated policies. These problems manifest themselves, especially during rush hours. With no proper network planning, the vehicles jammed the road hence worst traffic congestion begins. A journey that would generally take 30 minutes ends up taking two hours because of traffic jams. A productive time is wasted on the traffic alone as people and vehicles spend more time on the road. According to a local newspaper (2021), it was reported that time wasted in those traffic jams cost the city Kenyan shilling 100 billion (approximately $1 billion) every year. The Nairobi Metropolitan Area Transport Authority ranked the city as the fourth congested city globally. This is not good at all for any economy. It is this loss of money that prompted the government and Nairobi city authorities to come up with measures to save the city's economy. Therefore, numerous projects were proposed to find a long-term solution. Some of the projects have been completed, some are still ongoing while others are still in the planning stages.

4. New Mobility Infrastructures in Nairobi

4.1. Nairobi Expressway

It is one of the most decorated urban mobility projects in Nairobi city. It is a 27 km long road linking Mlolongo Town in the Machakos county and Jomo Kenyatta International Airport to the Nairobi Nakuru highway and also the city center. The project aimed to ease the traffic between the central business district of the city to the suburbs. Normally driving along this road especially during rush hours, early morning and evening, was taking almost two hours. But currently, it will take you 20 minutes to drive through. Some features have been incorporated to ensure faster movement of vehicles unlike before such as elevation of parts of the road and dual carriage. The project was started in 2020 and is expected to be officially open in April 2022 at a cost of approximately 487 million euros. It has a toll charge to recover the money invested in it since it is a public-private partnership project (Kenya National Highway Authority, n.d.).

4.2. Nairobi Western Bypass

The highway starts in Wangige and Ndederu then finally terminates at Ruaka on the Western side of the city. It is a dual carriage highway of about 32 km in length. It involves the construction of feeder roads, flyovers, and interchanges. When completed, it will ease the traffic congestion around the city. This will enhance faster mobility between the city center and its environment. The constructions which also involve pedestrians and cycle paths, will ensure safety for all, pedestrians and other non-motorized users and enhance a smooth flow of traffic. In combination with the project, a bus terminus is also being constructed in Wangige which will ensure public transport efficiency and reduce unnecessary traffic disruptions (Mulyungi, 2021).

4.3. Green Park Bus Terminus

It is a bus terminus constructed by the Nairobi Metropolitan Services. It is called green because of its greenery and the use of renewable energy since it is being powered by solar energy. Going green is always the best in terms of renewable energy use. The green parking lots involve capital a capital costs for related infrastructure but later the fuel used is free and plenty(sun) (Verma & Ranjan, 2019). The green park can also be used for recharging the electric buses in the future as diesel-powered buses will be faced out. It aims to decongest the city center which has been crowded by the public service vehicles transporting people around the city. Since many of the vehicles don't have a designated terminus, they have caused huge congestion within the city. By using the Green Park Terminus, more spaces will be available for quick mobility within the city and this has to lead the authorities to construct the cycling paths for the first time in the city. In addition to hosting the public service vehicles, the green terminus has a dispensary, police station, mini supermarket, and other stores.

4.4 Nairobi Commuter Rail Service

It is the use of diesel trains to transport Nairobi residents. The project was realized in 2020 by the president. It uses the existing rail network which was used by the old trains. The new multiple diesel trains in Nairobi are second-hand trains bought from Spain's Mallorcan Railway Services (SFM) (Cuenca, 2021). to help in modernizing the transport system within Nairobi to enhance mobility. In 2020, 13000 passengers used the service daily. This is a big improvement considering that in the previous few years nobody used the old trains. Though the rail system is not widespread across the city, people who live along the routes they are plying currently prefer to use them. The commuter trains have the advantage over other means since they experience no traffic problem unless a very rare breakdown. They have become the most reliable means of transport within Nairobi, especially along their routes. Due to this, the Kenya Railways Corporation is aiming to create a transit-oriented development to support ridership for commuter rail (Kenya Railways, n.d.). This urban rail system gives higher capacity access than the buses, matatu, or private cars with less environmental damage and less demand for land devoted to transport to develop highways and parking spaces (Simpson & Barry, 1994).

4.5 E-Payment (e-jijipay or ejijipay) System for Parking

"Jiji" means city in the Swahili language. Ejijipay is an electronic payment system Nairobi city residents are using to pay for services offered by the Nairobi City Authority such as parking fees, single business permit, rent, city bills, food handlers, land rates, and many other bills. The payment can be done through the Ejijipayment app, website, or through mobile phone number registration where the payment is done through the mobile money account call M-Pesa ("Pesa" means the money in Swahili and "M" for mobile) (Wikipedia, 2021). The payment system has several benefits for the city authority such as:

- Easy to pay as one does not need internet hence saving motorists time spent on looking for the parking machine or parking attendant.
- It saves time as one can pay while still in the car.
- It helps to prevent congestion caused by the delay in payment hence ensuring smooth and faster mobility in the city.
- Helps to improve the revenue collection as money goes directly into the account of the city authority.
- It prevents corruption as previously the motorists used to bribe the park accountant by paying fewer fees.

5. Conclusion

Like any other developing country, Nairobi has a big transport problem. It lacks an integrated public transport system that has led to congestion, road accidents, and pollution of the environment (Dixon & Labuschagne, 2018). The city authority and the government acknowledge these problems and that is the reason for the development of the above projects as one of the solutions. There are also other planned projects such as Bus Rapid Transport for mass transportation of the passengers rather than the small vans and mini buses (Mueni, 2019). There is more to be done to realize the full potential of efficient mobility within the city. Some simple infrastructure improvements would help make the public transport work better in Nairobi (Gordon, 2011). With the advancement of technology, more technological solutions will be found to promote the quality of life of the city residents through reliable and efficient transport. There is also a need for enacting proper transport policies in the favour of an efficient transport system followed by strict enforcement. It has also been observed that investments in transport infrastructure such as highways, rail, mass transit, ports, and airports, increase the accessibility, economic, environmental and social impacts (Joseph, 2005). To reduce the pollution caused by the diesel-powered vehicles within the city, energy and fuelling infrastructure and the operation of vehicles powered by alternative energy carriers for public transport using technology-based solutions for the city traffic and transport management supporting the reduction of energy consumption and emission should be implemented by all the stakeholders (European Commission, 2012).

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BEACONS AS THE TOUCHPOINTS ON THE CUSTOMER JOURNEY

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Purpose: The overriding goal of the presented considerations is to discuss beacons as consumer-brand touchpoints. In addition, the possibilities of using these sensors at various stages of the customer journey to implement the assumptions of the 5A model and build a lasting relationship with the buyer were indicated.
Design/methodology/approach: In order to build a lasting relationship with the consumer, it is necessary to conduct multidimensional marketing communication based on numerous touchpoints. This interaction is assisted by mobile devices and many different technological solutions. One of them may be beacons, supporting consumer service at every stage of the customer journey. As part of the considerations, it was examined how the sensors can support marketing activities at individual stages of the customer journey.
Findings: As part of the research, it was determined what role beacons can play at every stage of the customer journey, as well as their connections with promotion-mix elements. An attempt has been also made to indicate how these devices can create a holistic experience leading to buyer satisfaction and ultimately their loyalty.
Research limitations/implications: 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: The article can help businesses to better realize the potential of beacons as a tool to support consumers during the shopping experience. It shows practical ways of using devices as part of individual promotional mix elements, which allows for their optimal use at all stages of the customer journey.
Originality/value: Although the topic of beacons in commerce appears in academic publications, only a few of them relate these devices to the customer journey. This paper comprehensively deals with this topic and focuses on the relationship between sensors, the 5A model and the promotion mix tools.

Keywords: Beacons, Customer Journey, Consumer Buying Behavior, Touchpoints, Market Communication, Model 5A.

Category of the paper: Technical paper, Conceptual paper**.**

1. Introduction

Before consumers buy a product, they go through the process of deciding about making a specific choice from among many alternatives available on the market. The final outcome of a case is influenced by many factors, both internal and external. The first group includes, above all, basic psychological processes – such as personality, attitudes, beliefs, motivation, perception, memory and learning (Munthiu, 2009; Jisana, 2014; Kotler et al., 2019). On the other hand, the second group comprises all stimuli coming from the environment, for example: cultural conditions, socioeconomic status, pressure from the society, reference groups (Madhavan, Chandrasekar, 2015; Oni, Oni, 2018; Sanak-Kosmowska, 2022). The decisions and actions that the buyer takes as a result of the forces acting on him can be defined as "behavior of the consumer". It includes not only purchasing choices, but also a lifestyle, such as responsibility for the environment and society, activity and healthy eating.

The decision-making process is also influenced by actions taken directly by the brand to lead to a transaction. The places where the buyer meets the enterprise and becomes the recipient of marketing communication can be described as touchpoints. This contact can take place both in real and virtual space (Bajak, 2021a), and to establish it, brands use not only traditional media and employees, but also technological advances. In this context, beacons show an interesting potential in terms of application in marketing communication (Sanak-Kosmowska et al., 2018; van de Sanden, Willems, Brengman, 2019; Andrade et al., 2021). These are sensors that are one of the numerous components of the Internet of Things (Jeon et. al, 2018; Padiya, Gulhane, 2020; Spachos, Plataniotis, 2020). They use Bluetooth wireless communication standard to transmit messages to devices equipped with a compatible mobile application (Bajak, 2021b). It is the software that determines the spectrum of functionalities implemented by beacons.

The overriding goal of this study is to discuss beacons as the consumer's touchpoint with the brand. This publication indicates the possibilities of using these devices during the customer journey in order to implement the assumptions of the 5A model and build a lasting relationship with the buyer.

2. Customer journey

Before the consumers decide to make a purchase, a decision process is played in their mind. In its basic formula, it comprises five stages, which include (Engel, Blackwell, Kollat, 1978; Lamb, Hair, McDaniel):

1. need recognition,
2. information search,
3. evaluation of alternatives,
4. purchase,
5. post-purchase evaluation.

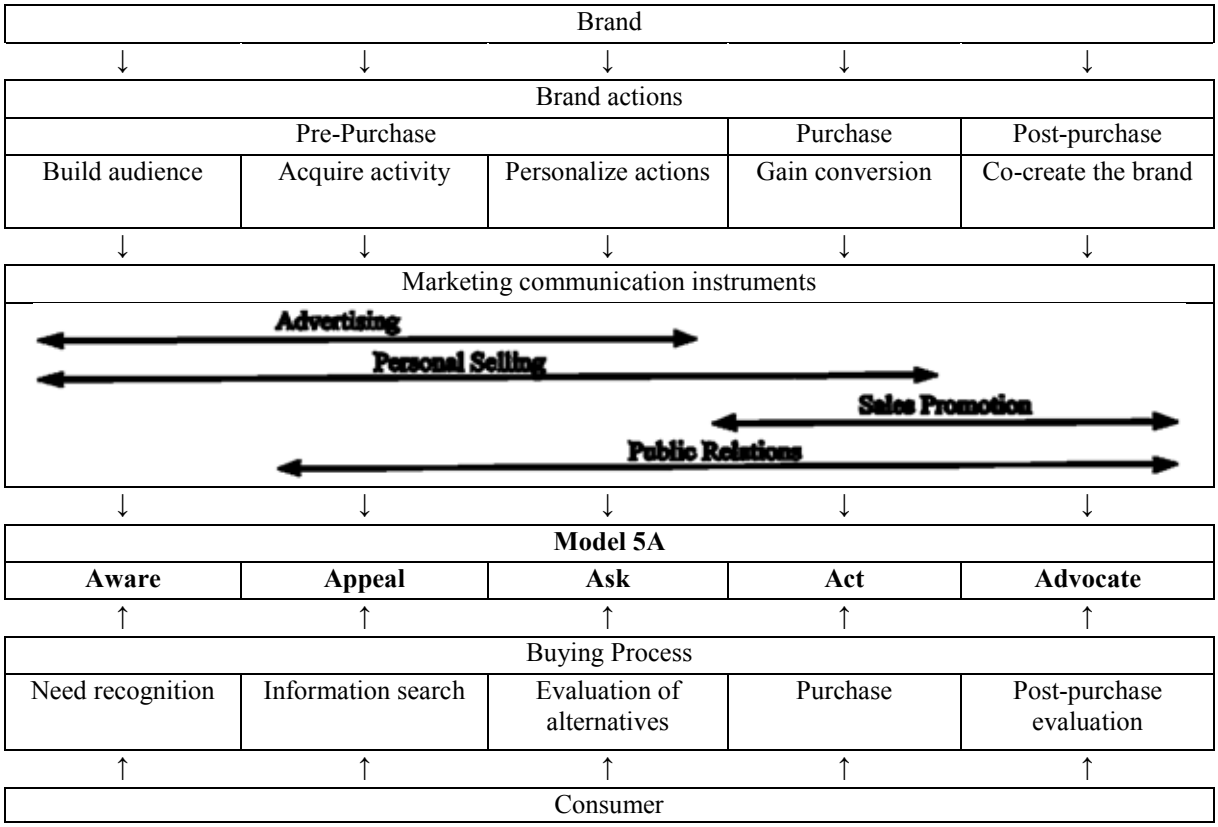
As a rule, brands do not look at the customer journey idly, but they accompany the consumer during making a choice (Kaczorowska-Spychalska, 2017; Smilansky, 2018). For this purpose, enterprises interact with the buyer through a variety of content – both unidirectional and bidirectional, thus engaging him in a dialogue (Verhoef, Kannan, Inman, 2015). Each single channel of transmission of the message is a new touchpoint in which the marketing communication takes place.

At the same time, it is worth noting that the modern consumer moves smoothly between real and virtual space. This is reflected in the actual course of the decision-making process, which is becoming increasingly complex through the multitude of purchasing alternatives and brand touchpoints. Therefore, brands are forced to conduct multifaceted marketing communication, engaging the recipient with the help of multiple online and offline stimuli at every stage of the consumer journey. This approach was considered in the 5A model proposed by Kotler, Kartajaya and Setiawan (2017), who indicate five elements depicting the consumer buying process:

1. aware – presentation of the brand's values and arousing the interest of the recipient with them,
2. appeal – shaping the desired image and building relationships with the consumer,
3. ask – conducting a dialogue with the recipient, educating about the range of products,
4. act – stimulating the buyer to action through direct incentives to encourage the purchase,
5. advocate – encouraging the client to provide an opinion about the brand and co-create it.

Effective conduct of the buyer through all points of the purchasing process requires the use of various forms and tools of marketing communication (Table 1).

Table 1.
Customer Journey



Source: own study.

It is also worth pointing out that the actions taken by the brand should not be limited solely to the online or offline world. In the era of ubiquitous technology, these environments should complement each other, surrounding the consumer and creating a multidimensional relationship with the brand. This approach is connected with the concept of omnichannel marketing communication, the assumption of which is the interpenetration of various message channels that focus around a single recipient (Królewski, Sala; 2017; Hajduk, 2019). In today's world, the customer is surrounded by numerous communication platforms, and interaction with the brand takes place in a variety of ways (Karasek, Hysa, 2020; Skurpel, 2020). This entails the need to create multidimensional yet coherent experiences for the buyer (Rogala, Pilarczyk, 2020; Bajak, 2021a), which include both unidirectional messages and above all entering into engaging interactions with the brand (Verhoef et al., 2015).

3. Beacons in market communication

Beacons use radio waves to transmit data to other devices equipped with compatible software, thus enabling automation, control and optimization of the communication (Bajak, 2021a). Sensors detect the position of objects connected to them, regardless of whether they are

outside or inside the building (Dudhane, Pitambare, 2015; Dasgupta, Nagaraj, Nagamani, 2016; Handojo et al., 2020). The possibility of navigation and the collected contextual information enable the optimization of the customer's visit to the facility, as well as individualize marketing communication (Thamm et al., 2016). As a result, these types of sensors can contribute to the creation of a digital environment of consumer service, which will be aware of his or her behavior and needs (Thamm et al., 2016; Betzing, 2018; Krishnansamy, Khan, Germack, 2018).

The era of the Internet of Things, of which beacons are part, will contribute to a change in the business model, putting even greater emphasis on proposing, capturing and creating experiences and values (Ng, Wakenshaw, 2017) that the company can share and exchange with the environment. These trends are consistent with contemporary trends in marketing communication (Doyle, 2008; Marinov, 2020; Sugai, 2021). Therefore, the marketing communication system is currently based on the identification and management of all touchpoints that connect the brand with the customer and shape its image (Rodgers, Thorson, 2012; Heding, Knudtzen, 2020), which creates an omni-channel environment. Beacons can conduct a dialogue with the consumers, contacting them at various stages of the consumer journey becoming, in effect, an element of a multidimensional marketing communication (Dudhane, Pitambare, 2015; Thamm et al., 2016). Moreover, their ability to monitor consumer’s behavior allows for tailoring services and products to the individual needs of buyers (Schechner, 2017) and conducting a personalized dialogue with each individual recipient (Peppers, Rogers, Weber, 2019).

From an IT point of view, the main tasks of beacons include detecting devices equipped with a compatible application, establishing a connection and exchanging data (de Cerio et al., 2017). It is on them that the functions of sensors in marketing communication are based. They include (Sanak-Kosmowska et al., 2018, Bajak, 2021a):

1. Navigation function – locating devices equipped with a compatible application and showing the desired way to the user.
2. Information function – transferring knowledge to the recipient after being with-in the sensor's range.
3. Interactivity function – sending notifications in response to specific user behavior and replying to his or her messages.
4. Research function – collecting data on the recipient's activity in the real and virtual world.
5. Promotional function – activating special offers, discounts and providing information on promotional campaigns.
6. Image function – conveying messages about the brand and directly shaping the image through the fact of using new technologies.

These tasks are performed thanks to the use of a mobile application operating in cooperation with beacons (Garg, Shukla, 2016). It may be based on only one or several of them or use all sensor functions at the same time (Bajak, 2021a, thus increasing the extensiveness of customer

service. Moreover, these sensors are often not a self-used technology, but one of the elements of the Internet of Things (Geng, 2017; Lea, 2018). Systems of this type may have a different complexity of the structure (Zhang, Han, Feng, 2010). The use of other devices in the network may translate into an increase in the range of sensor functionality. In this context, beacons can be supported by retrofitting them with additional transmitters based on other data exchange standards (e.g. GPS, LTE) or by adding new independent devices to the system that directly or indirectly cooperate with sensors.

Furthermore, it is worth pointing out that solutions using beacons should, primarily be useful to the consumer – otherwise recipient will not want to use this technology. Therefore, it is necessary to treat the customer's needs as the starting point for creating systems based on these sensors (Bajak, 2021a). Content delivery to buyers should be based on generating brand interest, communicating value and building value across all touchpoints (Moriarty, Schultz, 2012). Only beacons used in this way will allow for a real improvement in the quality of the customer service process and contribute to increasing its involvement in interaction with the brand. As a result, these devices can become a factor that will help increase the company's competitive advantage on the market (Dudhane, Pitambare, 2015).

4. Beacons as touchpoints between the brand and the consumer

The ubiquity of mobile devices and intelligent technologies have become a direct support for brands in communication with consumers. These types of touchpoints provide an opportunity not only for one-way transmission of promotional messages, but also for direct interaction with the recipient (Kruse Brandão, Wolfram, 2018). The scheme of beacon's operation (Figure 2) means that these devices can be successfully used to initiate a dialogue with the buyers, and then, through personalized messages, lead them through the store space informing about the range, indicating particularly attractive products or by providing discount codes. It is also worth pointing out that the data collected by the sensors can be used for journey mapping (Paepcke-Hjeltness, Cecil, 2018; Rajagopal, 2019). Sensors allow buyers to monitor the customer journey in the market space in a similar way as it is possible on the Internet. The integration of data on consumer behavior in the stationary and online store makes it possible to create precise customer profiles (Bajak, 2021a).

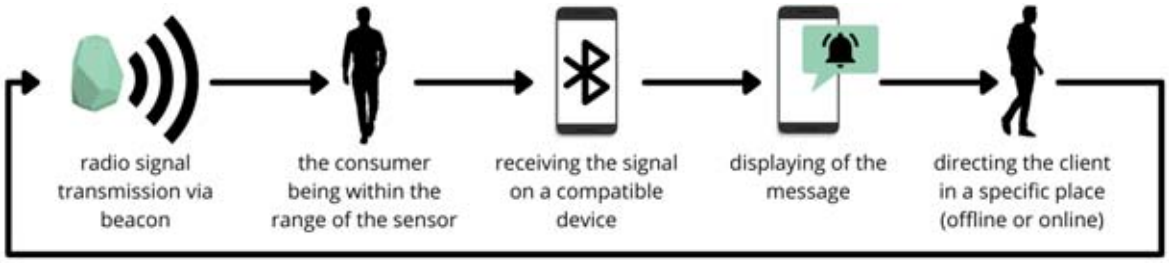


Figure 2. Beacons operation scheme. Source: own study.

It is important to emphasize that beacons should not be treated as single devices. Their effectiveness as touchpoints requires the creation of a network of sensors that will perform various and individual tasks during communication with the consumer. This will enable the creation of holistic experiences and create an authentic and stable relationship with the customer, which is the basis of the brand's success (Kruse Brandão, Wolfram, 2018). The multidimensional approach to the buyer is favored by the fact that beacons can perform a variety of tasks, supporting individual instruments of marketing communication:

1. Advertising – generic branding and purchase encouraging messages transmitted by sensors. Content can be displayed on the screen of a mobile device connected to the beacons once it is within range of the sensor, or via other devices connected to them (such as TV screens in a shop).
2. Personal Selling – personalized presentation of the company's offer based on the data collected about the buyer. It should take the form of interaction, so it can take place either through the use of virtual assistants or artificial intelligence mechanisms during communicating with a beacon or by calling a seller through an app.
3. Sales Promotion – sending codes and coupons and notification of price discounts and other benefits received after being in the range of the sensors, as well as due to signals indicating interest in specific products or simply making a purchase. These types of activities can also support cross-selling, up-selling and retargeting.
4. Public Relations – informing and inviting via sensors to events organized by the enterprise and social initiatives undertaken to shape the desired brand image, as well as the direct use of the devices to carry out socially responsible activities, for example by supporting people with disabilities through them (see Alapetite, Hansen, 2016; Manczak, Sanak-Kosmowska, Bajak, 2019; Antonić, 2021).

What is more, beacons are used at every stage of the consumer journey, which, combined with the use of a package of various marketing communication instruments, creates a coherent strategy of customer service leading to the implementation of the 5A model (Table 2).

Table 2.
Beacons on the customer journey

Beacons				
Welcoming the buyer to the store	General overview of the assortment	Personalized product notifications	Sending an individual discount and referral to the cash registers	Providing an invitation to an event organized by the brand
Build audience	Acquire activity	Personalize actions	Gain conversion	Co-create the brand
↓	↓	↓	↓	↓
Model 5A				
Aware	Appeal	Ask	Act	Advocate
↓	↓	↓	↓	↓
Buying Process				
Need recognition	Information search	Evaluation of alternatives	Purchase	Post-purchase evaluation

Source: own study.

It is worth noting that beacons enable balancing of the consumer between the real and virtual space, therefore the activities undertaken as part of the customer journey do not have to be limited to the offline or online space only. In the era of omnichannel marketing communication, it is even advisable that the actions taken by the brand should interpenetrate between these two worlds. The specificity of beacons creates an opportunity to freely combine stationary and online sales (Królewski, Sala, 2016). This integration can enhance the buyer's comfort while traversing the customer journey, help to optimally shape their behavior, and support the building of a relationship with the brand. Moreover, the ability to control the activities undertaken by the consumer in the real space via devices, combined with data collected about him online, creates a consistent profile of the buyer, and as a result, it allows for full personalization of promotional messages and more accurate selection of touchpoints.

5. Summary

Marketing communication focuses on the identification and management of touchpoints, which are the source of information about the brand (Solomon et al., 2019). The progressing technological development makes these tasks easier and the dialogue can be global with the simultaneous personalization of messages. The use of the full potential of touchpoints requires knowledge of the mechanisms of consumer behavior, a well-thought-out selection of marketing communication instruments and a thorough under-standing of the spectrum of possibilities of the technological solutions used. The conducted interaction requires coherent and synchronized messages that are conveyed using various channels and instruments. This creates a network of relationships that connects buyers with the brand and its other customers, creating a platform

for exchanging experiences, expectations and emotions related to purchases. As a result, the tone of the conducted marketing campaigns and the general shopping experience of individual consumers is also enhanced. The way of leading the customer through the purchasing process and the touchpoints with the brand that appear during it, which in turn further tightens the aforementioned network of relations, becomes all the more important.

Modern technologies such as beacons create the opportunity to adopt a multi-dimensional and integrative approach to customer service. These devices can guide the consumer through all stages of the customer journey using a range of marketing communication instruments. Sensors have the potential to increase buyer's satisfaction and, as a result, gain their loyalty (Dudhane, Pitambare, 2015; Thamm et al., 2016) and turn them into brand ambassadors (Solomon et al., 2019). Creating this type of holistic experience of contact with the brand contributes to building a lasting competitive advantage on the market. The dialogue with the consumer is complemented by the beacons' ability to monitor their behavior. The obtained data can be integrated with knowledge obtained from other sources (in particular online), which allows for a better adaptation of products, services and the service process to the customer's needs, and consequently even more effective shaping of the relationship with the brand.

The practical implementation of beacons as part of the customer journey enables the brand to achieve numerous benefits. The most important of them include:

- integration of the real and virtual environment, which allows for contextual adjustment of actions taken by the brand to the needs and behavior of an individual recipient,
- adaptive support for the consumer during the customer journey,
- stimulation of the purchaser's involvement through appropriately adapted promotional incentives generated at particular touchpoints,
- creating the possibility to collect, store and analyze data on the customer in order to optimize purchasing processes.

Unfortunately, in Poland the use of beacons in commerce is still only a curiosity. There is still a lack of practical examples of this type of implementation, which is why such projects should be looked at particularly carefully. The potential of using sensors in commerce is an important issue for further research and analysis. Moreover, the presented study focuses on the benefits generated by the use of beacons to support the consumer along the consumer journey, while possible difficulties have been overlooked. These include, among others: the need to purchase a large number of sensors in order to create advanced systems, exposure to cyberattacks or the existence of substitute technologies. This thread will be developed as part of further research on the topic. It is also planned to conduct qualitative and quantitative research on the use of beacons as a consumer support tool.

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TALENT MANAGEMENT DURING A PANDEMIC COVID-19

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Purpose: The main objective of the research presented in this article was to identify factors supporting sustainable talent management in times of COVID - 19 crisis in small and medium-sized companies in Lower Silesia province, as well as to conceptualise the notion of talent. In order to achieve this goal, the first part of the article explains the meaning of the term "talent management" in the scientific literature on management, and then, on the basis of the conducted research, an attempt was made to answer the question: which of the determinants of the "talent management" process are important in the ongoing COVID crisis-19 and guarantee their sustainable development.

Design/methodology/approach: For the research presented in this paper, a literature analysis in the area of resource sustainability, talent management and crisis was used. The studies in literature also included secondary sources, which were communications from research of similar scope.

The combination of different research methods allowed to obtain a broader context of the studied phenomenon and ensured a higher quality of the conducted research. The diversity of methods was aimed at achieving a consistency of the empirical basis for the inference. A diagnostic survey was adopted as the leading method. The remaining methods applied in the paper were auxiliary (complementary).

Findings: „Talent management" and having talented employees in a global economy is a strategically important resource affecting the market value of the organisation itself and providing a competitive advantage. Building a significant intellectual capital of the organisation requires the use of appropriate methods and tools to support the management, systematic measurement, constant comparison with competitors, elimination of barriers and use of opportunities for development (and such becomes the current crisis).

Research limitations/implications: In the future, research will be continued on a larger research sample.

Practical implications: The article presents results of research conducted among several dozen companies in Poland. The findings are very interesting and encourage research on a larger scale. They are a valuable source of information for managers responsible for creating the intellectual capital of the organisation in terms of acquiring and developing talented employees. On the other hand, for people responsible for recruiting employees, the results may be useful in terms of developing a candidate's profile, in particular when identifying the key competences of talented employees. The results also indicate the demand of the Polish market (especially medium-sized companies) for infrastructure that enables talent acquisition, improvement and development.

Originality/value Based on empirical research, the article proposes an original set of systemic solutions for talent management to improve organisational performance.

Keywords: talent management, talent, COVID-19.

Category of the paper: Research paper.

1. Introduction

Business cycles in the economy are obvious. From time to time, its successive phases (recovery, overheating, slowdown, recession) are repeated. Therefore, organisations should be prepared for various types of emergencies. COVID-19 is an example of this. Social and economic limitations have affected virtually all areas of our lives and have a negative impact on the global economy.

Organisations most often perceive crisis as a negative, undesirable phenomenon. However, it is important to note that the crisis may prove to be an opportunity for entrepreneurs. It forces managers to introduce fundamental changes, restructure and reorganise companies. Innovative solutions are being implemented to ensure better productivity and efficiency as a result. Employees themselves in times of crisis are more open to changes and more willing to accept them than usual.

Human capital decisions play an important role in times of crisis. Often, decisions are made to downsize, employees are sent into early retirement, awards are cut and various types of benefits are reduced. These actions show the strategic short-sightedness of managers. These activities do not support the sustainable development of human resources. The crisis caused by COVID-19 is different from those encountered so far (like all of them, anyway). Paradoxically, the actions taken by executives in the area of human capital partly meet the expectations of talented employees. They primarily have the ability to implement innovative solutions. The introduction of remote work, non-standard working time, task-based working time, working from home are solutions forced by the crisis that will stay with us forever. Such individual treatment, which would enable self-realisation, was expected by talented people.

All of these coronavirus-enforced activities may prove to be specific fulfillment of the needs of women who want to advance their careers. Women are the ones who bear most of the responsibilities in the household and in caring for children. The requirements for telework and flexible work make it possible for women to combine paid work with caregiving responsibilities. They will increasingly take up remote work, and its rules will have to be clarified by the law.

2. Talent management and crisis from a theoretical perspective

Rapid changes in technology, permanent migration, aging society and expansion of the knowledge-based economy are current challenges facing the labor market. The result of this situation is the shortage of talented employees. Some authors believe that a key reason for this situation is an ineffective talent search system among the company's employees. The role of a leader starts with getting to know the potential of your employees and exploring their talents (Balcerzyk, 2021).

In the works of M. Armstrong, the term talent management can be attributed to succession planning and employee development activities (Armstrong, 2011, p. 503). The author believes that this concept does not bring anything new to the known processes of human resource management, except a meaningful name. Talent management should be viewed as a universal set of activities. It is supposed to safeguard the flow of talent in the organisation, treating it as one of the key resources of the company.

In practical terms, "talent management includes finding talents in your own company or acquiring them from the outside, providing them with care more closely than other employees, consisting in enabling them to develop, train and plan their careers, and also ensuring adequate remuneration (not only in the form of pay), so that they are resistant to temptations from other employers and want to stay in the company" (Maliszewska, 2005).

According to R.E. Lewis and R.J. Hackman, talent management should be considered in three basic streams. In the first perspective, talent management is viewed as a set of standard practices, activities, and functions of human capital management. These include recruitment, selection and development. These functions are performed much faster than in the classical approach and should concern the entire organisation, not a single department. Proponents of the trend claim that the terms talent and HR management will be used interchangeably in the future. The second approach is to work within your talentpools. The inflow of employees is subject to analysis and control. Employees are assigned to their respective jobs. This approach is focused to the inside of the organisation. The third view, whose center is the talent itself, distinguishes two distinct tendencies (Lewis, and Hackman, 2006). The first, is based on the thesis that talents are individuals with high potential. They should be sought out, hired, and rewarded for performance. The second approach considers talent as an undifferentiated good. The reason for this approach are demographic and humanistic factors. The role of executives is to manage the overall talent to achieve the best results.

In addition to surviving in an unpredictable and changing environment, the aspiration of any organisation is to continually grow and adapt to change. The implementation of rational "talent management" programmes in the organisation may be a chance to achieve these goals. Therefore, the priority task of the organisation is to take particular care of employees who demonstrate above-average creativity, rich emotionality and strategic thinking skills.

The unique "thinking" of these individuals requires taking time, being well organised, and being open to new solutions and opportunities in the organisation's strategies.

Looking ahead, managers need to create the right strategy for talent development. Talented employees, without whom organisational success is impossible, become a scarce "commodity".

According to W.J. Rothwell, strategic development of talent (SDT) should be defined as a process of organisational, stakeholders and groups of employees' changes through planned and unplanned learning, in order for them to acquire competences that are key to achieving a competitive advantage by organisations (Rothwell, 2003).

D.G. Collings and K. Mellahim as definitions of strategic talent management (STM) give all activities and processes characterised by systematic identification, necessary to maintain permanent competitive advantage (Collings, and Mellahim, 2009, pp. 304-313). The units with the highest potential and performance and the overall HR architecture should be developed.

Consequently, „sustainable resource management (SRM) should be understood as activities of a strategic nature, the basis of which is the effective protection of resources necessary for, depending on the adopted strategy, the stability or growth of the organization" (Czaińska, 2020).

Employees with strategic talent are, in a sense, the ticket to further business development. Through their knowledge and unconventional methods of operation, they are able to ensure the company's market stability in the long term and keep it at an appropriate level, even when it is hit by a crisis. In the era of globalisation, organisations are unable to protect themselves from crisis situations. With talented employees in their organisational capital, however, they can significantly reduce their impact, minimise the cost of dealing with the crisis by implementing appropriate management strategies. Paradoxically, the crisis may contribute to their development and increase the pool of talents.

The term crisis comes from the Greek word krisis which has many different meanings. It means: dispute, preferences, separation, deciding, choice, struggle in which it is necessary to act under time pressure, and also – a turning point, breakthrough, decisive moment, qualitative change of the arrangement.

"A crisis is a turning point in the existence of an organisation, arising as a consequence of external or internal disturbances in the existence or realisation of one or more factors determining the existence and development of the enterprise" (Zełek, 2003, p. 34). The crisis is of a strategic nature, disregarding it may lead to huge financial losses and even bankruptcy of the company. A crisis is a moment that throws an organisation out of balance for a period of time. Crisis in business is „a low-probability, high-impact situation that is perceived by critical stakeholders to threaten the viability of the organization (Pearson, and Clair, 1998).

A crisis itself is not a positive phenomenon. Like any imbalance or currently existing order, it introduces a sense of anxiety, frustration, and threat. Crisis is sometimes necessary, it allows you to initiate change and it is sometimes the beginning of something positive. Thus, the focus should not be on the crisis per se, but rather on the positive effects of the crisis. So whether it

was a disaster or an opportunity can only be determined after the fact. If it initiates destruction, it will be a disaster; if it contributes to development, it will be defined as an opportunity. A better understanding of the term "crisis" can be gained from the way it is understood by the Japanese, who spell the word with two characters, the first meaning "danger," "imminent, inevitable ruin," and the second meaning "opportunity, possibility," a kind of perspective opening up in the face of the future. This interpretation of the term "crisis" unifies something that is simultaneously a danger and an opportunity, a threat and a new possibility for the future (Płużek, and Jacyniak, 2006, p. 12).

The current crisis caused by COVID-19 is global in scope. Its effects are being felt around the world. Given the etymology of the word crisis, we can assume that for some organisations an opportunity has arisen in the area of "sustainable talent management". As mentioned earlier, the strategic myopia of managers often equates the crisis with plans to cut staff, reduce spending on employee development and training. This approach generates an opportunity for competitors in acquiring talents. Therefore, appropriate crisis management covering many spheres of impact (psychological, financial, communication, and security) becomes essential (Czainska, 2021; Sus, 2013).

3. Methods and characteristics of the research sample

The study presented in this paper is based on the analysis of the literature on crisis management, talent management. The literature studies also included secondary sources, which were research communications of similar scope.

The diagnostic study and literature analysis, secondary sources allowed us to obtain a broader context of the phenomenon under study and ensured a higher quality of the research conducted. The variety of methods was intended to achieve consistency in the empirical basis of inference. A diagnostic survey was adopted as the guiding method. The other methods used in the paper were ancillary (complementary).

The questionnaire – survey – was prepared based on the analysis of the literature. The survey was designed for employees of Lower Silesia. The following variables were used as independent variables in the study: gender of the respondents, age of the respondents, size of the company (place of work), place of residence, and industry of the company.

The study was conducted in Q1 2021 on a random survey sample of people employed in Lower Silesian organisations. 268 people attended the survey. The study group was equally divided by gender. Women made up 47% of the study group and men 53%.

About 43.28% of the respondents are mature people aged 30-34 years. 23.88% of the respondents were between 35 and 40 years old, 15.67% of the respondents were between 25 and 29 years old and 13.81% workers between 19 and 24 years old. The least numerous

group were employees over 40 years of age (3.26% of respondents). Analyzing the structure of the study group in terms of age, it should be noted that the respondents are mature people at the stage of early career, during which crystallisation occurs, narrowing the field of exploration and finalisation of the choice of profession.

More than 50% of the respondents are employees of medium and large companies with 21 to 100 employees and 17.91% are employees of companies with more than 100 employees. Over 17.16% of the respondents were employed in small businesses (11 to 20 employees) and only 3.36 were employed in businesses with up to 10 employees.

About 61.94% of the respondents are residents of small municipalities up to 5,000 residents. A relatively large group of respondents are residents of communes of 6-10 thousand residents (19.4%). The remainder are mainly residents of towns of up to 50,000 people (approx. 12%).

The largest group of workers were those employed in manufacturing companies (33.58%). A large percentage of respondents are employed in the retail industry (28.36%) and transportation (11.19%). The others are those employed in the financial industry, construction, etc.

4. Talent acquisition and development in crisis

There are many definitions of "talent" in the management science literature. At the beginning of the survey questionnaire, respondents were asked to define the term. The importance of the definition of talent as perceived by the respondents is shown in Table 1.

Table 1.
Meaning of "talent" in respondents' opinion

Respondents' opinion	**Percentage**
Specialist, difficult to replace	0,37%
A person who can significantly influence the current and future achievements of his organization	38,81%
Best performer	4,10%
A person with high development potential	30,60%
A person with exceptional talents, rarely found, e.g. an outstanding scientist	22,76%
A person with unusual talents but superfluous, not improving the lives of others or the functioning of the organization	3,36%

Source: own research.

For more than one-third of those surveyed (38%), the term talented person means someone who can make a significant impact on the current and future performance of their organisation. A similar study was conducted in 2018 and a person with high developmental potential was considered talented (45%). Only 13.75% of the respondents considered the talented person to be able to influence the fate of the company. The prevailing pandemic has redefined the concept of talent. Entrepreneurship and creativity as well as intuition and strategic thinking are desirable talents in this time of crisis.

Therefore, one can accept the thesis that the concept of talent is a time variable. It depends on the factors of the company's internal and external environment. Internal factors relate to ensuring the safety of employees, the supply and distribution of goods and services. External factors are further restrictions imposed by laws and regulations by the government related to limitations on the operation of specific industries. Intuition and strategic thinking become particularly important in operating in such a volatile environment. Through entrepreneurship and creativity, talented individuals are able to accomplish new tasks, take risks, and implement new ideas. By acting in this way, these employees add "value" to the company. In the labor market, managers are expected to take initiatives in search of new solutions to problems, flexibility and mobility.

About 31% of the respondents considered a talented employee, a person with high development potential. Approximately 23% of respondents believe that a gifted person is characterised by having exceptional talents, rare such as an outstanding scientist. If a talent is considered to be a person with high developmental, entrepreneurial and creative potential, it can be assumed that the development of talent is influenced by environmental factors. These primarily include supervisors and co-workers who "sculpt" the company culture. The talent is also developed through the implementation of tasks (more and more complicated) and completely random events.

About 4% of the respondents believe that a talented person is a top performing employee and only 3.36% believe that a person with unusual talents but superfluous, not improving the lives of others or the functioning of the organisation.

Only 0.37% of respondents considered a hard-to-replace professional as a talent. This is a significant change from the 2018 results. This definition of talent then was indicated by 12.5% of respondents.

In their research, respondents identified the characteristics and competencies of the talent components that distinguish talented employees (Table 2).

Table 2.
Components of talent

Respondents' opinion	**Percentage**
Strategic thinking skills	17,16%
Leadership abilities	0,37%
Emotional intelligence	14,18%
Entrepreneurship, creativity	54,10%
Ability to work in a group	7,46%
IT and technical skills that go beyond their specialty	6,72%

Source: own research.

Respondents identified entrepreneurship and creativity as the leading trait as a component of talent (54.1%). Transforming businesses in the era of the prevailing pandemic has become a necessity. The introduction of lockdown, limiting availability has forced many businesses to make immediate changes. This involved moving to online operations, launching a new product,

introducing remote working, changing the way of communicating with employees, changing the flow of documents, simplifying many procedures and a new way of acquiring customers. Digital transformation is not just about moving to a digital world. It's definitely more than that. It's all about changing the way we think about our own business and the world around us. The pandemic has significantly changed our perceptions of the corporate environment. Entrepreneurs and employees have developed their technological and digital competencies, built a new work model, and made numerous business-level changes. Thanks to the creativity of management, most companies did not close and there was little downsizing. Some companies changed their industry "overnight". Others have diversified the scope and reach of their services. One can see the calmness and flexibility in the actions of the management team.

Respondents identified the ability to think strategically as the second most important talent trait (17.16%). Most companies were forced to rethink their own growth strategies. According to the respondents, emotional intelligence plays an important role (14.18%). Less important are the ability to work in a team (7.46%) and having computer and technical skills beyond their specialty (6.72%). Leadership skills should be considered insignificant (0.37%). This is a kind of surprise.

According to the respondents, management should support the emergence of talent in crisis (Table 3).

Table 3.
Activities supporting talent identification

Respondents' opinion	**Percentage**
Maintaining high standards in all areas of the company's operations	7,09%
Promoting the best employees	7,09%
Promoting diversity	48,13%
Creating an atmosphere of openness and honesty	17,54%
Paying attention to the high level of expected efficiency	10,82%
Supporting innovation, research and development	9,33%

Source: own research.

The actions taken by management in this area are primarily to support diversity, eliminate discrimination and treat employees equally (48.13%). This includes the age, gender, religion, culture and background of the employees. Diversity, or rather supporting it, is a source of competitive advantage. Thanks to the practice of diversity management, it is possible to expand the groups in which talents are identified and to support "picking" talents at the recruitment stage. Such activities create a climate of openness and honesty, and this, according to respondents (17.54%), is conducive to developing talent in the COVID-19 crisis. Allowing employees to speak freely and share ideas promotes the fulfillment of their potential. In crisis situations, executives should be open to different and unexpected sources of ideas. Their author can be any employee of the company regardless of their position in the organisational structure. In crisis situations, the flow of information and freedom of communication within the organisation is important. In times of crisis, the culture of creativity fully accepts the "uncertain

tomorrow" and change. Therefore, it is important for a company to be able to deal with unexpected situations and focuses employees' attention on the benefits of change.

Only 10.82% of the respondents said that the talent emergence in crisis is facilitated by the organisation's management's attention to high levels of expected employee performance. Efficiency in times of crisis is secondary and it is not the main criterion for action. Lower efficiency is the result of the general market downturn, not caused by employee skill gaps.

Identifying talents in a crisis is not supported by innovation, research and development activities (9.33%), as well as promoting the best employees and maintaining high standards in all areas of the company (7.09%).

The progressive integration of economies, industries, enterprises leads to an interdependent economic system on a global scale (Table 4). There is a deepening and intensification of trade, investment and information links.

Table 4.
Glocal managers as organisational capital

Respondents' opinion	**Percentage**
Definitely yes	23,13%
Yes	48,88%
No	10,45%
Definitely no	7,09%
I do not know	10,45%

Source: own research.

"Glocal managers" are becoming particularly sought-after talent. This is the view of 72% of respondents. They appreciate managers who can meet the local and global demands of an organisation that can think globally while operating in a local market. Changes in the environment imply the need for managers to adapt to working in an international environment. Each country is characterised by a specific tradition and different customs, which is why modern managers have to adapt to the culture prevailing in a given country, and local managers have to gain experience how to develop in a culturally diverse society. For 17.5% of respondents, a person with this aptitude is not a talent.

Socio-cultural globalisation has led to increased migration of workers, managers. Selection of the best working conditions, free movement in search of better working conditions have significantly affected the mobility of human resources and led to a kind of competition for talent. Therefore, there is a need to balance global and local needs by applying global standards and adapting them to local circumstances (e.g. cultural).

As a result of the COVID-19 crisis, the vast majority of companies reduced funding for employee training and development – 63.43% (Table 5). In the face of uncertainty, pressure and crisis, managers are making savings in organisations in the wrong areas, which can include employee improvement and development. Some of the companies see an opportunity for workforce development in the era of the pandemic and have increased funding to improve

employee knowledge and skills (33.21%). Only 3.36% of companies were not affected by the crisis situation in terms of the process of professional development of employees.

Table 5.
Training and development of employees in the COVID-19 crisis

Respondents' opinion	Percentage
Increased funds for the improvement of employees' knowledge and skills	33,21%
Reduced funding for employee training and development	63,43%
The crisis situation does not affect the professional development process	3,36%

Source: own research.

The pandemic situation forced companies to deploy employees to other jobs, branches, subsidiaries (39.18%). Approximately 13.81% of the respondents stated an increase in temporary staffing (Table 6).

Table 6.
Actions taken by managers in the COVID-19 crisis

Respondents' opinion	Percentage
Hired more temporary workers	13,81%
Deployed employees to other jobs	39,18%
Developing the technical competences of employees	13,81%
Developing the business competences of employees	10,82%
She reduced employment	22,39%

Source: own research.

Managers of these companies look for a chance for development in a crisis situation and see its positive effects.

Almost a quarter of the companies (22.38%), in the opinion of the respondents, reduced employment and only 13.8% of the companies took steps to develop their employees' business competences. This confirms the thesis of strategic short-sightedness of Polish managers. In the short term such actions bring measurable effects but in the long term they may cause financial problems of the company or even its liquidation. They forget that a recession is a good time for managers to take action to invest in employee competencies (knowledge and skills), due primarily to: lower training costs during this period, less workload. It is therefore important to take risks in investing in human capital.

Losing staff is all about disappointing employees (not just those being dismissed) and losing know-how. Dismissal of employees has a negative impact on the company's image.

5. Discussions

The current situation of the global economy has influenced the essence of the perception of a talented employee. In research conducted in 2018, the respondents considered a talented employee to be a person with high development potential (45%). Only one in nine respondents

considered a person who could influence the fate of the company to be a talent. In the 2021 survey, for nearly 40% of respondents, the term talented person means someone who can make a significant impact on the current and future performance of their organisation. The prevailing pandemic has redefined the concept of talent.

In the times of crisis, the respondents considered entrepreneurship and creativity as a leading feature of talent. The changing environment in the ongoing crisis (introduction of lockdown) made business transformation a necessity (introduction of remote working, change of communication with employees, change of workflow, simplification of many procedures and new way of acquiring customers. These changes are accompanied by a digital transformation of how we think about our own business, economy or world.

At a time when knowledge and information are becoming the basis for development, the biggest problems of modern organisations will be „brain drain", bad identification of talents or their shortage. The biggest gains in the economy are made by innovative companies, often created through the start-up formula.

6. Conclusions

Summarizing the issue of "talent management", it should be stated that a considerable challenge for companies during the ongoing COVID-19 crisis proved to be the maintenance of employee development programmes. Strategic short-sightedness of managers does not guarantee opportunities for talent development and ensuring high retention of employees, especially the talented ones. What can be seen in the actions taken by managers is a lack of appreciation for the unique value of employees and the formation of a belief that they are recognizable and important to the organisation.

In times of recession, there is a diminishing focus in organisations on talent development and new talent acquisition. organisations that decide to continue their development programmes despite the crisis situation prove to their employees that they are reliable employers and employees can trust them. This also has a positive impact on the image of these organisations and by their actions they attract other talented employees who have lost their jobs or are looking for new challenges.

In a crisis, it is important to keep employees in the organisation (especially those achieving excellent results) because they will ensure the implementation of a recovery programme that allows the company to develop after the crisis. It is therefore important to intensify employee retention.

In the era of globalisation, the economy and gaining competitive advantage therein are based on knowledge. Gone are the days when skyrocketing profits were made by owners of the means of production using cheap labor.

The organisation's task is to take care of employees who demonstrate above-average creativity, rich emotionality and strategic thinking skills. The sound thinking of these individuals requires taking time, being well organised, and being open to new solutions and opportunities in the organisation's strategies. It is important to create comfortable conditions for further intellectual development of such people in the company, for enriching knowledge and gaining experience, so that they can continually achieve excellent professional results, and thus significantly increase the key market value of the company.

But there is no doubt that the costs that crises create are too great to be left alone. The waste of scarce resources, manifested in the immobilisation of existing capital, mass unemployment, less production, as well as reduced consumption, growing poverty, individual dramas, etc., create costs that cannot find acceptance among economists and politicians.

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INNOVATIVENESS OF THE FOOD INDUSTRY ENTERPRISES IN THE EUROPEAN UNION IN CONDITIONS OF CHANGING ECONOMIC SITUATION

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Purpose: The main aim of the study is to assess a correlation coefficient between the level of economic growth and innovativeness of the food industry enterprises in the European Union countries.
Design/methodology/approach: The study period includes the years 2012, 2014, 2016 and 2018. The conducted studies focus on three types of variables relating to innovativeness of the food industry enterprises. The Spearman's rang correlations coefficient and its significance tests were used for the purpose of achieving the research aim.
Findings: The study results revealed significant differences in the innovation level in the European Union. It was also indicated that there is a statistically significant correlation between the value of per capita GDP and the level of expenditure on internal research and development per one enterprise in all analysed years and the expenditure on purchase of machines, equipment and software calculated per one innovative enterprise in 2014 and 2016. Additionally, it should be stated that there is no connection between the level of economic situation in the European Union countries and the number of innovative food industry enterprises.
Originality/value: The added value of the article is the answer to the question if there is a correlation between the economic development and the food industry innovativeness in the European Union countries.

Keywords: competitiveness of enterprises; innovative enterprises; innovation expenditure; correlation coefficient.

Category of the paper: Research paper.

1. Introduction

Innovation is one of the main factors increasing competitiveness of the food industry enterprises (Grunert et al., 1997; Rama, 2008). It is an essential feature of business entities necessary to conduct economic activity and compete with other entities on the global market. Their systematic generation and ability to adapt to constantly changing environmental conditions enable the entrepreneurs to remain on the market (Grosse, 2002). Therefore, it is important to constantly seek new solutions practically in all areas of functioning of enterprises, which as a consequence results in implementation of innovation.

The term of innovation has evolved considerably over the analysed years. It was introduced into the world literature by Schumpeter (1912), who considered innovation as new combinations taking place in the following cases:

- the manufacture of a new product or introduction of goods with new characteristics on the market;
- the introduction of new production methods;
- the opening of a new market;
- the obtaining new sources of raw materials;
- the implementation of new organisation and economic processes.

The Schumpeter's approach is a basis for discussion of the impact of innovation on the economy. Schumpeter created the concept of continues destruction of old structures, which are replaced by new, more effective ones. Then, the Porter's studies had a significant influence on the contemporary views on innovation processes (1998). In the literature on the subject there are narrow and broad definitions of innovation. For example, Freeman (1982) claims that innovation is the first commercial use of a new product, process or a device. Broader definitions are proposed by Kotler and Armstrong (1999), as well as Fagerberg (2005). Kotler and Armstrong emphasize that innovation refers to a good, service or an idea perceived as new, and Fagerberg proves that innovation is a new and better solution contributing to the improvement of living conditions of population. The Oslo Manual's definition is also worth mentioning (2018). It states that innovation is a new or improved product or a business process (or their combination) which significantly differs from the previous products or business processes and was introduced on a market or launched for use by enterprises.

The issue of innovation in enterprises has been frequently raised. Many authors emphasized the factors relevant to enterprises to introduce innovations, including Earle (1997), Avermaete et al. (2004), De Jong and Vermeulen (2006), Rama and von Tunzelmann (2008). Wakelin (1998) studied the connections between innovation and export activities. Bougheas (2004) focused on analyses of the importance of research and development in innovativeness of enterprises. Many authors, among others Fritsch and Lukas (2001), Tether (2002), Freel (2003),

as well as Freel (2003), concentrated on the importance of cooperation between entities in implementation of innovation.

A considerable part of these studies focused on the issues of innovation in the food industry. Rama (1996) as well as Martinez and Briz (2000) indicated that the level of innovation in this sector is usually lower than in other sectors. Earle emphasized (1997) the complexity of innovation processes in the food industry. On the other hand, Firlej et al. (2017) indicate that innovations are at different levels and in various areas of company activity. Acs and Audretsch (2005) state that the level of investment in research and development has a direct influence on an innovation process. Firlej et al. agree with this opinion and claim that innovations are strictly connected with enterprises and their implementation is a result of scientific and technical progress. It is also worth mentioning that very important factors influencing the level of innovation are uncertainty about their effectiveness, level of knowledge and enterprises ability to collect know-how (Teece, 1996; Christensen, 2008). In the literature on the subject the necessity of cooperation between many agribusiness entities to create innovative solutions in the food industry is also emphasized (Costa and Jongen, 2006). Additionally, K. Firlej (2018) proves that innovation in the market economy is a comprehensive set of tools including heterogeneous strategic tools taking part in a proper modern production of the entire range of food products and stimulating the investment activities of enterprises.

It should be noted that in the last decade there were significant changes in the food sector in a social, economic and technological aspect. In addition, Costa and Jongen (2006) reveal that the food sector is characterized by more competitive environment, which has a significant impact on the changes in food demand and the organization of a supply chain. That results in a strong drive for innovation among the enterprises belonging to the sector (Rama, and Tunzelmann, 2008; Capitanio et al., 2010).

A highly important issue regarding the innovation is also the level of a business cycle impact on an innovative activity of enterprises. The connection of these two aspects is confirmed by the studies of D'Estea et al., (2012), Archibugi, Filippetti and Frenz (2013), as well as Tomaszewski and Świadek (2017).

The undertaken innovation activities are considered as one of the main factors of the economic development. However, in spite of the significant role of the food industry in the contemporary economy, the studies regarding the innovativeness of this sector in all the European Union countries are relatively rarely undertaken. Therefore, the main aim of the study was to assess a correlation coefficient between the level of economic situation in the European Union countries and innovativeness of the food industry enterprises. The added value of the article is the answer to the question if there is a correlation between the economic development and the food industry innovativeness in the European Union countries.

2. Research methodology

The studies cover all the European Union member countries. The food industry enterprises producing food goods, beverages and tobacco are analysed. Due to the limited access to statistical data the study period includes the years 2012, 2014, 2016 and 2018.

The conducted studies focus on three types of variables referring to the innovativeness of the food industry enterprises: the number of innovative enterprises, the level of spending on internal research and development per one innovative enterprise, the level of expenditure on machines, equipment and software per one innovative enterprise. The number of innovative enterprises presents the main picture of tendencies and abilities of companies to develop and assimilate innovation. On the other hand, the variables referring to the level of expenditure on innovation reflect the ability of the economy for innovation. The eligibility of presenting the expenditure in two categories is based on the European Commission recommendation indicating that research and development expenditure is a much narrower category than spending on an innovative activity (European…, 2020). The statistical data referring to innovativeness of enterprises was derived from the Structural Business Statistics Database (Eurostat) using the results of the studies CIS-8, CIS-9, CIS-10 and CIS-11. The value of per capita GDP was adopted as a variable representing the economic situation. Its value was derived from the World Bank database.

In order to implement the research aim, the Spearman's coefficient of rank correlation and tests of its significance were used. This measure describes the power of correlation of two characteristics, when they are measurable, of a qualitative nature, can be put in order and the analysed population is small. The Spearman's coefficient of rank correlation is calculated in accordance with the following formula:

$$r = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n\cdot(n^2-1)} \quad (1)$$

where:

r – the Spearman's coefficient of rank correlation,

di –the difference between the ranks assigned to i- observation in relation to the first variable and the second variable,

n – the number of analysed objects.

When the observations of each variable in a trial are repeated, the coefficient of rank correlation is additionally corrected due to related ranks. The measure of coefficient has the values ranging from <-1, to +1>. The closer they are to unity, the stronger the relation between the analysed characteristics. The sign of coefficient informs about the direction of correlation between the analysed variables, the module of a number about its strength. The assessment of correlation strength is based on the following ranges: <0.0-0.2) – very weak correlation, <0.2-0.4) – weak correlation, <0.4-0.6) – moderate correlation, <0.6-0.8) – strong correlation,

<0.8-1.0> – very strong correlation. Due to the small number of observations during the null hypothesis testing, their exact distribution was used. The lack of correlation between the analysed variables was assumed as the null hypothesis, whereas the existence of correlation as the alternative hypothesis. In attributing ranks, the variables were put in order from the highest to the lowest values. Due to the limited access to statistical data certain observations were not included in calculations.

3. The study results

In the first stage of the study the individual variables from the years 2012, 2014, 2016 and 2018 were analysed. The detailed results of the values of per capita GDP in the European Union countries are presented in figure 1.

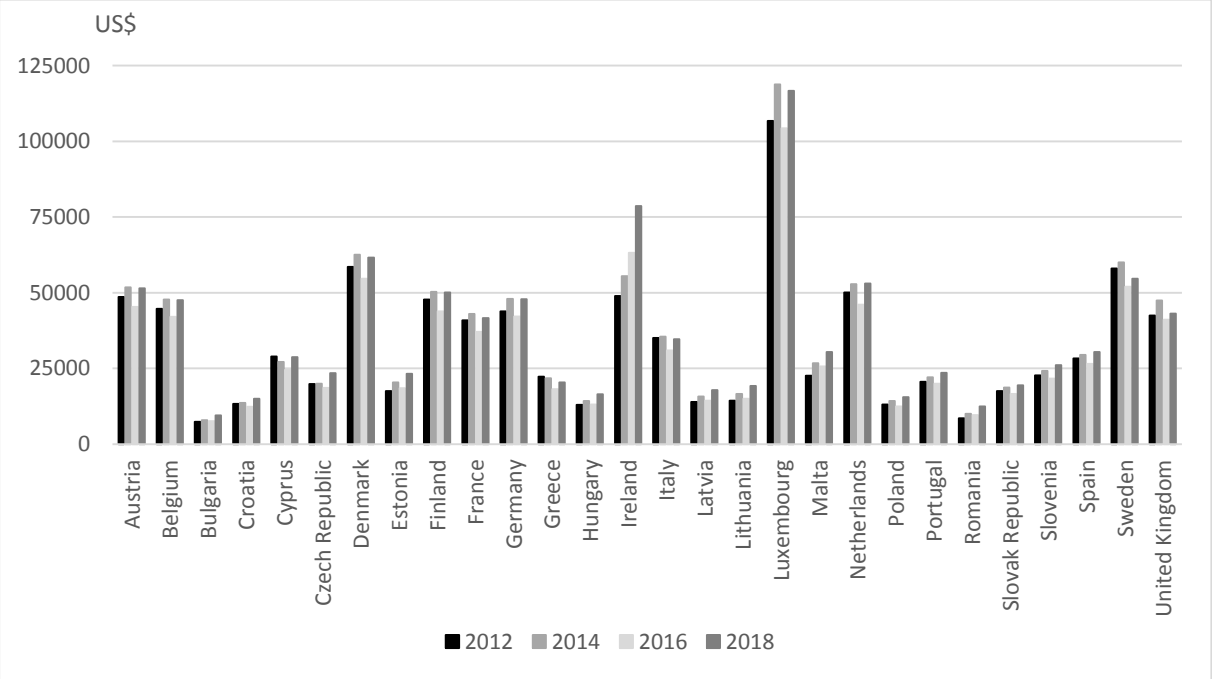

Figure 1. The value of per capita GDP in the European Union countries in the years 2012, 2014, 2016 and 2018 (US$). Source: own studies based on (World Bank, 2021).

As it is presented in figure 1, the highest value of per capita GDP in the all analysed years was observed in Luxembourg, the lowest values in Romania and Bulgaria. Taking into consideration all the European Union countries the increase is observed between 2012 and 2014 as well as 2016 and 2018 (successively from 32467.75 US$ to 34856.23 US$ and from 31305.45 US$ to 36141.69 US$). In 2012, 2014 and 2016 the values over the EU average were noticed in 12 countries, whereas in 2018 in 11 countries. Comparing the values between 2012 and 2018 the highest increase of the GDP per capita value was in Ireland, then in Romania, Malta, Lithuania and Estonia (successively by 60.72%, 45.76%, 35.11%, 33.42% and 32.14%). The decrease of the value is observed in four countries: Cyprus, Italy, Sweden and Greece.

The biggest differences in GDP per capita values in the analysed period were in Ireland, Romania and Lithuania, the smallest in Denmark, Belgium and Spain.

Considering the variables referring to innovativeness of the food industry enterprises it should be emphasized that there is a diverse number of innovative enterprises in the European Union (figure 2).

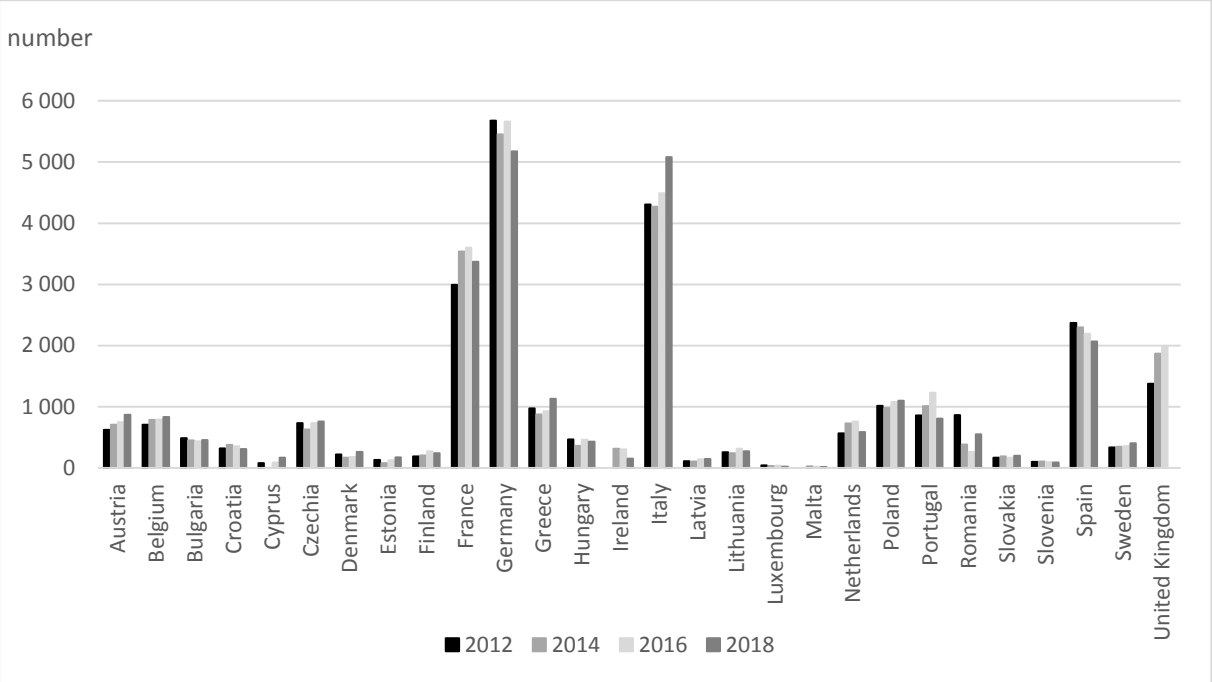

Figure 2. The number of innovative food industry enterprises in the European Union countries in the years 2012, 2014, 2016 and 2018. Source: own studies based on (Eurostat, 2021).

Analysing the individual years, it should be emphasized that the largest number of innovative enterprises in the food industry was observed in three countries – Germany, Italy and France. Relatively large numbers were also in Spain and Great Britain (except 2018). On the other hand, the lowest level of variable is observed in Luxembourg and Malta every year. The larger increase of innovative enterprises between 2012 and 2018 was in Cyprus, then Austria, Latvia and Estonia (successively the increase by 106.17%, 39.42%, 33.93% and 31.06%). The decrease was observed in eight countries: Croatia, Portugal, Bulgaria, Slovenia, Hungary, Germany, Spain and Romania.

The various quantities were also observed in the level of expenditure on internal research and development calculated per one innovative enterprise (figure 3).

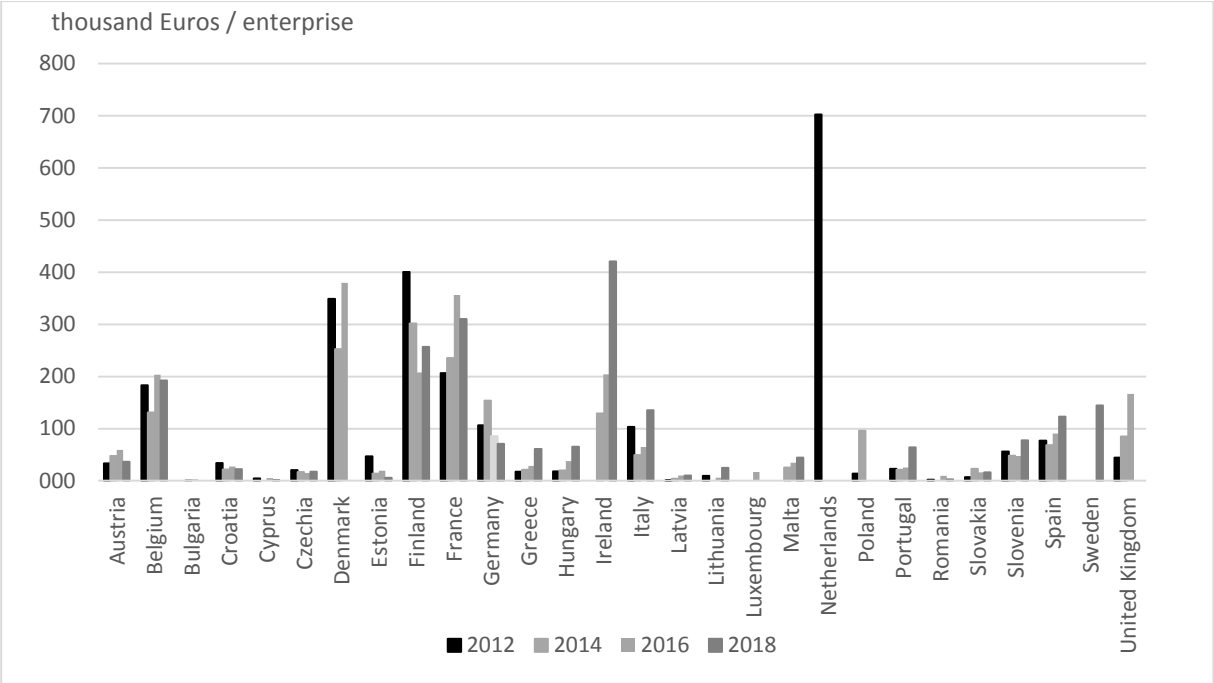

Figure 3. The value of expenditure on internal research and development calculated per one innovative enterprise in the European Union countries in the food industry in the years 2012, 2014, 2016 and 2018 (in thousand Euros/enterprise). Source: own studies based on (Eurostat, 2021).

The average value of expenditure on research and development incurred by innovative enterprises in the European Union in the food industry has had an increasing trend since 2014. The highest level of expenditure per one innovative enterprise in 2012 was observed in the Netherlands. In other years the highest values were in Denmark, France, Belgium and Ireland. At the same time, it should be emphasized that the expenditure on internal research and development per one innovative enterprise in the Netherlands in 2012 was seven times bigger than the EU average. However, there is no statistical data to analyse this issue in the Netherlands in the subsequent years. The lowest values were recorded in Latvia (in 2012), Bulgaria (in 2014 and 2016) and in Cyprus (in 2018). Analysing the dynamics between 2012 and 2018 it was observed that the highest increase of the value was in Latvia (by 1006.56%), then in Hungary, Greece, Portugal, Lithuania and Slovakia. On the other hand, the decrease of spending on internal research and development per one innovative enterprise between 2012 and 2018 was noticed in six countries, the biggest in Estonia, Cyprus and Finland.

In the next step the analysis of expenditure level on the purchase of machines, equipment and software per one innovative enterprise was performed (figure 4).

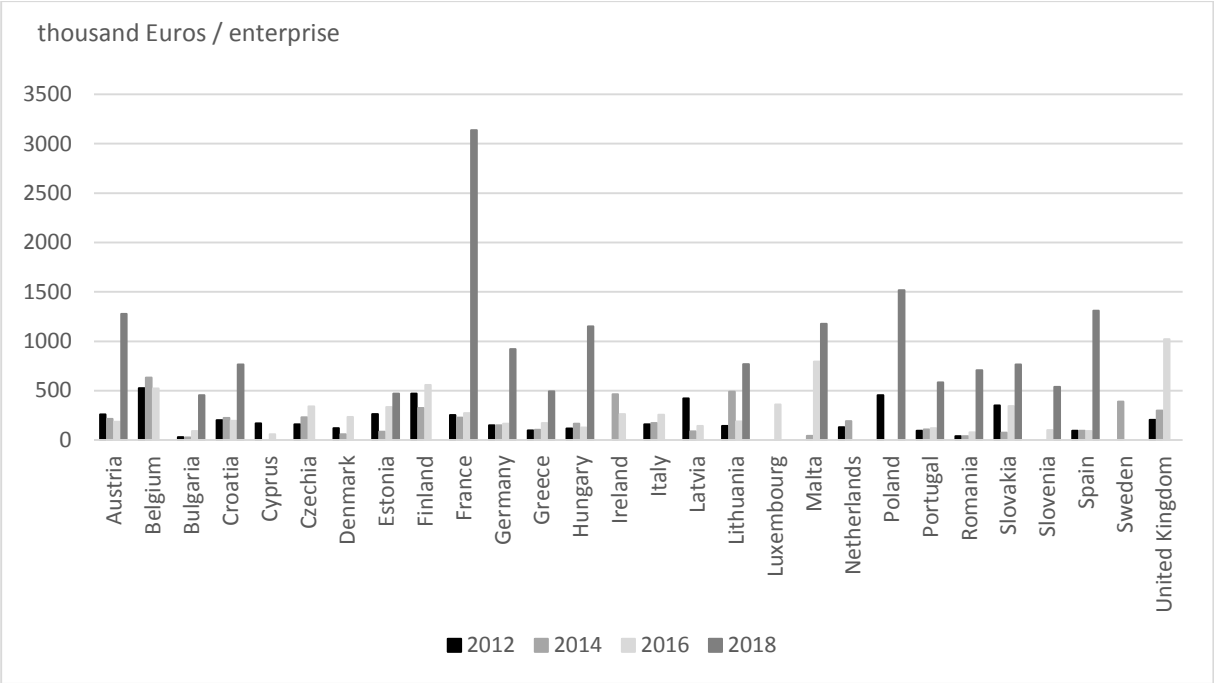

Figure 4. The expenditure on the purchase of machines, equipment and software per one innovative enterprise in the European Union countries in the food industry in the years 2012, 2014, 2016 and 2018 (in thousand Euros/enterprise). Source: own studies based on (Eurostat, 2021).

The average value of expenditure on the purchase of machines, equipment and software per one innovative enterprise in the European Union countries in the food industry has had an increasing tendency since 2014. Considering the highest level of this measure, diverse results can be observed. In the years 2012, 2014 and 2016 the highest level was in Belgium and Finland, additionally in Poland in 2012, in Lithuania and Ireland in 2014, and in Great Britain and Malta in 2016. On the other hand, in 2018 the highest level was observed in France, Poland and Spain. The lowest values of expenditure on the purchase of machines, equipment and software per one innovative enterprise were in Bulgaria (in all analysed years), in Romania and Spain (in 2012, 2014 and 2016) as well as in Portugal (in 2012 and 2016).

In the next stage of the study the correlation between the value of GDP per capita and variables referring to the innovativeness of the food industry enterprises was calculated. During the calculations the observations were ordered from the highest values (the lowest rank) to the lowest values (the highest rank). The assigned ranks are presented in table 1.

Table 1.
The ranking list of the values of per capita GDP and variables referring to the food industry innovative enterprises

	GDP per capita value				The number of innovative enterprises				The level of expenditure on internal research and development per one innovative enterprise				The level of expenditure on the purchase of machines, equipment and software per one innovative enterprise			
	2012	2014	2016	2018	2012	2014	2016	2018	2012	2014	2016	2018	2012	2014	2016	2018
Austria	6	6	6	6	12	11	11	7	13	12	10	14	7	10	15	4
Belgium	8	9	9	9	11	9	9	8	5	5	5	4	1	1	4	x
Bulgaria	28	28	28	28	14	13	14	13	x	22	25	x	23	24	22	16
Croatia	24	26	26	26	17	15	16	16	12	15	15	16	10	9	13	9
Cyprus	13	14	15	15	25	x	26	22	21	x	24	22	11	x	25	x
Czechia	19	20	18	18	10	12	12	10	15	19	20	17	13	7	7	x
Denmark	2	2	3	3	19	22	21	18	3	2	1	x	17	21	12	x
Estonia	20	19	19	19	22	25	24	21	10	20	17	20	6	19	8	15
Finland	7	7	7	7	20	20	19	19	2	1	3	3	2	5	3	x
France	11	11	11	11	3	3	3	3	4	3	2	2	8	8	9	1
Germany	9	8	8	8	1	1	1	1	6	4	8	9	14	14	17	7
Greece	17	18	20	20	7	8	8	5	17	17	14	12	19	16	16	14
Hungary	26	25	24	24	15	16	13	14	16	18	12	10	18	13	19	6
Ireland	5	4	2	2	x	18	18	23	x	6	4	1	x	3	10	x
Italy	12	12	12	12	2	2	2	2	7	10	9	6	12	12	11	x
Latvia	23	23	23	23	23	23	23	24	23	21	21	19	4	18	18	x
Lithuania	22	22	22	22	18	19	17	17	19	x	23	15	15	2	14	8
Luxembourg	1	1	1	1	26	26	27	26	x	x	18	x	x	x	5	x
Malta	16	15	14	13	x	27	28	27	x	13	13	13	x	22	2	5
Netherlands	4	5	5	5	13	10	10	11	1	x	x	x	16	11	x	x
Poland	25	24	25	25	6	7	7	6	18	7	x	x	3	x	x	2
Portugal	18	17	17	17	9	6	6	9	14	16	16	11	20	15	20	12
Romania	27	27	27	27	8	14	20	12	22	x	22	21	22	23	24	11
Slovak Republic	21	21	21	21	21	21	22	20	20	14	19	18	5	20	6	10
Slovenia	15	16	16	16	24	24	25	25	9	11	11	8	x	x	21	13
Spain	14	13	13	14	4	4	4	4	8	9	7	7	21	17	23	3
Sweden	3	3	4	4	16	17	15	15	x	x	x	5	x	4	x	x
United Kingdom	10	10	10	10	5	5	5	x	11	8	6	x	9	6	1	x

Source: own studies.

Analysing the correlation between the variables (table 2), it should be stated that the obtained results indicate different phenomena.

Table 2.
The value of the Spearman's coefficient of ranks correlation between the value of per capita GDP and variables referring to the innovativeness of the food industry enterprises

2012		2014		2016		2018	
Correlation between the value of per capita GDP and the number of innovative enterprises							
R	test	r	test	r	test	r	test
-0.022	n=26 α=0.05 r^0_d=0.329	0.008	n=27 α=0.05 r^0_d=0.323	0.061	n=28 α=0.05 r^0_d=0.317	-0.051	n=27 α=0.05 r^0_d=0.323

Cont. table 2.

Correlation between the value of per capita GDP and the level of expenditure on internal research and development per one innovative enterprise							
r	test	r	test	r	test	r	test
0.767	n=23 α=0.05 r^0_d=0.351	0.754	n=22 α=0.05 r^0_d=0.323	0.714	n=25 α=0.05 r^0_d=0.336	0.700	n=22 α=0.05 r^0_d=0.359
Correlation between the value of per capita GDP and the level of expenditure on the purchase of machines, equipment and software per one innovative enterprise							
r	test	r	test	r	test	r	test
0.236	n=23 α=0.05 r^0_d=0.351	0.418	n=24 α=0.05 r^0_d=0.343	0.452	n=25 α=0.05 r^0_d=0.336	0.415	n=16. α=0.05 r^0_d=0.425

Source: own studies.

There is no correlation between the GDP per capita value and the number of innovative enterprises in none of the analysed years. On the other hand, the value of the Spearman's coefficient of ranks correlations between the GDP per capita value and the level of expenditure on the internal research and development per one innovative enterprise in all analysed years indicates the strong correlation (r value from 0.700 to 0.767). However, the power of correlations had a decreasing tendency, which means that year by year there is a lower connection between the economic situation and the value of expenditure on the internal research and development incurred by innovative enterprises. During the testing of the null hypothesis between these variables, in all cases the null hypothesis indicating the lack of correlation between the analysed variables was rejected in favour of the alternative hypothesis indicating the existence of correlation. In the case of the analysis of a connection between the value of GDP per capita and the level of expenditure on the purchase of machines, equipment and software by the innovative enterprises a moderate correlation is observed (statistically significant) in 2014 and 2016. In other years a compliance between these variables was not observed.

The studies are in accordance with the results obtained by Galindo and Mendez (2014) who analysed the effect of a feedback between the level of innovation and the economic growth as well as Pece et al. (2015) whose results prove the positive relationship between the economic growth and innovation. The results also confirm the studies by Wolniak (2010) who claims that the high level of industry innovativeness results in the higher quality of industrial products manufactured by an organization, which fosters the increase of national wealth.

4. The final conclusions

The conducted studies analysing the correlations between the level of the economic growth of the European Union countries and the innovativeness of the food industry enterprises allow to formulate the following conclusions:

- Enterprises incurring the largest expenditure both on internal research and development as well as on the purchase of machines, equipment and software come from the following three countries: Belgium, Finland and France. Relatively high level of these categories of expenditure is observed in Ireland and Great Britain. At the same time, there was the high level of expenditure on internal research and development per one enterprise in Denmark (in years 2012, 2014 and 2016) and the high level of expenditure on the purchase of machines, equipment and software per one enterprise in Poland (in 2012 and 2018).
- Central and Eastern Europe countries (Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Romania and Slovakia) as well as Cyprus are characterized by the lowest level of expenditure on the internal research and development per one innovative enterprise. The similar situation may be observed in the case of the purchase of machines, equipment and software per one innovative enterprise. The lowest values are observed in Central and Eastern Europe (Bulgaria, Estonia, Latvia [in 2016 and 2018], Romania and Slovenia) and additionally in Greece and Portugal.
- the expenditure growth incurred on innovativeness by individual enterprises is observed in the analysed period. It may foster the increase of abilities and motivation in creating and implementing of system changes in the area of conducted business activity.
- there is a significant statistical correlation between the level of economic growth measured by the value of per capita GDP and the level of expenditure on internal research and development per one enterprise in all analysed years and expenditure on the purchase of machines, equipment and software counted per one innovative enterprise in the 2014 and 2016. It means that the innovative activities undertaken in this period are strictly connected with the economic situation of the European Union countries. However, the gradual decrease of the existing correlation between the value of per capita GDP and the level of expenditure on the internal research and development per one innovative enterprise is observed, which may indicate that this correlation is becoming less important. In addition, it should be stated that there is no connection between the level of economic growth of the European Union countries and the number of food industry innovative enterprises.

It should be taken into consideration that there is no statistical data in some of the analysed countries, which may influence, to a certain degree, the achieved results. Additionally, a number of other indicators referring to innovativeness of enterprises may be identified and taken into account in explaining the impact of economic situation on the level of innovativeness. However, gathering appropriate statistical data presenting the phenomena, which would enable the extension of the studies on the subject, may be a serious obstacle.

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CONFLICT IN WORK ENVIRONMENT – ITS CAUSES, PREVENTION, METHODS OF SOLVING

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Purpose: This paper attempts to present the essence of the problem of conflicts in the work environment, as well as their most important causes and methods of solving them. Attention was also drawn to the possibility of creative resolution of the disputed issues. The essence of conflict is problematic, due to various definitions and concepts assigned to the term. In the presented paper, conflict will be defined in a way that enables consideration of its constructive, as well as functional aspects.
Design/methodology/approach: Empirical research was conducted in the form of a questionnaire addressed to employees. Literature research of the subject was carried out.
Findings: When several or a dozen or so people are to cooperate, conflicts are inevitable and even useful, they occur in all teams, regardless of their nature. Teams that are aware that constructive conflicts are needed and are prepared to resolve them work effectively, even when difficult or crisis situations arise. Members of such teams are not surprised by them, they know how to act in such situations and what behaviors of other participants of the conflict they can expect. Therefore, constructive conflicts do not deteriorate employees' efficiency, atmosphere or relations in the team.
Practical implications: The issues discussed in this paper significantly affect the improvement of methods related to work environment management and the desired shaping of attitudes and behavior of employees regarding a constructive approach to the issue of conflict at work.
Originality/value In company management, the greatest attention should be paid to people as the subjects of all activities. Therefore, it is worth considering and asking the question what to do in a conflict situation, what actions to take, so that the conflict is not only a destructive phenomenon, but so that by searching for its multifaceted solutions, it becomes an instrument of organizational innovation and can lead to constructive solutions and creative changes in the company.

Keywords: company management, conflict in work environment, human factor.

Category of the paper: General review.

1. Introduction

Conflicts are an integral part of the life of every company. They are a natural phenomenon at work and occur even in the best teams. They create tension between employees and have a significant impact on the efficiency of their work, which, in turn, translates into the success or failure of the entire company. The key issue of the problem is the identification of the basis of a conflict situation and the selection of appropriate methods to solve it. Constructive conflict resolution should, first of all, lead to the integration of the team and cooperation of its members. The worst attitude that can be adopted in a situation, where things go wrong in the company, is pretending that the problem does not exist, trying to downplay it, or the so-called "sweeping it under the rug". This paper attempts to present the essence of the problem of conflicts at work, as well as their most important causes and methods of solving them. Attention was also drawn to the possibility of creative resolution of the disputed issues.

2. Conflict, competition and cooperation – concepts and definitions

The word conflict comes from Latin – *conflictus* meaning *a clash*. A conflict can be understood as a human conflict of interests, attitudes or aspirations. Each conflict has the parties involved and its subject matter. In a company, the parties are most often specific groups of people and the subject matter may be views, attitudes, expectations or material goods (Ostrowska, 2017; Lakis, 2010; Breet et al., 2010; Hobfoll, 2010; Taylor et al., 2010).

The essence of conflict is problematic, due to various definitions and concepts assigned to the term. In the presented paper, conflict will be defined in a way that enables consideration of its constructive, as well as functional aspects.

"Conflict in an organization means a dispute between two or more members or groups, resulting from the necessity to share limited resources or work, or having a different position, different goals, values or observations. When in dispute, members or departments of the organization try to make their case or point of view prevail over the case or point of view of others" (Stoner and Wankel, 1997).

The above definition is general on purpose, it does not specify the intensity of the dispute, how individual parties want to win, how the conflict is managed or what is its result. In any case, these factors determine whether the conflict is functional or dysfunctional for the organization and to what extent.

One of the many semantic difficulties associated with organizational conflict is the distinction between conflict and competition. You can distinguish between these concepts by asking whether one party may prevent the other from achieving its goals. Competition occurs

when the goals of the parties cannot be reconciled, but the parties cannot interfere with each other. An example would be two production teams competing to be the first to perform a planned task (both cannot be first). If there is no possibility to prevent the other team from achieving their goal, we speak about competition; however, if there is such a possibility and it is used, we deal with a conflict.

We talk of cooperation, on the other hand, when two or more parties work together to achieve common goals. Conflict and cooperation can coexist. The opposite of cooperation is not conflict, but lack of cooperation. An example would be two parties, who agree on the goals, but firmly disagree on how to achieve them. Conflict management means that managers should look for ways to balance it and cooperate (Stoner and Wankel, 1997; Jensen et al., 2015; Lohman et al., 2010; Weeks et al., 2009).

3. Conflict and changing approach to its perception

Over the past thirty years, the approach to organizational conflict has changed significantly. Stephen P. Robbins traced this evolution, paying special attention to the difference between the traditional view of conflict and the present one, which he calls interactive.

The traditional approach viewed conflict as redundant and very harmful. Initially, managers and management authors believed that the emergence of a conflict was a clear signal of something wrong with the organization. They believed that a conflict arises only when managers do not rely on healthy management principles in running an organization, or fail to make employees aware of the common interests between management and staff. According to the traditional approach, removing such problems should allow the organization to function as an integrated whole. One of the supporters of such views is F. Taylor, who believed that having applied the principles of scientific organization, permanent conflict between workers and management would disappear (Stoner and Wankel, 1997; Auster et al., 2005; Killoren et al., 2015; Knight et al., 2010).

The traditional approach to conflict has evolved as behaviorists and other management professionals began to see the causes of conflict in organizations that arise regardless of mistakes made by managers. This shift was accelerated when the advantages of conflicts that were managed effectively were noticed.

The dominant approach today is that organizational conflicts are inevitable and even necessary, regardless of how organizations are designed and handled. Of course, many conflicts are still considered to be dysfunctional: they can harm individuals and be a significant obstacle to the achievement of the organization's goals. However, it should always be remembered that some of them are also functional, as they contribute to greater efficiency of the organization.

It is currently believed that conflicts can lead to the search for solutions, and therefore are often an instrument of organizational innovation and change. From this point of view, the task of managers is not to extinguish or resolve all conflicts, but to guide them in such a way, as to minimize their harmful aspects and maximize positive ones. Such management may, even in certain specific situations, stimulate a conflict, if its lack or suppression may harm the effectiveness, creativity or innovation in the organization (Gembalska-Kwiecień, 2017; Stoner and Wankel, 1997; Knight et al., 2010; Lazarus, 1991).

According to the survey conducted in several companies from various industries, the majority of the survey participants assessed the conflict as a negative phenomenon of a dysfunctional nature.

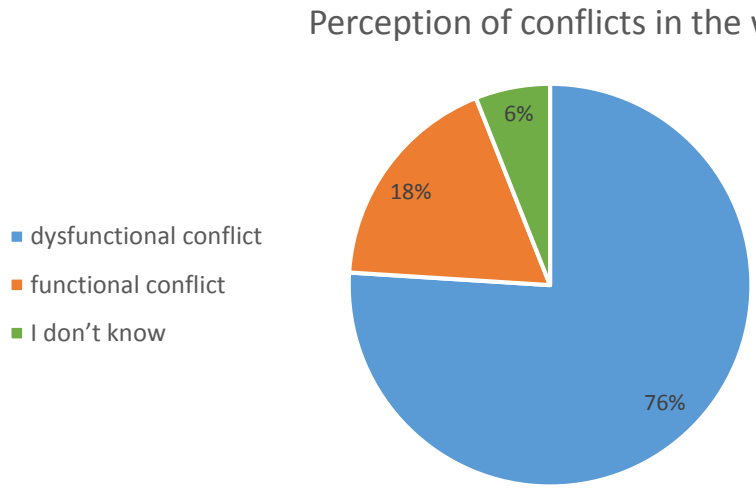

Fig. 1. Perception of conflicts at work. Source: own research.

Therefore, it is worth considering and asking the question what to do in a conflict situation, what actions to take, so that the conflict is not only a destructive phenomenon, but so that by searching for its multifaceted solutions, it becomes an instrument of organizational innovation and can lead to constructive solutions and creative changes in the company.

Summing up what has been presented above about the role that a conflict can play in an organization, we can distinguish:

Destructive (dysfunctional) conflict – which leads to mutual antagonisms, hostility and even sometimes aggression, arouses fear, anxiety and frustration; there is a negative attitude "against someone", someone always has to win; its effects may be:

- ✓ destructive stress,
- ✓ a sense of threat through social disapproval, and even potential exclusion,
- ✓ negative emotions, often even aggression,
- ✓ significant deterioration of the already bad relations between the parties to the conflict,
- ✓ lack of constructive communication between the parties,
- ✓ waste of time and resources of the parties to the conflict,

- ✓ hindered or impossible teamwork,
- ✓ significant decrease in work performance,
- ✓ higher operating costs of the organization.

Constructive (functional) conflict – which does not lead to mutual antagonisms, teaches respect for others, fosters the search for creative solutions and meeting the needs of all parties to the conflict; its effects may be:

- ✓ a significant increase in energy and motivation to undertake a new type of action,
- ✓ positive emotions, including increased trust between the parties,
- ✓ perceiving others in a kind and open way,
- ✓ the emergence of a sense of justice,
- ✓ focus on a common goal,
- ✓ finding more creative solutions to the conflict,
- ✓ the emergence of innovations (Stoner and Wankel, 1997; ; Lazarus,1991 Telzer at al., 2001).

4. Types of conflict

In the literature on the subject, there are several classifications of conflicts, according to various criteria. According to J. A. F. Stoner and Ch. Wankel, there are five types of conflict in an organization:

1. A person's internal conflict occurs when they do not know what work is expected of them, when some job requirements conflict with others, or when they are expected to do more than they think they can do. This type of conflict often affects how an individual responds to other types of conflict in the organization.

2. Conflict between individuals within an organization is often attributed to personality differences. Usually, however, such conflicts arise as a result of pressure related to the roles played (e.g. between a manager and a subordinate) or as a result of the personalization of conflict between groups.

3. Conflict between the individual and the group is often caused by the way individuals respond to pressure exerted by the working group, intended to enforce conformism. An individual may be penalized by a group for exceeding or failing to meet their performance standards.

4. Conflict between groups within an organization; most often inter-group conflicts arise between the line and staff, and between workers and management.

5. Conflict between organizations is considered inherent and desirable economically; most often it is referred to as competition. This type of conflict has been shown to lead to the development of new products, technologies and services, as well as to lower prices and a more efficient use of resources. Laws and state institutions try to encourage functional conflicts (e.g. through antitrust legislation) and limit their dysfunctional aspects (e.g. false advertising or espionage), (Stoner and Wankel, 1997 Bridges, 2008;).

5. The causes of conflict at work

The main causes of conflict include, among others:

- ✓ the need to share limited resources,
- ✓ differences in goals of individual units or teams,
- ✓ the interdependence of work in the company,
- ✓ differences in values or views,
- ✓ perception differences between individual teams.

- ✓ The conflict usually concerns material goods, which are often limited, or values and views. It is often also related to power, prestige or career. The reasons for its appearance may be various, sometimes contradictory team or personal interests. The source of conflict may also lie in hurt pride, passivity, failure to keep promises, jealousy, unspoken criticism or failure to fulfill official duties (Ostrowska, 2017; Stoner and Wankel, 1997; Auster at al., 2005 Heimpel at al., 2006).

There are many causes of conflict in work environment. First of all, it results from the specificity of a given organization, in particular, its defective structure, incorrect formal solutions (e.g. inadequate internal regulations) or inadequate organization of work.

The following causes of conflict in work environment are often presented in the literature on the subject:

- ✓ Shared resources. Assuming that each cell of the organization had access to an unlimited number of employees, money, materials, equipment and work space, there would be no problem with the distribution of these resources. The possibility of conflict occurs because the resources listed above are limited. They have to be allocated, so it is inevitable that certain groups receive less than they want or need. As individual groups compete for the greatest possible share of the available resources, a conflict or loss of cooperation may arise.
- ✓ Interdependence. The greater it is, the bigger the problems with its coordination may be. In the case of sequential work, conflict may be caused by one group producing too

many or too few products, with the consequent failure of the other group to meet its deadlines or goals. Sometimes conflict arises when there are too many tasks to be performed by all groups. Tension will build up between members of different groups, who may accuse each other of evading their duties. Conflict may also break out when work is distributed evenly, but the remuneration for it is different for the teams or individual members performing it. The greatest probability of occurrence of conflict is where one team cannot start working until another team completes a task.

- ✓ Different or conflicting goals. Different departments in a company specialize and differentiate as they adopt different goals, tasks and employees. Such differentiation often leads to a conflict of interest or priorities, even when there is agreement about the overall goals of the organization.
- ✓ Differences in attitudes, values and views. The differing goals of members of different departments are often accompanied by differences in attitudes, values and views, that can also lead to conflict.
- ✓ Excessive competition. Not all employees achieve their goals well in an atmosphere of permanent or excessive competition. Sometimes, they do not have the will or predisposition to compete, but the ubiquitous "rat race" eventually captivates them. However, it should be remembered that this does not have a positive effect on the atmosphere of teamwork and the work of individual employees (Stoner and Wankel, 1997; Stoffregen;at al., 2019; Lakis, 2010; Telzer at al., 2009).

Other causes of conflict observed in practice and described in the literature on the subject include: individual styles and organizational ambiguity. Some people like conflict, polemics and disagreement, and if these situations are under control, moderate disagreement can stimulate the activity of team members and increase their effectiveness. Some, however, exacerbate their conflicts, polemics and disagreements to the level of a "full-scale battle". Examples here include workers, who are highly authoritarian or have low self-esteem and often anger their colleagues by reacting too sharply to minor misunderstandings.

Conflict at work can arise on various levels – between colleagues, between a supervisor and an employee, during teamwork. Generational conflict is also quite common. At work, we usually do not choose our colleagues, but we must learn to function with them, and preferably cooperate constructively. Not everyone is able to find understanding right away. That is why the role of the manager skillfully leading their team is very important.

Other causes of conflict occurring at work are: overload, lack of proper communication between superiors and subordinates or co-workers, difficult contact with the supervisor, unclear rules for granting promotions or periodic performance review, lack of employee participation in decision making, bias, constant criticism, refusing a raise or holiday leave, especially when it is really important to the employee. Vague scopes of duties of individual employees, favoring one or more employees with a large bonus or prestigious training, which causes a negative

attitude of the rest of colleagues towards the distinguished person, unfair or unclear division of duties (Ostrowska, 2017 Zimmerman at al., 2015).

Summing up, the potential for inter-group conflict is greatest when there are significant differences between group members in terms of work attitude, age and education. Very often in such groups employees do not trust each other, cannot communicate with each other or simply dislike each other (Gembalska-Kwiecień, 2017; Ostrowska, 2017; Stoner and Wankel, 1997; Reiman at al., 2019).

6. Prevention of conflict at work

As discussed above, conflict at work is inevitable and even necessary, and it occurs in all teams, regardless of their nature. Team members, who agree on everything, do not question the assumptions, do not come up with new ideas, do not indicate mistakes made at work, which, in turn, will lower the performance of the entire company. Of course, not all conflicts are useful. Personal reluctance between employees or clashes related to the awaiting task may lead to a toxic atmosphere and, as a result, failure.

Pretending that nothing happened – the proverbial "sweeping the problem under the rug" is never a good way to resolve conflicts, especially in the workplace. Suppressing your aggression, fears, mutual grievances and resentments is a purely self-destructive phenomenon. Such attitude leads to a significant increase in the level of stress, a decrease in motivation and the quality of work performed (https.://www.praca.pl/;2021 Stoffregen;at al., 2019; De Drue at al., 2008; Villarreal at al., 2005).

To resolve a conflict, cooperation between all parties is necessary. Let's not try to delude ourselves – it is impossible to resolve a conflict with a few or a dozen e-mails sent, and think that something was done in the contentious matter and that will be enough. We should make it clear to ourselves and others that it is not enough. In such a situation, it is best to talk face to face. It is worth having such a conversation coolly, without violent emotions, in order not to regret what has already been said when the emotions subside. We must not forget about respect for our interlocutors, even if we do not agree with them in the dispute and we have a different opinion. We should let others present their opinion first and then make our views known.

Before having the conversation, it is advisable to analyze the situation and consider whether there is any alternative solution or compromise that could be achieved in this situation and propose it during the negotiations.

It is certain that some agreement can be reached, because there is no conflict that cannot be resolved. The main obstacle in solving it is the unwillingness of either party to cooperate. A good manager will certainly want to cooperate. Only as a result of constructive conversation with employees can they get to know their skills, ideas and needs better. In the future, this will

allow for the development of a more flexible work environment, in which tension does not build up, or builds up on a smaller scale, and there are no sudden outbreaks of conflict. This, in turn, will translate into better motivation to work and will significantly improve atmosphere and interpersonal relations (https://leadersheep.com.pl/blog/,2021; https://poradnikprzedsiebiorcy.pl; 2021, Reiman at al., 2019; Bridges, 2008 De Drue at al., 2008;).

According to surveys conducted in several companies from various industries, the participants indicated ways of conflict resolution in their workplace.

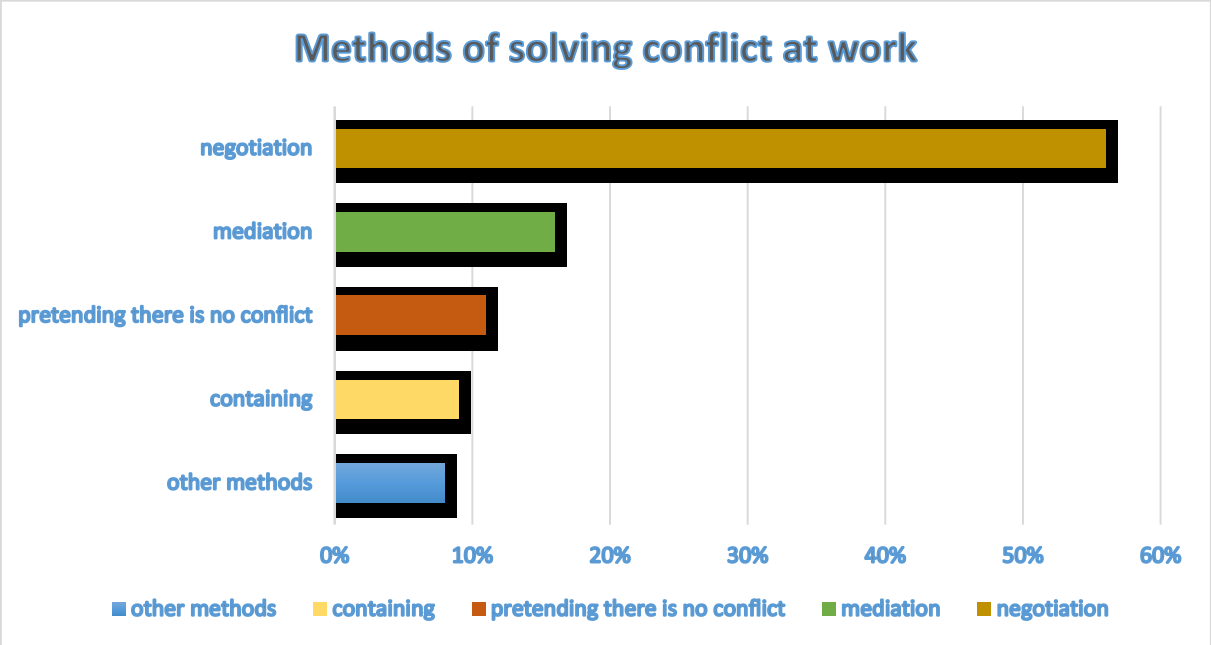

Fig.2 Methods of solving conflict at work

Source: own research

Below, there are some tips on what to do if there is a conflict in the workplace, how to convince staff that constructive conflicts play an important role in teamwork.

7. Conflict resolution at work – practical tips

1. Constructive conflict:

- ✓ At the team building phase, talk to the team members that conflicts are a natural phenomenon in teamwork.
- ✓ It is also worth emphasizing that thanks to their occurrence, the team can avoid making mistakes, because if they are constructively resolved, they can contribute to building a better atmosphere and strengthening interpersonal relationships in the workplace.

2. Before a major conflict or its escalation occurs, make your expectations clear and specific to the team.

Make sure to introduce the following rules to the team:

- ✓ Establish the ground rules. At the team building stage, identify acceptable and unacceptable behavior during conflict. This will prevent it from getting out of control. Each company, each team has its own specifics, and the people who create it are also different, so it is difficult to define rules that will suit everyone. However, one rule applies everywhere and always – a conflict should always be spoken about openly.
- ✓ Introduce a collaborative conflict resolution process. If team members know what to do when tension occurs, they will not be afraid of disagreement between them and will often successfully solve their own problems. A team should have specific, written, step-by-step rules of conflict resolution.

8. Summary

When several or a dozen or so people are to cooperate, conflicts are inevitable and even useful, they occur in all teams, regardless of their nature.

Teams that are aware that constructive conflicts are needed and are prepared to resolve them work effectively, even when difficult or crisis situations arise.

Members of such teams are not surprised by them; they know how to act in such situations and what behaviors of other participants of the conflict they can expect.

Therefore, constructive conflicts do not deteriorate employees' efficiency, atmosphere or relations in the team.

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DEPRESSION IN WORK ENVIRONMENT – ITS CAUSES, SYMPTOMS AND PREVENTION

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Purpose: This paper addresses the problem of depression. Depression is one of the most common mental health problems faced by employees, regardless of their position. WHO research indicates that various forms of depression will become, along with cardiovascular diseases, the most frequent health condition of people in developed regions of the world. Treatment in most cases restores health, yet it is highly disturbing that half of the patients do not undergo treatment for various reasons, thus depriving themselves of the chance to return to normal life and work. The purpose of this paper is to highlight this very important problem.
Design/methodology/approach: Literature research of the subject was carried out.
Findings: The risk of incidence of depression at work can and should be minimized. First of all, overall physical and mental health of employees should be taken care of. Therefore, we should take care of healthy sleep, healthy diet, practice sports and tourism, and find time to develop our passions and interests outside of work. Of course, the key issue here is the work environment. It is important for the employee to follow the basic rules of hygiene at mental or physical work. That is, not to burn the candle at both ends, not to overwork, not to set excessive, and thus often unrealistic goals to achieve, use rational breaks at work and, above all, take care of good relations with our colleagues. Also, report problems with professional work on an ongoing basis.
Practical implications: The issues discussed in this paper significantly affect the improvement of methods related to work environment management and the desired shaping of attitudes and behavior of employees regarding the approach to the issue of depression, a problem related to work environment that has been downplayed so far.
Originality/value: A holistic approach to depression. Defining it as an interdisciplinary problem. It should be handled by doctors of various specialties, especially psychiatrists, of course, but also general practitioners, neurologists, gastroenterologists, cardiologists and many other physicians. It also requires the attention of non-medical specialists.

Keywords: company management, depression in work environment, human factor.

Category of the paper: General review.

1. Introduction

The times we live in intensively create, and thus impose on us, an idealistic vision of success, an image of a man fulfilled in every area of life, including, of course, at work, a vision to which many people want to aspire. However, it is often done at the cost of losing touch with our own needs, values and expectations. Achieving satisfaction with our actions and work becomes impossible because it is difficult to give and see the meaning of activities that do not arise from our needs, but have been imposed on us from outside. Leading a life that does not make us happy and does not please us, using too many "must", "should", "have to", instead of "want", "need" and "desire", it is very easy to start implementing someone else's life plan that, in time, will turn against us.

If we add to this the threat related, for example, to the present situation of living in a pandemic, enormous stress related to the fear for our life and health and the life and health of our relatives and loved ones, as well as work overload, for example when working remotely or in isolation, overtime, high requirements of superiors – the risk of chronic fatigue, burnout and depression increases in consequence. The real experience of inner emptiness also becomes our part.

Depression is a growing problem. It is one of the most common diseases in the world, according to the World Health Organization (WHO). According to forecasts, by 2020, it will rank second among the most common diseases, and by 2030 – first. About 350 million people worldwide suffer from depression. In Poland, it accounts for 3-4 per cent of all reported mental disorders, and probably about 1.5 million people suffer from it (WHO, 2021).

Depression is most often diagnosed between the age of 20 and 40. The economic costs of treatment of depression in Poland range from PLN 1 billion to 2.6 billion (studies by IZWOZ, 2014). Across Europe, this sum is approximately EUR 170 billion (WHO data, 2014). In two years, the number of antidepressant packs sold increased by 2 million. In 2017, Poles spent PLN 346.2 million on antidepressants (IQVIA research). In 2016, approximately 5,500 suicides were committed in Poland.

Women suffer from depression more frequently. It is usually diagnosed in young and middle-aged people, but it also more and more often affects seniors. Unfortunately, the pandemic has had a negative impact on mental health – stress and fear related to concerns about our life and health and the life and health of our loved ones has left their mark. New data shows that approximately 42 per cent of Poles notice that their mental condition is deteriorating due to the COVID-19 pandemic (WHO, 2021; MEDONET, 2021).

As global research shows, depression is one of the most common mental health problems faced by employees, regardless of their position. WHO research indicates that various forms of depression will become, along with cardiovascular diseases, the most frequent health condition of people in developed regions of the world. It is believed that the causes of the growing

epidemic of depression are accelerated pace of life, chronic stress, competition, the pursuit of success and fear for the future. Treatment in most cases restores health, yet it is highly disturbing that half of the patients do not undergo treatment for various reasons, thus depriving themselves of the chance to return to normal life and work.

One can function for a long time feeling blue, ignoring symptoms and leading a life devoid of joys, colors and tastes. When everyday matters become a challenge and the suffering is unbearable, it is high time to see a specialist. However, we should not wait until that moment. Help that can turn things around may come sooner. And going through the whole therapeutic process minimizes the possibility of recurrence of the symptoms of the disease.

Summing up, depression is a disease that can and should be treated, its symptoms can be both recurrent and chronic. Currently, increasingly better methods of therapy are available, which, on the one hand, are more and more effective, and on the other hand are less and less burdensome.

2. Depression – terms and definitions

First of all, it should be clarified that depression is an ambiguous term, very often used, but also misunderstood. In colloquial language, it is very often used to refer to any type of low mood, malaise, dejection, regardless of the cause of this condition.

In psychiatry, this term is used to describe mood and emotional disorder, it is considered a disease entity (Pużyński, 2009; Święcicki, 2002).

The literature on the subject emphasizes that depression is more than just a painful emotional experience – it is a symptom complex that lasts longer than common dejection, disturbs social and emotional life, biological functions, cognitive processes and causes changes in human behavior (Kliszcz, Nowicka-Saure, Trzeciak, Sadowska, 2004; Sprawka, Wysokiński, Orzechowska, Talarowska-Bogusz, Typel, Gruszczyński, 2008).

Depression can be tricky in many cases and can resemble many different diseases. These often include ailments of the digestive system, circulatory system or the heart. Sometimes, it is accompanied by severe headaches, stomach aches, particular muscle pains, problems with the respiratory system, balance disorders or skin problems that seem unrelated to this disease.

Therefore, depression can certainly be labeled an interdisciplinary problem, that should be handled by doctors of various specialties, primarily psychiatrists, of course, but also general practitioners, neurologists, gastroenterologists, cardiologists and many other physicians (Kliszcz, Nowicka-Saure, Trzeciak, Sadowska, 2004; Sprawka, Wysokiński, Orzechowska, Talarowska-Bogusz, Typel, Gruszczyński, 2008). A person suffering from depression should be treated in a holistic way, which is why non-medical specialists should often participate in its

diagnosis and treatment. Despite the more and more widespread knowledge and available information on depression, it is still largely perceived as an embarrassing disease that should not be discussed.

3. Depression – symptoms

Depression very often disturbs the functioning of the patient in four spheres: it affects their mood, thinking, behavior and life activity.

Mood-related symptoms of depression include gradual loss of joy and pleasure in life, inability to enjoy the things and events that were previously perceived as joyful, which sometimes even leads to their complete disappearance. Low mood and emotional response, combined with indifference, a feeling of overwhelming and omnipresent emptiness. Often, a changeable, irritable mood, difficulty in controlling it, as well as deep and penetrating sadness, crying that is more and more difficult to control, sometimes also the inability to control one's emotions, impulsiveness inconsistent with previous behavior.

According to specialists, anxiety is not a typical symptom of depression, but it is very common. A person suffering from depression may be accompanied by the so-called general anxiety, consisting in a constant feeling of fear, although it is difficult for them to determine what specifically they are afraid of. Anxiety is often chronic, its intensity gradually increases and decreases. It is the so-called free-floating anxiety, often located by the patient somewhere in the middle of the body, for example in the chest (Borowiecka-Kluza, 2021).

Another symptom of the disease is depressive thinking. It is a pessimistic assessment of one's past, present and future. It is accompanied by a loss of self-confidence, lowered self-esteem, a feeling of being worthless and even unnecessary. Sometimes depressive delusions, i.e. false judgments, in which the patient believes, despite unsuccessful attempts to confront them with reality. They are delusions about feeling guilty, being sinful, punished, or about poverty, destitution, lack of any future prospects for oneself and one’s family. The appearance of such delusional thoughts is an unquestionable symptom requiring immediate psychiatrist consultation (Kocur, 2021; Borowiecka-Kluza, 2021; Greenberg et al., 2015).

Further symptoms of depression may be manifested in activity limitation. It is characterized by a gradual loss of previous interests, difficulties in undertaking various activities and actions, up to the extreme abandonment of these activities, for example, inability to get out of bed, perform the simplest hygienic activities, such as getting dressed, washed or combed. Gradual loss of vital energy and decreased sensitivity to emotional stimuli – apathy. Increased tiredness, chronic fatigue with limited daily activity. Sometimes psychomotor agitation with a sense of increased internal tension, anxiety and an inability to find a place for oneself.

There may also be changes in the patient's behavior, manifested in attention deficit disorder, deterioration of memory and cognitive functions.

Sleep disorders in depression are often manifested by difficulties in falling asleep and maintaining sleep, and often sleep becomes shallow and interrupted. Frequent waking up in the morning (3.00-5.00 a.m.) is also common in depression patients, with the possibility of falling asleep again in milder cases of depression, or with the inability to go back to sleep in people with severe depression. However, sleep disorders in the case of depression may also occur in the form of excessive sleepiness, both at night and during the day.

Possible symptoms of depression also include decreased or lost appetite, patients often force themselves to eat and feel that the food is tasteless. This is sometimes accompanied by significant weight loss (a few kilograms a month). However, sometimes depression may be accompanied by excessive appetite, characterized by overeating, which is uncharacteristic of the patient's previous behavior and, combined with a lack of physical activity, can lead to weight gain. In such a case, specialists talk about the so-called atypical depression.

A noticeable decrease in libido is also often observed in depression. Decreased or lost interest in sexual activity may intensify the depressive sense of diminishing one's self-esteem, femininity, masculinity or generally understood attractiveness. And this, in turn, may result in an even greater weakening of libido. Sexual life is not a source of pleasure, satisfaction. It can additionally increase the experience of depression.

According to specialists, the so-called daily mood swings are characteristic of typical forms of depression. Patients usually feel worse in the morning and at noon and it is very difficult for them to start the day. However, in the evening they feel a little better and are more active. But there are also patients suffering from depression, who feel better in the morning than in the evening, or do not experience daily fluctuations in their mood (Borowiecka-Kluza, 2021).

4. The origin and causes of the disease

Depression at work can have many different causes and, in many cases, it is very difficult to identify one main cause. Nowadays, excessive stress is the main cause of mental disorders resulting from the work environment. Employees are faced with ever higher requirements, that are sometimes difficult to meet. This may be accompanied by the fear of losing a job that we really care about. Let us not forget about the fast pace of work, the feeling that there are no irreplaceable people and, very often, disturbed balance between private and professional life. Depression is often manifested in the form of workaholism, resulting largely from the lack of personal life and non-professional passions.

The dependence between depression and work also manifests itself in inappropriate interpersonal relationships, conflicts with colleagues and superiors. It may also be a consequence of lack of support from superiors, or a lack of understanding of our actions by subordinates. In addition, slander, rumors, or the so-called rat race are not conducive to the creation of proper relationships at work. There are also activities aimed at deliberately destroying or lowering the professional position, used by colleagues. They negatively affect the attitude to life of the attacked people. Extreme situations, that can contribute to depression at work, are also pathological behaviors, such as harassment and mobbing.

As mentioned above, the relationship between work and depression is relatively complex. If any alarming signals are noticed, that may contribute to the occurrence or development of the disease, appropriate measures should be taken immediately to eliminate them (Borowiecka-Kluza, 2021; Greenberg et al., 2015).

5. Depression and professional work

Research shows that we have never been so stressed before. One in four of us will experience some form of mental disorder in our lives, and today the number of people suffering from depression is over 350 million and is constantly growing. The statistics are frightening and leave no doubt that we live in a civilization of anxiety.

According to a CIPD report, the number of people experiencing anxiety disorders, neurosis and depression at work has increased from a quarter to a third over the past five years, making mental health problems the leading cause of absenteeism. This has an impact on the global economy. WHO warns that the decline in productivity caused by the growing scale of mental disorders generates costs estimated at one trillion dollars annually (WHO, 2021).

At work, depression often manifests itself in a decrease or loss of motivation to work, a significant reduction in employee productivity and, in many cases, it leads to long-term inability to work. Difficulties in decision making, procrastination and avoiding professional duties set in. Since everything comes with a lot of effort, it becomes impossible to make a creative contribution to work. Research shows that with the onset of a disease, work efficiency drops by an average of 5.5 hours a week, which can practically be considered as a one-day absence of the employee. Withdrawal is noticeable. It does not have to be associated with complete social isolation, but in contact with a depressed person you may experience some kind of aloofness and a tendency to solitude.

Stressogenicity in some professions is a common problem, investigated by researchers analyzing the psychophysical burden among teachers, emergency services and health care workers. Research shows that nursing home workers are more likely to suffer from depression than the average population. Work in gastronomy is particularly strenuous for women; high rate

of depression is observed among waitresses and kitchen assistants. Social workers, who have few positive reinforcements, also show high rate of depression. Health care professionals, including nurses, are another group. Nurses, while performing their work, must be ready to be in constant contact, not only with the people who suffer and expect help, but also with the dying and their families. They have a constant sense of responsibility for their health and life and perform their duties in a shift system that adversely affects their physical and mental health. Artists and teachers are the next groups. Research conducted in Great Britain shows that more than 40% of teachers quit within the first 5 years of starting their career. Depression also affects secretarial staff, skilled workers, accountants and cashiers (Hallstrom, McClure, 2007; Kużel, Krajewska-Kułak, Śmigielska-Kuzia, 2015).

Unfortunately, it can be observed that depression is a fully democratic disease, because neither the financial status, nor the prestige of the profession or education protect us against it.

6. Prevention of depression in the work environment

As it has been mentioned above, depression affects all spheres of our lives, including the quality of our work. That is why the question how to effectively deal with depression in the workplace becomes so important.

Can our company be an employee-friendly place? Nowadays, employers and employees face many new challenges, but also creative possibilities for solving this pressing problem.

- ✓ Being an "employer with a human face" or simply a responsible employer, aware of the needs and expectations of their employees, is not only very necessary today, but also profitable from the point of view of the company. The FTSE 100 Index shows that organizations using phrases, such as "mental health" and "wellbeing" in their annual report at least twice posted profits up to three times greater than others. Unfortunately, there are still very few enterprises with a developed strategy for the promotion of mental health among employees. It should be added, though, that this situation is slowly, but surely, changing for the benefit of all concerne (Kocur,2021; Borowiecka-Kluza, 2021; Lerner, 2008).

It is important to realize how much depends on the employers themselves. Work, as such, is good for our mental health, but there are many factors that increase the possibility of illness, including:

- bad policy regarding employee safety and health,
- bad communication, conducive to the formation of a network of gossip and rumors,
- management by conflict,
- lack of employee participation in the company's activities,
- low level or lack of employee support from superiors,

- inflexible working hours, the need for shift work,
- unjustified accumulation of work,
- time pressure exerted on employees,
- vague orders, tasks,
- too high expectations towards employees,
- or finally pathologies, such as: humiliation, persecution, mobbing.

That is why it is so important to ensure appropriate employee-friendly atmosphere in the company. It can be done by creating a sense of security, mutual trust, in which employee participation in important matters of the company can develop. The sense of meaningful work, the ability to decide on the organization of your work and adapt it to your own pace. These are just some of the many factors that can protect employees from more serious health consequences.

- ✓ However, when employee health problems do emerge, it is important to immediately get adequate support and as much help as possible. As research shows, as many as 80% of employees admit that chronic stress at work clearly affects their relationships outside work, including family ones the most (Mental Health America study) (CIOP, 2021; Grygorczuk, 2008; Greenberg et al., 2015).

The European Agency for Safety and Health at Work proposes that organizations take specific actions to promote the mental health of workers:

- "organizing 'health circles' to detect and discuss problems and to find solutions based on employee participation,
- setting up policies on mental health and related issues, like violence and harassment at work, or integrating mental health issues in the general OSH policy within the company,
- providing training for management on how to recognize stress symptoms in employees and how to find good solutions for diminishing employees' stress,
- conducting a staff survey, using anonymous questionnaires, to find out what employees worry about at work,
- evaluation of measures and programs implemented by getting feedback from employees,
- running web portals informing all staff members on all the measures and programs that are being carried out in the workplace, aimed at enhancing mental wellbeing,
- providing courses/training for employees on how to cope with stressful situations,
- free counseling on diverse issues regarding private or working life for all employees, ideally available during the working day" (CIOP, 2021).

Changes that many employees are afraid of by nature, even changes for the better, should be introduced in an evolutionary way, in small steps, so that employees do not feel overwhelmed, threatened or simply afraid of them. Caring for the right atmosphere, balance at work and rest for employees is becoming more and more common in modern enterprises. Employee-friendly workplaces offer specially designated areas for relaxation, free massage,

meditation or short fitness trainings. Some companies have dedicated places for short naps. The Salesforce corporation went even further – during breaks at work you can participate in inspiring workshops and lectures, conducted, among others, by Zen masters.

Globally, WHO has implemented several international plans to promote mental health in the workplace: Global Plan of Action on Worker's Health (2008-2017) and Mental Health Action Plan (2013-2020), which include, among others, the identification of social factors related to mental health, including such important ones as housing and work environment, anti-discrimination and stigmatization of sick people, as well as increasing access to help, both in medical facilities and workplaces. Support is also promoted in cases of abuse and chronic stress. On the other hand, as part of the Mental Health Gap Action Program (mhGAP), the World Health Organization provides tools supporting the early detection and prevention of addictions and suicidal tendencies, (CIOP, 2021; Dekkers-Sánchez et al., 2013; Ekberg et al., 2013; Flook et al., 2013; Krasner et al., 2009; Cleirigh and Greaney, 2006).

With such a large scale of the problem related to the ever-growing incidence of mental disorders, including depression, there is no time to think about when to start introducing changes – because they are necessary today.

7. Practical advice

- ✓ The disease must be diagnosed – to do this you need to seek the help of a specialist. Depression is one of those diseases, that must not be ignored and whose diagnosis and treatment must not be delayed. Including, if the doctor recommends it, pharmacological treatment and psychological support.
- ✓ It must be remembered that coping with depression is absolutely not an easy task. There may be days when it will seem that nothing can be improved and nothing is good enough. It's just a temporary illusion, if you take medication and get psychological support, it will pass.
- ✓ In getting out of depression, it is very important to take care of yourself in every sense of the word, physical, mental or social. We should take care of ourselves as we would take care of the person most dear to us.
- ✓ Taking care of ourselves physically is the basis of health, but – unfortunately – people forget how much physical health affects our mental wellbeing. The simplest and most important things are the right amount of restful sleep, a healthy and balanced diet and physical activity.
- ✓ Mental self-care includes reducing stress and being good to yourself, including forgiving yourself.

- ✓ Sessions with a therapist. It will only be effective if we follow the recommendations of specialists honestly and diligently and trust their experience.
- ✓ Taking care of yourself socially means good interpersonal relationships. People, who experienced depression themselves, are often helpful, they will listen and share their experience. But also a new circle of people, for example acquaintances from a class of pilates, swimming, yoga or other creative activities. Such contacts should not be deprecated in advance.
- ✓ You should talk about your feelings, meet with your family and friends.
- ✓ Open up to the beauty of the surrounding nature, to cultivate a garden or even a green corner on a balcony or terrace. Go for a walk in the forest, listen to the birds singing and give yourself a chance for it to work (Gembalska-Kwiecień, 2017; Kocur, 2021; Galinsky et al., 2008).

8. Final conclusions

As presented above, depression is a growing problem of our time and a serious disease, so democratic that it can affect any of us. However, if we follow the recommendations set out above, we may protect ourselves against it.

The risk of incidence of depression at work can and should be minimized. First of all, overall physical and mental health of employees should be taken care of. Therefore, we should take care of healthy sleep, healthy diet, practice sports and tourism, and find time to develop our passions and interests outside of work. It is also worth investing in good relations with our loved ones, especially with family and friends, who can prove to be an invaluable support in difficult times.

Of course, the key issue here is the work environment. It is important for the employee to follow the basic rules of hygiene at mental or physical work. That is, not to burn the candle at both ends, not to overwork, not to set excessive, and thus often unrealistic goals to achieve, use rational breaks at work and, above all, take care of good relations with our colleagues. It is also important that we report problems with professional work on an ongoing basis.

However, when the work environment clearly leads to depression at work, a change of work should be considered. Such a solution, although radical at first glance is, in many cases, necessary to free oneself from toxic work and maintain good mental health.

Last, but not least, it should be emphasized that, in the case of a diagnosed depression, caused by factors related to work, the above recommendations are insufficient. Depression is a disease and it is necessary to introduce appropriate treatment, including both pharmacological agents and psychotherapy (WHO, 2021; Kocur, 2021; Borowiecka-Kluza, 2021; Kessler et al., 2006).

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IDENTIFICATION OF HUMAN RESOURCE RISK BY MANAGERS AND EMPLOYEES THROUGH THE LENS OF THE COVID-19 PANDEMIC

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Purpose: The main purpose of the paper is to identify the gap between the risks indicated by managers at the beginning of the pandemic and some selected actual challenges.
Design/methodology/approach: The text includes both a literature review and the authors' own study consisting of two parts. The first one deals directly with how companies manage risk. The study used a descriptive form that was completed by managers in the first half of 2020. The second part of the study was conducted using the CAWI method and concerned the evaluation of remote working from the perspective of employees. The particular value of combining these surveys is the possibility to compare risk management with the actual risk. External reports were also used to comment on the results.
Findings: Research findings concerning the risks identified at the beginning of the pandemic and the attempt to assess them through the prism of the opinions of employees who worked under pandemic conditions indicate that technology will be an important aspect of many components of the HR function in the future. Thus, it can be accepted that the technological aspect (including the increasing use of IT at work) should be more widely taken into account by employers in the HR risk management methodologies. It is useful to carry out ex-post analysis in risk management methodologies in order to improve the methods of risk identification.
Research limitations/implications: The research results presented and the statements put forward are certainly subject to limitations. As mentioned earlier, many of the indications are region- or sector-specific, and a detailed assessment of risk management must be carried out using case study methods. The conclusions arrived at should therefore be treated in a directional manner. However, this does not change the fact that the pandemic itself is certainly a regional as well as a universal issue and poses similar challenges to all.
Practical implications: Pointing to the application aspect of the study results, it is worth noting that COVID-19 effects or market changes are conducive to the creation of new standards in the field of human resources risk and the promotion of sustainable use of human capital. The research methodology can be used to analyse the phenomenon of HR risk in organisations,

and the research results can be a valuable contribution to building the mentioned standards in organisations.
Social implications: Work on new types of risk should also have a positive impact on human capital construction. Further advances in knowledge in this area will be particularly important as it is estimated that the challenges of work organisation (including remote working) in times of pandemic will stay for long time.
Originality/value: This paper addresses the issue of HR risk management in the face of the pandemic and the development of remote working. The research problem being identified is whether the pandemic situation gives rise to new areas of HR risk and whether the experiences of this period should influence the way risk is managed in the future.

Keywords: remote work, human resources risk management.

Category of the paper: research paper.

1. Introduction

The concept of crisis situations is quite broad in economics. It includes division of crises according to the area, e.g. economic or financial, or to the scale, e.g. regional, national or sectoral. The beginning of the third decade of the 21st century will certainly be associated with a multidimensional crisis caused by a pandemic. At the same time, almost two years after the first lockdowns, the economic and social situation does not cease to amaze and is certainly not homogeneous. Huge falls in demand in some parts of the economy are encountered by rises in others. Such a situation breeds uncertainty and has a huge impact on both businesses and workers, which is an important background for further considerations. The pandemic period has significantly changed the way businesses operate. Many organisational and technical solutions have significantly changed the internal processes, but also the way work is done and the way employees are managed. There have also appeared many situations of uncertainty, not only economic, but also related to the labour market and those working remotely themselves.

Nowadays risk management concepts are based on several basic assumptions defining that the risk portfolio should be considered and that enterprise risk management requires a holistic approach (Dankiewicz, Ostrowska-Dankiewicz and Bulut, 2020). The same approach applies to HR risk management where one should not define fixed risks or the relations between them and performance, but rather try to modify the current scope of the risk portfolio and the methods of identifying risks as well as counteracting, monitoring and mitigating them. It is also worth noting that the individual types of risks are significantly influenced by current events and the economic or social situation. Thus, research findings should not be generalised, which does not mean, however, that there are no valuable attempts made to analyse other areas. However, while the knowledge in this area should be considered interesting and well-established, for the purpose of fulfilling the objectives of the paper, the issues concerning HR risks during

COVID-19 should be elucidated. Some authors have already made attempts to explore the HR areas during the pandemic. A review of the literature made it possible to identify some HR issues and keywords related to COVID-19 research. The results are: employee wellbeing, flexible workforce, remote work, job loss, human capital (human capital efficiency, digital platform, and human capital loss), human resource development (HRD), leadership, performance, communication (Zhong, Yameng, Jian, and Yiyi, 2021).

2. Theoretical background

The literature often analyses the risks associated with sectors or areas, or indicates e.g. the relation between the management practices applied and the HR risk characteristics. For example, regional studies for V4 countries (Poland, Czech Republic, Slovakia and Hungary) note that risks such as high employee turnover rate, insufficient employee qualification, and low work morale and discipline, are significantly higher in Hungary compared with other V4 countries (Kozubíková, Zámečník, and Výstupová, 2020). Interesting areas of research also include analyses of HR risks in specific processes. By way of example, the aim of one study was to develop a hybrid model for risk management and develop strategies to overcome the human resources barriers to effective risk management in international projects. In a research paper 20 barriers were identified where the most important was poor leadership abilities of project manager (Dandage, Rane, and Mantha, 2021).

At the same time, many authors avoid generalisation and employ in their research case-study methods, interviews and questionnaires to analyse and learn from detailed situations (e.g. Balali, Valipour, Edwards, and Moehler, 2021) or detailed risks (Tokarz-Kocik, 2019). Although most risk analyses are done from the perspective of the enterprise as the employer, it is also important to take into account the risks perceived by employees. For example, the impact of job uncertainty on job-seeker performance is analysed (Godlonton, 2020).

Apart from describing individual risks and their determinants, research findings also attempt to identify specific solutions. Taking into account current challenges related to the pandemic and the topic being discussed, it is worth mentioning here such recommendations as e.g. training and development of digital skills, promoting the use of digital platforms, developing multiple skills, and establishing safe working environments or flexible work schedules (Zhong, Yameng, Jian, and Yiyi, 2021). When grouping the aforementioned recommendations together, it is worth noting that they often improve the methodology covering the whole process of risk management. They concern the management methodology itself or early warning models of human resource management risk. The models include identification, preparation, analysis, planning, organising, control, early response, counteraction, selection and cost of preventive actions (e.g. Yan, Deng, and Sun, 2020; Mitrofanova, A., Mitrofanova, E.A.,

Konovalova, Ashurbekov, and Trubitsyn, 2017; Mytnik, Piskorz, and Badzmirowski, 2018; Huang, Sun, Guan, and Peng, 2017).

Although the paper addresses the topic of HR risk in the context of remote working, it is worth noting that in some studies the perspective of entrepreneurs' assessment reduced the significance of HR risk. For example, in some studies on SMEs in the Czech Republic and Slovakia financial risk was considered as one of the three most significant risks in around 35% of the companies, and during the COVID-19 crisis in around 57% while the rating for personnel risk decreased from on average 65% to 28% (Cepel, Gavurova, Dvorsky, and Belas, 2020). Nevertheless, there is no doubt that the COVID-19 situation poses immediate threats to the organisations' performance and viability, which means they have to face many challenges, also related to HR. Among these challenges are person-environment (e.g. shifting to remote working, environments or implementing new workplace policies and procedures to limit contact), work-family balance (Carnevale, and Hatak, 2020).

Commenting on these results, it is worth noting that they do not indicate new areas of risk, but change its value. Nevertheless, one should agree with the authors that COVID-19 has an enormous impact on conventional human resource management and requires the theoretical and empirical attention of researchers. At the same time, before presenting our own research, it is worth sorting out the relevant economic and social context using the results of reports and analyses by independent institutions.

In the wake of the COVID-19 pandemic many countries have taken a number of actions to mitigate the negative impacts, such as increased unemployment. These actions include (OECD, 2020): increasing income support for workers losing their jobs or wages and increasing paid sick leave, introducing measures to allow people to stay at home, providing support to businesses to save viable jobs and mitigating cash flow problems. These actions were mainly monetary in nature. For example, the European Commission (n.d) indicates that EU Member States received budgetary, liquidity and policy resources totalling EUR 3.7trn. It also estimates that the global fiscal support in 2020 amounted to USD 14trn, equivalent to 13.5% of the global GDP (World Bank Group, 2021, p. 17). An example of this can be seen in the UK, where the government offered funding to employers until September 2021 to cover part of the wages of workers who are unable to work. In total, from August to November 2020, around 9 million people received 80% of their income in this way (Bank of England, n.d.). It should be noted that all these measures were aimed at protecting jobs, income or supporting the transition to remote (home-based) working, but they may also indirectly affect employees' mental health.

At the same time, the OECD (2021) emphasises that it was already before the crisis that mental health support was poorly integrated into the welfare, labour and youth support schemes so it is still crucial to develop strong and more integrated policies to support employees' mental health. This is critically needed as numerous studies indicate that employees' mental health has suffered during the pandemic (Zdrowie psychiczne…, 2021). A study conducted by McKinsey in 2020 (on the US labour market) found that the majority of employees reported difficulties

accessing mental health care, and around 70% of employers planned to invest in mental health resources for their employees by starting, continuing or expanding the benefits in 2021. At the same time, the most common reported reasons for reducing or discontinuing support (reported by around 10 to 15% of employers) were the cost, complexity of resource management and low use of the resources by the employees (McKinsey, 2021). The pandemic affected women's psychological well-being more than men's, which may be due to a shift towards traditional gender roles during the COVID-19 pandemic (Meyer, Zill, Dilba, Gerlach, and Schumann, 2021, p. 547).

What emerges from the above data is a picture of huge interventions affecting the labour market (and therefore demand and supply during the pandemic) and, at the same time, huge internal challenges for employers who will have to deal with the effects of employees' disrupted mental health. This raises the question of whether managers are correctly identifying the risks emerging.

3. Research methodology

In the first part of the study, a descriptive form (Table 1) was used, in which respondents had to identify the risks (minimum 4, maximum 10 significant HR risk situations), indicate their sources and assess the probability of occurrence and possible consequences. The form was filled in by Polish mid- and senior-level managers of organisations who were participants in MBA studies. The survey was conducted in the first half of 2020. Before completing the form, the managers had been provided with adequate preparation that enabled them to contemplate, discuss and later assess the individual HR risks in their own organisations. A total of 45 forms were completed and 275 risks were identified. Due to the way the survey was used and due to its scale, the breakdown of results by scale or industry, or other company characteristics was omitted in this paper.

Table 1.
Survey form

Description	Risk 1	Risk 2	Risk n
Name, nature and type of risk			
Source of risk (describe in brief)			
Possible effects (describe in brief)			
Impact assessment (1-10)*			
Assessment of the likelihood of occurrence (1-10)**			
Possible ways of counteracting	*(not used in this article)*		
Possible mitigation measures			
Method of monitoring			

Source: own study.

In addition to the identification of risks, the survey asked respondents to rate subjectively the likelihood and impact of the identified risks (on a scale of 1-10) indicating the relevant definition, where according to the scale:

1. 10 – will definitely happen; 1 – very low likelihood,
2. 10 – inability to continue operations; 7 – loss of viability; 5 – a significant decline in performance; 1 – negligible impact on operations.

The average rating of the likelihood that a particular risk will materialise and of the consequences of its occurrence was at mid-level – above 5. The standard deviation in both criteria for all risks was not high – 0.58 for the consequences of the risk and 0.73 for the likelihood of occurrence, respectively, which may indicate some difficulty in assessing these aspects by managers leading to choosing middle scores on the scales. It is worth noting that similar breakdowns are also proposed by other authors, but in their research findings they indicate the necessity of using expert opinions and not only internal ones (cf. Tikhonov, 2020), although at the same time it is indicated that for adequate risk measurement quantitative methods are necessary (Dankiewicz, Ostrowska-Dankiewicz, and Bulut, 2020).

An important conclusion of the study at this stage may therefore be to point out the difficulties experienced by managers in properly assessing risks (and the tendency to average them out). Indeed, other researchers also point out that most enterprises are aware of human errors and the associated personnel risks, but they do not pay enough attention to the mistakes of managers (Hudakova, Lahuta, 2020), and they themselves do not always implement risk management solutions sufficiently (Bombiak, 2018). Despite these reservations, the results presented include matrices of sources and areas of risk with assessments of the likelihood and consequences of their occurrence.

A CAWI survey was conducted in order to comment on the results from the perspective of time and experience of the pandemic period and to include the views of employees. The surveys were carried out in mid-2021, addressing the topic of enforced (pandemic-induced) remote working of office workers (500 people in total were surveyed). As in the case of the first survey, a closer analysis of the response structures according to the characteristics of the respondents or the companies in which they work was omitted here. At the same time, the results were used to try to assess and comment on the ability to predict the risks associated with remote working and the pandemic. The structure and the links between the surveys are shown in Figure 1.

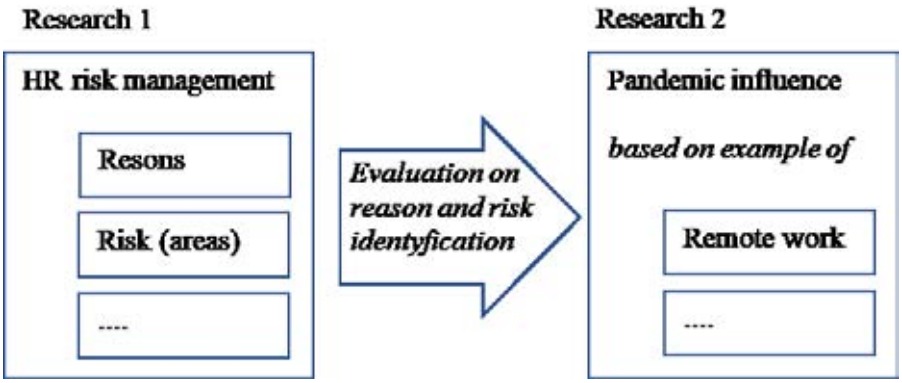

Figure 1. Research layout. Source: own study.

4. Results

The sources of the risks identified were grouped into the categories they concerned and divided into two areas: internal (dependent on the company) and external (dependent on the environment in which it operates). Among the internal sources most frequently mentioned by managers were those related to employee competence (e.g. lack or loss of suitably qualified staff), as well as related problems with the employee development system and the promotion system. These sources may in part be related to the labour market situation in most sectors, where the employee market is currently returning (cf. Money, 2021), while failure to provide opportunities for development and promotion may translate into a loss of competent employees and difficulty of replacing them.

This was also emphasised by the managers, who often pointed to another of the sources of external risks – the labour market and the political and legal conditions. These sources of risk, in turn, can be linked to internal risk involved in personnel planning (employment structure), which risk was also among those most frequently identified. Still in the area of company-related risks, it should be noted that common risk sources that were identified concerned the system of remuneration, communication and incentives. On the other hand, a risk source that is heavily dependent on employees was negligence – especially with regard to health and safety regulations, but also proper communication or some other staff duties.

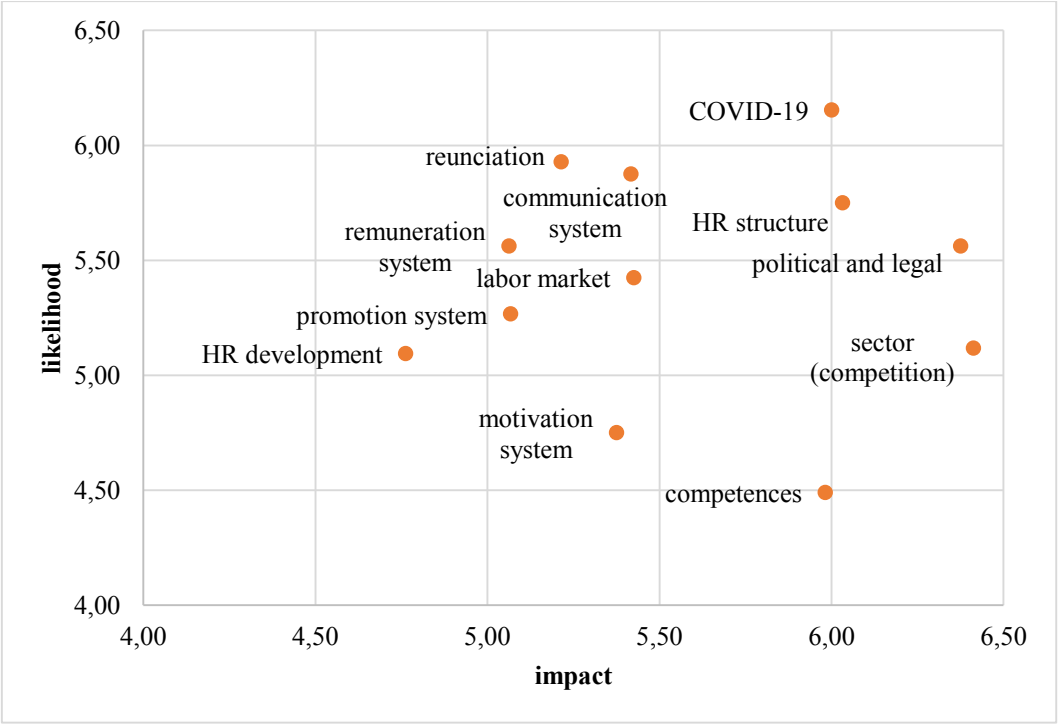

Figure 2. Risk cause matrix. Source: own study.

Subject to the reservations indicated above, the risk matrix presented (Figure 2) shows that the sources associated with the most severe impact for the company were those related to political and legal conditions and the effect of the sector on the company, i.e. those stemming from the external environment, as well as the COVID-19 pandemic, a risk source that was associated with a high (relative to the others) likelihood of occurrence. Among the internal sources of risk, those with significant impact included personnel planning and staffing structure. Interestingly, even though the lack of competence was commonly indicated as a source of risk associated with highly significant, the likelihood of occurrence of this risk was rated the lowest.

Each risk listed was assigned an area that may be affected. Many authors propose a classification of risks, e.g. with divisions for the risk as a whole, e.g. political or social (e.g. loyalty), or with reference to the risks in the HR areas, such as risks of labour relations or risks of inappropriate working conditions (Tikhonov, 2020), but for the purpose of the overall comment, a different breakdown was proposed, based on the results obtained, i.e. a division according to the areas affected by each risk with another division of the components of the HR functions responsible for the particular areas of activity.

On this basis, it was shown that the most frequently occurring area were errors in staff management. At the same time, equally frequently identified risk areas include turnover, loyalty, but also absenteeism and age structure. These risks indicate the difficulty of establishing a long-term relation with an employee. It may be even more acute in some industries, especially in positions with a simple scope of work, in view of the current surplus of job offers over the demand for work at employment agencies employing foreigners (Business

Insider, 2021). Other frequently perceived areas of risk are those relating to the competencies of employees, their commitment and the resultant development (Figure 3).

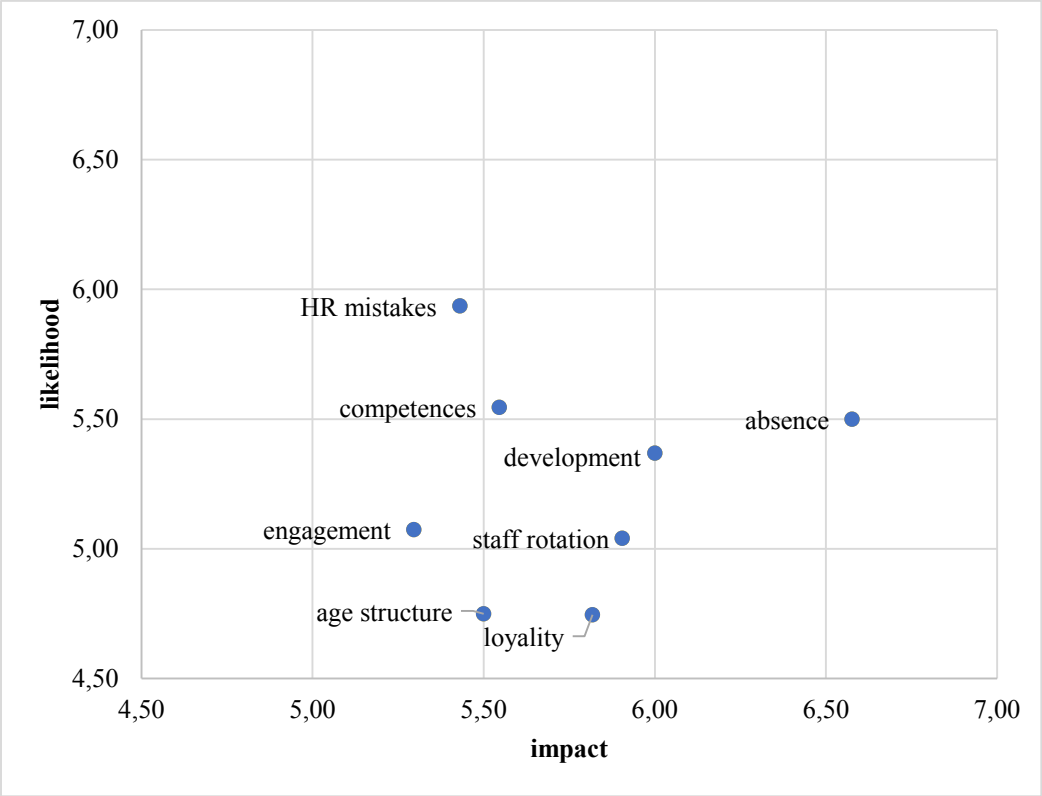

Figure 3. Areas of HR risk. Source: own study.

Considering the scale of possible consequences, the possibility of risk in the area of absenteeism becoming reality is associated with the most highly rated impact, all the more so if these absences cannot be predicted. Highly rated was the impact of risks in the area of turnover and development although they have a lower likelihood occurrence than popular or mistakes made in connection with employee management. One of the lower impacts and likelihoods of occurrence was associated with risks in the area of age structure, which may be due to the predictability and frequently undertaken actions in the area of this risk.

The individual risks were also assigned to the area of human resource management they concern (Figure 4). The area most commonly indicated by managers was workforce planning even though the likelihood of this risk occurring was one of the lower among the main types of risk. Next in terms of indications were risks in the area of motivation and development, the impacts of which were assessed similarly, while the area of development had a higher likelihood of becoming reality. It should be pointed out here that these areas are closely connected – failure to provide opportunities for development is often associated with a lack of motivation of the employee for further work and may result in looking for a new employer. Hence it is probably no coincidence that risks in the area of recruitment were mentioned by managers together with a high likelihood and higher potential impact than others. Another frequently identified risk area was the organisational area (work planning) with the highest

possible impact in the key risk areas even though the risks indicated were often associated with short-term consequences (e.g. due to unplanned absences or unused holidays). The areas of remuneration and management, which appeared equally frequently in the managers' indications, had almost identical high likelihoods of occurrence, with higher scores for impact in the management area.

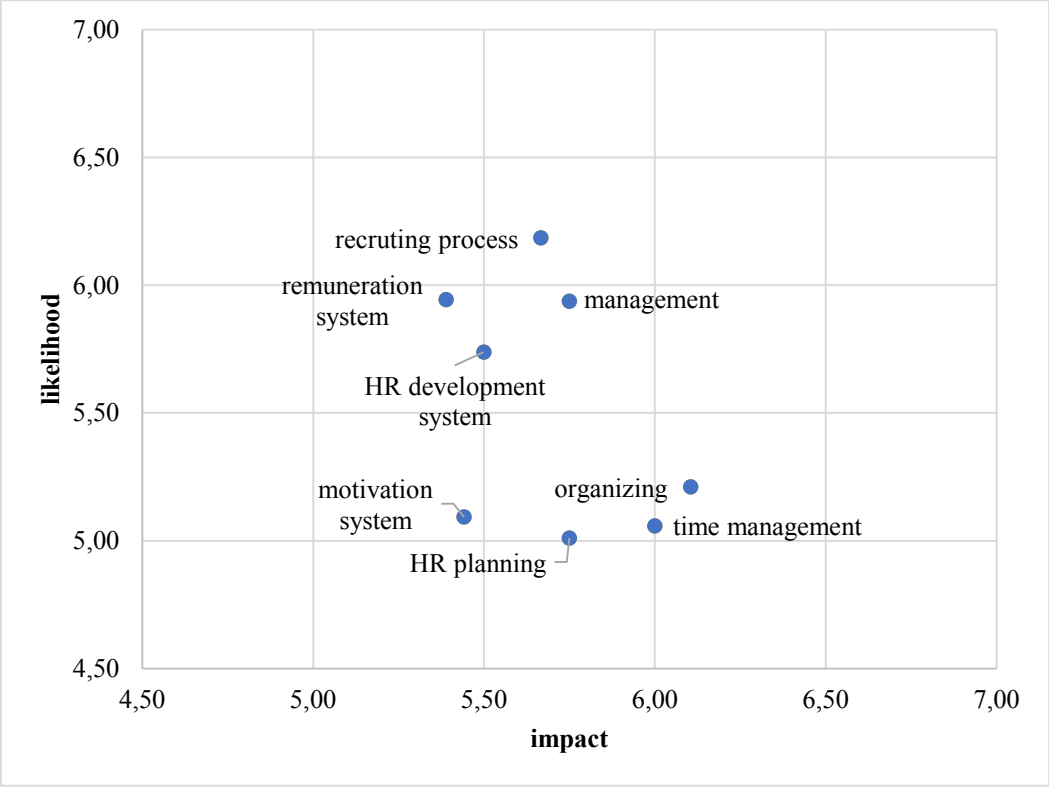

Figure 4. Components of the HR function related to the risks identified. Source: own study.

Summarising the results so far, it is important to note that during the initial period of the pandemic managers:

1. most often recognised components of the labour market and their own staffing structure (including competences) as the sources of risk – and in a similar manner, they rated the impact and likelihood of risk associated with these sources as high.
2. At the same time, only less than 4% of the risk sources identified referred to the COVID-19 situation although the risks associated with this source had high scores.
3. The problem area and HR action area were related to the sources and included staffing (including staff with the right competencies) and staff turnover; however, work organisation was also identified as an area of risk the impact of which could be significant.

When interpreting the results, certain limitations should be borne in mind – they may be related to the regional conditions or the scale of operations. For example, in the area of sources, research in the Czech Republic and Slovakia shows that contrary to the results presented in this paper, evaluation of employee turnover was relatively positive as a considerable part of entrepreneurs stated that turnover was low and did not have a negative impact on their business.

(Kotásková, Belás, Bilan, and Khan, 2020). Similar differences may be due to technological advancement or even the scale of state intervention as mentioned in the paper.

However, regional conditions will not affect the assessment of the extent to which COVID-19 risks are taken into account. This therefore provides a basis for verification and an attempt to assess ex-post the correctness of managers' identification of the sources and of the risk itself.

5. Discussion

Indeed, in the first of the surveys presented, 4% of the sources indicated related to pandemic concerns (with the most common source – lack of competencies – occurring in 16% of the risks indicated). In particular, respondents feared that the employees might be split into groups and isolated individuals, which fears included the consequences of enforced remote working and physical isolation. The lack of preparation, 'immaturity' of employees, but also the lack of standards and infrastructure that should be provided by the employer in remote working were directly pointed out.

Interestingly, further in the survey (in a part not presented in full in this paper), respondents indicated suggested solutions. These included the development of procedures or policies for remote working (and generally, procedures for emergency situations), preparation of tools enabling better collaboration between teams, conducting appropriate trainings, changes in the planning work, work accountability and granting subsidies for equipment.

It is worth noting that these indications confirm the validity of the choice of the area of remote working (as one of the more important changes in the pursuing of many professions during the pandemic) for the assessment of the earlier indications of managers.

It is the results of the authors' second survey[1], in which employees evaluated a period of remote working, that will serve for this assessment. Questions on the determinants of remote working and later on the role of technology were extracted from the wider survey. The questions on determinants concerned the factors that favour and factors that hinder remote working and its effectiveness:

1. among the favourable factors, the organisational elements related to working time (flexibility, cost-effectiveness, and combining with private life – although at the same time private life conflicts were an important hindering element) were rated highest.
2. among the hindering factors, the aspects of workplace design and technical organisation (availability of resources) and coordination were key ones.

[1] In a separate publication, the authors have carried out a closer analysis of these determinants and their consequences, but for the purpose of this paper only aggregate results have been used.

Against this background, it must be acknowledged that the importance of the area of organisation considered by managers as a vital aspect of HR risk in general, and the indication of organisational issues as necessary solutions during the COVID-19 pandemic, is momentous. At the same time, the analysis of the risks indicated by the managers only touched on technical and technological issues at very few points, in terms of e.g. accessibility to resources or organisation of the workplace.

In contrast, the importance of these aspects was highlighted in the opinions of employees (Figure 5). According to the respondents, technology was crucial for efficiency (e.g. the number of mistakes made, amount of work, and effort): 45% of them evaluated the impact of technology on work positively, and 14% negatively. At the same time, the importance of technology for task performance (e.g. efficiency of task performance, scope of responsibilities, timeliness, and division of labour) was assessed positively by 47% of the respondents, and negatively by 15%.

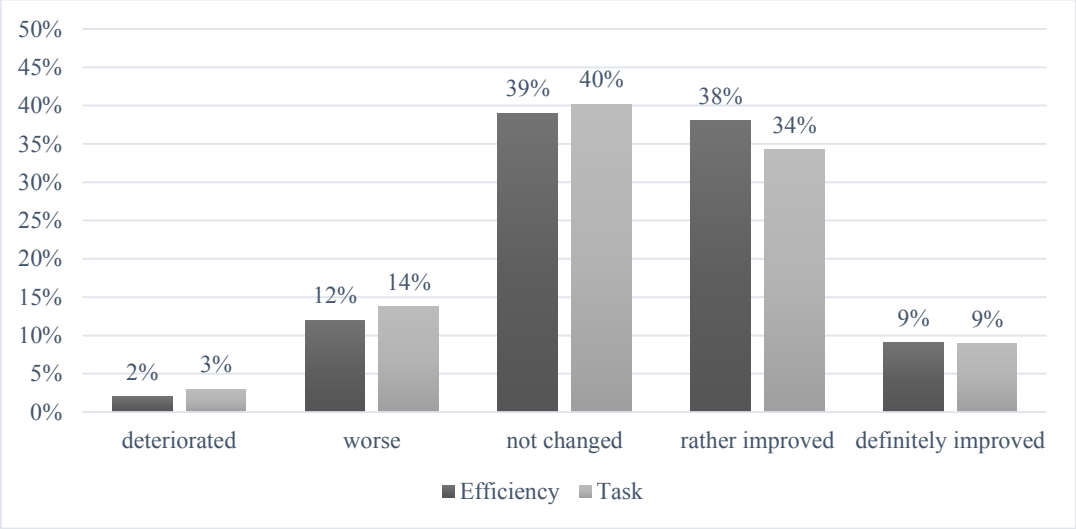

Figure 5. Influence of technology on task (amount of task) and efficiency (of work). Source: own study.

Assessing the indications with the benefit of hindsight extending now over a year, it is important to note that the managers rightly identified COVID-19 as a highly likely source of risk, and they also identified the area of organisational challenges as important in terms of impact likelihood. Obviously, these two studies cannot be directly compared; nevertheless, it is important to note that technological aspects were cited as risks rather than elements of mitigation. They were not rated as crucial at the start of the pandemic, but had a significant impact on work in the opinion of the employees themselves.

Similar conclusions are reached by other authors who indicate the need for a more up-to-date approach to HR risk management. A proposed framework for identifying sources of risks consists of two levels (Popescu, Santa, Teleaba, and Ilesan, 2020):

1. the first correlating globalization and 4.0 development stage challenges. It is shown by the matrix identifying source of risk like technological progress, cultural patterns, and domains sensitive to risks like work performance, working skills, working models, environment & tools.
2. the second level focuses on the sources of risks arise due to a company's digital transformation with regard to the choice of the working models configuration, employees' recruitment & hiring, training, working planning, organization & control, and setting up working regulations.

Interestingly, it has also been noted in studies on other risk areas that the technological (and organisational) aspect is prominent during the pandemic. For example, the dimensions of resource management risk competence shows that the dominant ones were technological competencies (Drozdowski, Rogozińska-Mitrut, and Stasiak, 2021). At the same time, the study noted that as the management levels increased, organizational resource management risk increased and technological resource management risk decreased. This seems to indicate that the sources of information should be diversified to a larger extent in the methodology of risk management. For example, in a remote working situation managers may have failed to recognise the importance of efficient technological solutions (for operational work or communication).

6. Conclusion

There is a wide literature proving that human resource risk management frameworks provide a conceptual model for the systematic development and planning of human resource risk management activities (Kermani, Beheshtifar, Montazery, and Arabpour, 2021). However, this knowledge is constantly evolving. The literature has attempted to identify megatrends and find out how they affect the level of individual types of personnel risk. However, technological challenges were not always considered among these megatrends (i.e. among globalisation, demographic changes and the increasing pluralism of values and lifestyles, e.g. Lipka, 2016).

Research findings concerning the risks identified at the beginning of the pandemic and the attempt to assess them through the prism of the opinions of employees who worked under pandemic conditions indicate that technology will be an important aspect of many components of the HR function in the future. Thus, it can be accepted that:

1. the technological aspect (including the increasing use of IT at work) should be more widely taken into account by employers in the HR risk management methodologies;
2. it is useful to carry out ex-post analysis in risk management methodologies in order to improve the methods of risk identification.

In related publications (in the process of being published), the authors of this paper develop the subject matter in two directions:

1. they examine the determinants of remote working (with particular consideration of technology) and its effects;
2. apart from identifying staffing risks, they also examine ways of monitoring them and reducing the likelihood and impact of their occurrence.

The research results presented and the statements put forward are certainly subject to limitations. As mentioned earlier, many of the indications are region- or sector-specific, and a detailed assessment of risk management must be carried out using case study methods. The conclusions arrived at should therefore be treated in a directional manner. However, this does not change the fact that the pandemic itself is certainly a regional as well as a universal issue and poses similar challenges to all.

To summarise the considerations from the perspective of the assessment of the effect of the pandemic for HR risk, it is worth noting that risk is defined as a potential (measurable) variability of events (although it is worth noting that the scope of the definition is extremely wide, cf. Aven, 2011). Alongside risk, uncertainty is defined as doubting the ability to predict the consequences of current events (Janasz, 2009). In seeking to develop better risk management methods, it is therefore important to take into account the fact that situations such as pandemics should be assessed in terms of uncertainty rather than risk. The conclusions drawn should not therefore be used to assess the performance of managers (including those managing staffing risks), but rather as lessons for the future.

While issues directly related to remote working and its impact on organisations may be associated with risk, it is worth remembering that even almost 2 years after the outbreak of the pandemic, both the state of social health and the state of the economy create a situation of uncertainty that affects decision makers, managers and employees alike. Thus, the attempt to take stock of the challenges will allow at least a partial reduction of uncertainty and more effective management, which will address the known categories of risk.

Indicating also the application aspect of the study results, it is worth noting that the effects of COVID-19 or market changes encourage developing new standards to address human resource risks and promote sustainable human capital (Grove, Clouse, and Xu, 2021). As is pointed out, such measures (human capital disclosure) have a significant and negative effect on the cost of capital and a positive impact on firm value (Salvi, Raimo, Petruzzella, and Vitolla, 2021). Work on new types of risk should also have a positive impact on human capital construction (Jia, and Bradbury, 2020). Further advances in knowledge in this area will be particularly important as it is estimated that the challenges of work organisation (including remote working) in times of pandemic will stay for long time (Carnevale, & Hatak, 2020).

Acknowledgements

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2022
ORGANIZATION AND MANAGEMENT SERIES NO. 155

THE ADAPTATION OF IMPRESSION MANAGEMENT AND SYMBOLIC COMMUNICATION TO COUNTERACT THE LOSS OF THE COMPANY'S LEGITIMACY

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Purpose: Due to the increasing importance attached to how corporations attempt to build their legitimacies, it is not to be avoided to gain insight whether strategies they can implement can be assessed as being fair from the point of view of stakeholders. Because the way in which organizations communicate with stakeholders can be considered as being one of the sources of corporate legitimacy special attention should be paid to the level of sincerity and fairness in messages send to stakeholders by corporations. When analyzing the process of communication from this point of view symbols and symbolic management may become relevant factors. The paper determines circumstances under which corporations can use or resign from using impression management techniques, which is believed to be related to how they perceive both sources of their power over stakeholder (be it legitimacy or other established way of rendering stakeholders' judgment about those corporations) and the level of uncertainty related to their operations carried out within given sectoral environment.
Design/methodology/approach: The work is based on literature studies and critical review of hitherto established ways of analyzing symbolic management and its possible impact on how corporations take part in communication process aimed at legitimacy building.
Findings: Research propositions have been built based on analysis that reveals how organizational failures in carrying out activities related to indicated types of legitimacy are expected to impact on the probability of making use of impression management techniques.
Research limitations/implications: Limited number of types of legitimacy has been taken into account.
Practical implications: Because impression management techniques may lead companies to problems with building relationships with stakeholders, companies need to take care of when they could be more inclined to use those techniques. Then in spite of greater probability that those techniques may be implemented, companies may decide on more sincere communication.
Originality/value: The approaches to problems related to impression management techniques should allow for showing that in addition to phenomena like legitimacy or reputation, those related to stigmatization and disapproval appear to be significant when analyzing corporate communication. The communication when being symbolic not necessarily should be disregarded.

Keywords: symbols, communication process, legitimacy.

1. Introduction

Symbolic management is thought to be related to how strategically consequential meanings are ascribed to the structures, actions and intentions of the organizations (Schnackenberg, Bundy, and Westphal, 2019, p. 387). Here symbols can be considered as "categories of social construction with ascribed meanings defined by the agents and audiences who use them" (Schnackenberg, Bundy, and Westphal, 2019, p. 376). Messages and meanings that are conveyed by symbols are to be the key for developing competitive advantage (Schnackenberg, Bundy, and Westphal, 2019; Westphal, and Zajac, 1998). For example, in case of high levels of uncertainty it may turn out that effects of symbolic action that involves changes in organizational policy that are independent of substantive practices can bring some social benefits to the extent to which market reactions are induced only by the information related to the attempts of the implementation of legitimate formal practices. Hence, agency perspective can be described from the conventional point of view (being focused on economic benefits of undertaken actions) or from the social point of view (being focused on social benefits) (Westphal, and Zajac, 1998). This is worth mentioning since high level of uncertainty of the environment could lead to sincere communication another time (Patelli, and Pedrini, 2014). That is why the problem of understanding of the links of legitimacy strategies to how corporations communicate demands further attention.

The issue is that while legitimacy similarly to symbolic communication is believed to be closely related to competitive advantage knowledge of how it is built and why it maybe built by making use of symbols should be of great importance not only to managers but also to stakeholders. The core of the matter is whether the corporations that want stakeholders to focus on social benefits at the same time put an effort into implementing the solutions about which they communicate. If so, then using symbols can be perceived as a justified way of actually supporting legitimacy. If not, then it may be that stakeholders become victims of so called impression management techniques. Those are communication techniques whose aim is to emphasize the symbolic dimension of activities and achievements while not paying attention at all whether those solutions are or at least could be put into practice. The aim of this paper is to consider circumstances under which corporations can use or resign from using impression management techniques, which is believed to be related to how they perceive both sources of their power over stakeholder (be it legitimacy or other established way of rendering stakeholders' judgment about those corporations) and the level of uncertainty related to their operations carrier out within given sectoral environment. The relations that have been proposed in research propositions in this paper next can be verified when conducting research in empirical contexts that would be either similar or dissimilar when compared with those discussed in the paper.

It has been proved that the greater the extent to which organization is legitimated, the more satisfaction this organization can provide to its customers. This may be because there is a relationship between corporate abilities and legitimacy-building initiatives so that in order not to lose legitimacy the companies are expected to manage it actively (Payne, Cruz-Suarez, and Prado-Román, 2018, p. 121). While symbolic management can be considered as one of the approaches to legitimacy building, the issue is to check whether the companies take into account how adapted approaches can interact with the dimensions of legitimacy that have been built. What is important here is that motivations for impression management can be analyzed from the point of view of different theories. Among them there are social/political theories that involve legitimacy, stakeholders theory and institutional theory. It can be assumed that when using communication that is far from being linked to impression management techniques the company is more focused on economic benefits that can be derived as a result of long term strategy of value creation with accordance to social expectations. But while the use of communication based on impression management techniques could lead to some short-term social advantages in the long run this approach appears to be risky and irresponsible. More generally, the question that is to be posed is related to how existing corporate views on social judgements that have already been made with regard to corporate activities may help in considering these problems. Moreover the issue of whether symbols as embedded tools in messages sent by corporations are used in a reasonable way is to be taken into account. It may remain possible that symbols rather still should be perceived as being a kind of distractor. In order to be able to consider presented dilemmas in a straightforward way it should be mentioned that hitherto views on types of legitimacy that can be built by companies are not to make the task easier so that firstly some level of sufficient clarity needs to be achieved. The results of several decades of research on legitimacy strategies give rise to the belief that various types of legitimation may be built. However, at the same time it becomes less clear what are the differences between them. In order to built research propositions it is indispensable to have applied terms defined precisely. That is why authors focus their attention on legitimacy types matched to the normative dimension, which is believed to be linked to those corporate activities which have strong impact on corporate communication process. Then it becomes more justified to make attempts to recognize the sources of possible bias in tis process.

2. Literature review

2.1. Selected ways of the development of a company legitimacy

van Halderen, van Riel and Brown (2011) proposed to recognize two patterns that can be used by corporations depending on what they want to communicate. In this perspective when being focused on legitimacy they tend to emphasize their features like transparency or sincerity, which are believed to entail stakeholders' acceptance. But when being focused on distinctiveness they are thought to look for competitive advantage, which van Halderen, van Riel and Brown (2011, p. 273) match to taking a more provocative standpoint in a public debate. As this division made between legitimacy and distinctiveness that could be also linked to other kind of social judgments is to be taken into account next, it should also be emphasized that the issue of competitive advantage in legitimacy literature is significant. Even if it should be argued that communication aimed at legitimacy building is not about unique organizational features (Bitektine, 2011; Deephouse, and Carter, 2005), then it appears to be justified to assume that legitimacy and competitive advantage are strongly related to each other. Emphasizing that the competitive advantage is a preceding factor to survival, Payne, Cruz-Suarez and Prado-Román (2018) are claimed to maintain that "legitimacy is in itself a competitive advantage" (Diez-de-Castro, and Peris-Ortiz, 2018, p. 7). As it is indicated by Payne, Cruz-Suarez and Prado-Román (2018) there are numerous studies (e.g. Chen et al., 2016; Díez-Martín et al., 2013 as cited in: Payne, Cruz-Suarez, and Prado-Román, 2018, p. 123) that actually support the assertion made by Brown (1998) who sees legitimacy as a necessary condition making it possible for organization to acquiring resources, to entering markets and to long-term survival (Brown, 1998 as cited in: Payne, Cruz-Suarez, and Prado-Román, 2018, p. 123). But in order to make it more visible which aspects of legitimacy building should particularly be taken into consideration when analyzing the way in which corporate communication can be linked to social judgements formation, the short review of legitimacy typologies is needed.

Currently, in the literature in the field of management, a multitude of different approaches to the problem of the legitimacy of an organization can be found. This is because legitimacy is a multilevel construct in itself and in addition to this there is a need to establish relations between this term and others somewhat close to it like e. g. reputation (Bitektine, 2011) or introduced more recently stigma and disapproval (Vergne, 2012). In order to avoid confusion it appears to be advisable to limit the number of possible types of legitimacy taken into account, next to establish clear boundaries between considered types of legitimacy as well as to indicate which aspects of the phenomena are of the upmost importance and finally to reflect on how related terms can be matched to those being discussed under legitimacy heading.

For years one of the most widely cited legitimacy typology has been the one created by Suchman (1995) who indicated on three types of legitimacy (that is pragmatic legitimacy, moral legitimacy as well as cognitive legitimacy) as well as propose number of subtypes which can be recognized within the boundaries of mentioned types. As new issues were identified that could be hardly matched to previously created typologies, then new ones have appeared as a result of the evolution of existing ones. However, it is claimed that there has been a lack of consensus among researchers as to what types of legitimacy should be taken into consideration. It was not until Díez-de-Castro et al. proposed their typology of legitimacies consisting of eight types (that is cognitive/cultural legitimacy, regulatory legitimacy, moral/ethical legitimacy, pragmatic/instrumental/resources legitimacy, managerial/output legitimacy, technical legitimacy, emotional/relational legitimacy, legitimacy of the industry or sector) that it can be said that there was greater clarity as to what types of legitimacy should have been taken into account. What is especially important regarding the work performed by Diez-Castro et al. (2018) is the way in which they approach the construct of normative legitimacy which has been linked to issues related to moral legitimacy, professional (managerial as well as technical) legitimacy.

Moral legitimacy can be thought as being related to initiatives based on values which are appreciated by stakeholders who consider them as being above private interests (Díez-de-Castro et al., 2018, p. 9). What is important is that in case of considering whether the organization can or can not obtain moral (ethical) legitimacy, the force with which stakeholders perceive ethical principles followed by the organization is to be a decisive factor (Díez-de-Castro et al., 2018, p. 11). As social legitimacy can be considered as being the part of moral legitimacy, it can be noticed that the degree to which the organization is concerned about social issues (and could influence the stakeholders' interpretation of the importance of principles followed by the organization) can be assessed by paying the attention to how much information is provided by the organization (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 12). In case of managerial (output) legitimacy those same initiatives can be considered as being related to organizational mission, vision and strategic objectives (that most often are not to be against the general interest). If so, they should allow the organization for being granted output legitimacy (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 9). Here, in order for stakeholders to be able to grant this kind of legitimacy, it is needed that the organization report its achievements to its stakeholders. Put it differently, it can be said that there is a need for the proof of the materialization of its general goals (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 14). When being considered from the point of view of technical legitimacy above-mentioned initiatives are to be analyzed by the prism of their smartness or with regard to the superiority of managers being involved. In general it can be important whether they could be carried out in a better way - if not, of course, those initiative and the organization deserve for being granted technical legitimacy (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 9). Here again it is emphasized that it can be difficult to achieve the state that the stakeholders know and value

the fact that the organization performs at this high level of excellence (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 11). Generally, it appears crucial to recognize that when corporate ability can be defined as "the ability to improve product/service quality and the ability to innovatively generate new products/services" (Payne, Cruz-Suarez, and Prado-Román, 2018, p. 125) then in addition to possessing those abilities for the companies it is at least equally important to make customers aware of having them. It is also worth adding that if it has been assumed that there is the affective link between the group of stakeholders and the organization, then it can be claimed that the organization could be understand on the basis of emotional legitimacy. Here the evaluation appears not to happen at all, since stakeholders should be strongly identified with the ideal that is represented by the organization (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 15). Whatever simplified it can be, it appears useful to assume that the emotional and normative (especially technical) are both two types of legitimacy that remain in opposition to each other.

It can be emphasized that industry legitimacy can be recognized as well which is when given industrial sector is characterized by its standards or practices that are legitimized (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 16). The perception of so called stigmatized industries is the opposed one since their specific features causes them to be publicly vilified which is why organizations that operate within the boundaries of such and industry can be exposed at greater risk of being disapproved. At the same time, it does not have to entail disapproval as the linear relationship between a firm's association with a stigmatized category and disapproval of the firm has already been questioned (Vergne, 2012). Hence, even if it is obvious that the organization operate within the industry sector that is far from being legitimated (e. g. tabacco or gambling industry) and it appears to be doubtful whether the considered organization from this sector can be said as the legitimate one, it is not the same as to say that the organization is undoubtedly strongly disapproved. This means that even if organizations operate within the context that is disadvantageous from the point of view of legitimacy, then it may be possible for the organization to make steps (e. g. differentiation) that cause stakeholders to perceive this organization from more favorable point of view. Then the fact of belonging to a given industry can be perceived as bringing some additional risk which is why it can have impact on behavior of the corporations. It can also be recognized that as far as legitimate judgements are mainly related to whether organizational structures, processes can be accepted or even encouraged, in case of reputation judgement the attention is paid to possible unique features of the organization which can be possibly inferred from stakeholder's perceptions and past experiences (Bitektine, 2011, p. 162). The issues to be taken into consideration relate to how actually the organization behaves when those stakeholders' perceptions and experiences are built.

2.2. Legitimate context of using symbols in situations of uncertainty

Before implementing symbolic management as a means of legitimacy building, it is worth mentioning that in general three possible approaches can be defined in this regard. Among them there are those that involve getting associations with recognized symbols as well as creating new symbols or elaborating the meaning of symbols (Schnackenberg, Bundy, and Westphal, 2019). In the authors' own research existing symbols are taken into consideration with which organizations can try to gain affiliation. This happens because meanings of those symbols (e.g. sustainable products, industry awards, fashionable management practices) are thought to be hardly possible to be changed. Consequently, when being built skillfully those associations () should allow the organization to be positioned in good light. Symbols can enable symbolic association as they are aligned with stakeholders interests as well as they convey the message that organizations have sufficient resources (money, time, effort) to undertake steps allowing for symbolic association (Schnackenberg, Bundy, and Westphal, 2019, p. 391). By means of symbolic associations the organization can provide its stakeholders with the (symbolic) value that can be thought as the one that makes it possible for stakeholders to achieve their goals (e.g. finding well paid job as a result of receiving reputable diploma from the university). From this point of view symbolic values may be regarded as a factor helping organization to communicate stakeholders about its strengths. However, the distortions may arise as there is a need to communicate with many groups of stakeholders. Ngai and Singh (2018, p. 213) following Falkheimer (2014) emphasize that organizational financial performance is impacted not only by increased globalization (as well as transparency or mobility) but also by how relations with various stakeholders tend to be shaped. Actually they become more complex, uncertain and fragile. Those factors create the context within which, as it has been shown by Ngai and Singh (2018), when communicating corporate leaders may omit some themes and strategically focus on others (like progress or business environment) in order to influence their stakeholders' attitudes in a strategic way. Those ways of communicating can be linked to above-mentioned impression management techniques that cover different narrative disclosure strategies.

Oliveira, Azevedo and Borges (2016) are discussing discretionary narrative disclosure strategies previously identified mainly by Merkl-Davies and Brennan (2007) and Brennan et al. (2009). Among these there are readibility manipulaton related to the intention of obscuration of bad news (Courtis, 2004, p. 292 as cited in: Oliveira, Azevedo, and Borges, 2016, p. 391), rhetorical manipulation related to the distortion of narrative disclosure in one or more ethical principles (Yuthas et al., 2002 as cited in: Oliveira, Azevedo, and Borges, 2016, p. 391); thematic manipulation related to the unjustified use of positive words or themes (Merkl-Davies, and Brennan, 2007; Merkl-Davies et al., 2011 as cited in: Oliveira, Azevedo, and Borges, 2016, p. 391); visual and structural manipulation related to emphasizing goods news in different ways (Merkl-Davies, and Brennan, 2007; Merkl-Davies et al., 2011 as cited in: Oliveira, Azevedo,

and Borges, 2016, p. 391), performance comparisons/choice of earnings numbers related to the selective use of performance referents/earnings numbers (Merkl-Davies, and Brennan, 2007 as cited in: Oliveira, Azevedo, and Borges, 2016, p. 391) as well as performance attribution related to matching positive and negative events with managers' performance or external factors respectively (Aerts, 2001, 2005, Merkl-Davies, and Brennan, 2007 as cited in: Oliveira, Azevedo, and Borges, 2016, p. 391). Other researchers emphasize the role of specific linguistic mechanisms that can be used to disassociate the author of the message from the text so that the message can be considered as being objective and neutral (Boudt, and Thewissen, 2019, p. 80). In general, it can be noticed that the bases on which those strategies are recognized consist mainly of the choice related to the bias that can be introduced in the communication process due to the optimistic way of conveying the message as well as to the choice related to the selectivity of pieces of information that are presented. There are also other worth mentioning narrative disclosure strategies that can lead company to shape communication process in a way that at least at the beginning may appear to be promising due to possible advantages that can be derived (including possibilities of avoiding problems). Especially the proposition presented by Huhn and Lülfs (2014) should be mentioned as these authors emphasize that in addition to those strategies that are directed at the production of distortions to lesser or greater extent (those are marginalization, abstraction, indicating facts, instrumental or theoretical rationalization, authorization, corrective action based on unprecise information) there is also possible that when having to respond to social or environmental problems caused by the company provision of more concrete information based on measures will occur. In general, the problem that arises for researchers is to try to explain what are the reasons of why some companies make use of trust-threatening communication when at the same time others prefer using trust-enhancing communication. As those reasons are to be found in the field of types of legitimacies that corporations could possess then the role of symbols embedded in messages sent by corporations should be taken into account as well.

Symbols, which may be, e. g. socially recognized leaders or close ties with important entities may be considered as substitutions for reliable and direct information that cause stakeholders to understand organizations better. Based on this understandability stakeholders are to define the organization as appropriate. Then symbols can be matched with so called cognitive (cultural) legitimacy based on the image. In order for this legitimacy to be granted the image of the organization that stakeholders have needs to be assumed as corresponding to what the organization is (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018). When organizations are trying to achieve association with symbols having its value based on their reference to cultural expectations, then by causing stakeholders to react positively organizations are able to gain stakeholder acceptance more easily (Marquis, & Qian, 2014 as cited in: Schnackenberg, Bundy, and Westphal, 2019, p. 392;). Nevertheless, organizations can find it reasonable to associate also with symbols having their value based on delivering answers to questions about superiority based on criteria that stakeholders find attractive. Moreover

organizations may associate with symbols having their value based on delivering answers to questions as to how distinguish right from wrong when applying criteria that stakeholders find admirable (Schnackenberg, Bundy, and Westphal, 2019; Suchman, 1995; Glynn, 2000). It can be noticed that when taking into account this wider view on possible symbolic values to which the organization can associate with, it may become visible that actually using symbols in organizational communication does not need lead to insincere communication. On the one hand, the organization when e.g. producing goods in a harmful way to the environment may make others pay their attention to its (even no exceptional) innovativeness, which is why the organization itself can be considered as being the symbol of progress. On the other hand, when other organizations like e.g. those engaged in sustainable water management describe their operations through the prism of showing clean water as the symbol of life persistence then this kind of symbolism may actually be only a part of detailed set of information related to how these practices are carried out by organizations. Similarly, universities can emphasize their long lasting tradition that may be attractive for potential stakeholders. This possibility of being able to associate with long lasting tradition when is supported by strong results achieved nowadays should not cause that communication consisting of those two elements (tradition as well as results achieved at present times) make this communication being related to impression management techniques. However, it can be said that the communication is symbolic and actually embedded symbols being organizational resources can lead to the possibilities for organizations to associate with strong symbols. Those can be perceived as important factors that only can (but does not have to) cause organizations to eventually make use of impression management techniques. That all entails that when there is a need to consider consequences of decision made on why to use or not to use impression management techniques analyzed from the point of view of their impact on legitimacy, it is needed to take into account different types of legitimacy, especially so called moral legitimacy, that taken together with technical legitimacy and output legitimacy can be considered as being the part of so called normative legitimacy. Put it differently, here organizations are assumed to develop communication and information policies that may involve symbols not only to make it possible to stakeholders to simply understand organizational business models in a way expected by the corporations (here impression management techniques can be applied), but also to make them aware of both advantages that they can derive as a result of the effective functioning of the organization and moral reasons that can be attached to relations with the organization. The more organization is eager to emphasize the fact that it possesses such symbols at its disposal, the more stakeholders can be inclined to devote their resources on acquiring them. At the same time they should have be more attached to the organizations with which they begin to build relations. What is important from the point of view adapted in this paper is whether when investing with relations with this kind of organization stakeholders are aware of other factual data that could strongly support what symbolic value is suggested to exist. It should be taken into account that those relations can be broken as a result of the stigmatization of critical organizational attributes

(Schnackenberg, Bundy, and Westphal, 2019; Hsu, Kocak, and Kovacs, 2018). Hence, adapted approach to the communication process based on only symbolic values is not expected to last over long period of time as it can be finally disclosed. Then the organization can have its attributes stigmatized.

3. Discussion

When analyzing possible links among communication, embedded symbols and legitimacy building one is to consider factors among which there those that relate to the awareness of current social judgments rendered by stakeholders of the organization as well as to risk of disapproval induced (to some extent) by possible stigmatization of the industry within which organizations operate. The issue of how risk is to impact on communication process needs to be considered with special care as results in this field do not appear to provide researchers with unequivocal answers. Patelli and Pedrini (2014, p. 19) have shown that tough macroeconomic conditions can be a factor that causes companies to build dialogues with shareholders as the disclosures tend to be sincere. In this way the obfuscation hypothesis as indicated by Patelli and Pedrini (2014, p. 20) in case of corporate messaging is questioned. As far as those arguments related to macroeconomic risk appear to be reasonable, the attention should be also paid that the risk of losing legitimacy as a result of having used impression management techniques recognized can have impact differently in case of so called stigmatization industries. Cho, Roberts and Patten (2010) found that firms belonging to the chemicals industry (and generally low-environmental performers among which it would be possible to find companies belonging to other environmentally sensitive industries that deal with activities like emissions of toxic chemicals, sale of coal and oil and its derivative products or generation of hazardous waste that all pose a threat to the environment) when disclosing information about their activities can be more optimistic, which can be linked to impression management techniques. Then hitherto attention focused on such companies instead of causing them to be more cautious when disclosing it appears to make them more susceptible to using these techniques. All in all these considerations show that risk involved should be regarded as a important factor.

As it has been already stated the legitimacy can be perceived as a source of competitive advantage so that even the potential threat of losing the legitimacy may lead companies to make use of impression management techniques. Actually not every organization decide on impression management techniques involving hiding important aspects of information when trying to make stakeholders convinced about organization reasons as to why it should be granted legitimacy. In those cases companies appear to be pay more attention to that having been recognized as the ones that apply impression management techniques would may cause them

to find on the verge of going bankrupt. Thus the fact that practices involving messages directed at unfairly enhancing corporate image to maintain legitimacy is not a rule, which needs to be recognized and next taken into account in the analysis. The attention should be also paid to that while organizational legitimacy is a matter of beholder's judgement, then organizations may by somewhat encouraged to employ impression management techniques not only in order to make inappropriate behavior look like being fair and correct, but these behaviors may be caused by the fact that legitimacy may not be granted by stakeholders because of their limited knowledge regarding the organization or because of their focus on different criteria. This may be because stakeholders may not be fully aware of all efforts that organization put into some fields of its functioning. As a result, regardless of how hard the organization performs, stakeholders may interpret these efforts as being insufficient to give legitimacy to the organization (Diez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018). Following Yuthas et al. (2002) it could be assumed that both messages included in corporate communication are not to be considered in accordance with impression management theory (based on the assumption that this kind of communication is a kind of strategic action aimed at influencing readers – Yuthas et al., 2002 as cited in: Patelli, and Pedrini, 2014, p. 20) and those messages should become to be perceived as a part of the communication action directed at building mutual understanding. But even if those assumptions are to be taken into account these communications can still be perceived as a management tool that can be linked to symbolic values that are to be conveyed in order to emphasize true achievements of the corporate that otherwise could be (unfairly) underappreciated. But this again under some circumstances may be a factor finally contributing to the use of impression management techniques. The task is to consider over more general circumstances that can lead to the use of impression management techniques.

To further develop the argumentation the gambling industry can be considered. Those engaged in the industry perform different activities in order to make the industry less harmful for the society within which they operate. Activities can involve such initiatives as allocation of funding to responsible gambling, employee training, advertising restrictions, provision of better information, liaison with community agencies (Hing, 2011; Miller and Michelson, 2012; as cited in: Guan, Hou, and Noronha, 2021, p. 5). In this case legitimacy based on managerial output appears to be crucial since technical aspects appears to be less important. Due to the fact that the industry can be classified as a stigmatized one it can be assumed that doubts over moral aspect of organizations that operate within the industry are impossible to be avoided. This does not mean that those moral aspects are less important, however, in order for legitimacy to be built by means of messages with embedded symbols it appears to be required that claims for moral legitimacy be supplemented with justified claims for managerial legitimacy. It comes to situation, that not only the organization should show links of its initiatives to widely accepted values but also organization should be able to show that these initiatives could be derived from its vision, mission and strategic objectives. Put it differently, those initiatives need to have strategic importance for the organization and not to be of limited importance. Otherwise it is

impossible to indicate on managerial legitimacy due to the lack of real willingness to follow vision and mission formulated in a prosocial way. That is why companies should put greater emphasize on how they communicate potential benefits that are to arise as a result of their activities in a way that is not to be harmful for societies. As the problems related to such kind of controversial industry are wide known it appears to be that possible corporate references to reputational aspects are of limited impact. Here the judgment that is built by stakeholders and is of the greatest importance to the organization is focused on whether the outcomes can be perceived as being socially acceptable, and next whether it is possible not only to tolerate them but in addition to this encourage them (Bitektine, 2011, p. 162). To be like that both moral and managerial types of legitimacy should be possible to be recognized in corporate activities. At the same time due to stigmatization of the whole industry within which the organization operate it can be assumed that the issue of past history of a given organization may appear to be of less importance to stakeholders who are more likely to take into account current industrial trends (and not possible unique organizational features) when rendering their judgments. Merely if it turns out that some stakeholders may be linked to the organization by emotions considered in emotional type of the legitimacy, then proofs of the presence of both moral and managerial types of legitimacy could be of less importance. Simultaneously if state like this is to occur then the organization in spite of the fact that the risk of facing disapproval is relatively high, the organization when communicating may starts making distorted use of symbols embedded in messages that are to be sent. Hence, the research proposition could be as follows: *under the conditions of high uncertainty due to possibility of disapproval, if activities carried out by organizations do not provide both moral and managerial legitimacy, then regardless of the hitherto reputation of the organization, the communication process will rely on impression management techniques using symbols in a way that compensates for the deficiencies of legitimacy activities. Organizations are more inclined to use those techniques when emotional legitimacy is present at least to some extent* (research proposition 1).

It can be noticed that the research conducted by El-Bassiouny, Darrag and Zahran (2017) shows that one of the financial holding bas been involved in two-communication process with its stakeholders. The process has been assessed as being symmetrical which means that company is not only focused on whether information that is delivered to customers results in mutual understanding of company's initiatives, but also stakeholders are allowed to communicate their expectations with regard to companies prosocial activities (El-Bassiouny, Darrgag, and Zahran, 2017). This high level of openness on the part of the organization may be possible probably as a result of the general lack of doubts over moral aspects concerning activities undertaken by the organization (the lack of stigmatization of the industry within which the organization operates could support this state of things). What is more, because the organization communicates its willingness to modify its activities when stakeholders see it to be necessary, this could mean that the organization remain convinced as to the high level of its

operations related to technical type of the legitimacy. It could be imagined that if it turns out that the organization is not capable of introducing changes required by stakeholders then it could try compensate this lack of competences by communication which can be detached to some extent from the reality. In case of above-mentioned distinctiveness shown in research on corporate communication conducted by van Halderen, van Riel and Brown (2011) in addition to the possibility that organization communicates its "over conforming" institutional requirements there is another one. This latter involves more controversial communication entailing "under conforming" institutional requirements which is to occur especially when organizations that have strong reputation developed are believed to have sufficiently powerful position toward stakeholders to not being afraid of defying institutional norms and expectations (van Halderen, van Riel, and Brown, 2011; Suchman, 1995). That is why high level of reputation supported by relatively low level of disapproval due to lack of stigmatization of industry within which the corporation operates may be regarded as a potential factor leading in long term perspective to the resignation from two-way communication with stakeholders. As a consequence, lack of taking care of stakeholders' expectations or even of stakeholders' level of familiarization with corporate activities may make it easier for corporation to use symbols embedded in communication in a distorted way. Again the possible presence of emotional legitimacy which corporation would be aware of could increase the probability for it to occur. Actually here the emotional legitimacy can appear as a possible important field of generating the influence over the stakeholders as stakeholders have been somewhat taking part in how the company has been to perform. Hence, the research proposition could be as follows: *under the condition of low uncertainty due to lower possibility of disapproval, if activities carried out by organizations do not provide both moral and technical legitimacy, then the communication process will rely on impression management techniques using symbols in a way that compensates for the deficiencies of legitimacy activities. Organizations are more inclined to use those techniques when they has had high level of reputation and when emotional legitimacy is present at least to some extent* (research proposition 2).

4. Summary

When the organization is to resign from being motivated mainly by economic factors it can be said that the organization find "doing the right thing" being more important motive for given initiative than those benefits that can be generated for the organization (Díez-de-Castro, Peris-Ortiz, and Diez-Martin, 2018, p. 11). Nevertheless, emphasizing the role of the organization considered from the point of view of only social benefits entails risk that the organization tends to hide its poor business performance. That is why those both dimensions appear to be necessary to be taken into account when analyzing what are the factors that may lead the organization to

make use of impression management techniques. Each time organization is arguing about its features, performances or strategic objectives it is required that stakeholders would try to take into account various aspects related to the situation. Without this it becomes simply impossible to recognize when symbols embedded in organizational communication are used in a justified way, that means in order to help organization to make others pay attention to those fields within which organization put great effort into operation. In the paper special attention has been paid to the fact that depending on features of e. g. industrial sector within which the company operates it may be exposed to threats related to not possessing social favor. Then, as it has been stated in two formulated research propositions, impression management techniques may be regarded as a result of deficiencies of different kinds of legitimacy activities. At the same time when complementary legitimacy activities are carried out then it has been assumed that impression management techniques are not to be used. Those deficiencies may appear to be important regardless of reputation. It has been shown that it appears to be justifiable to look for relationships between those factors, which is of significance for organizations as they may also use symbolic communication without causing their process of communication to be biased. Those main conclusions allow for consideration of further issues.

Following Bitektine (2011) it can be also recognized that when considering the issue of legitimacy of the organization, stakeholders may consider the extent to which the organization is beneficial not only to a given person, but also to the social group to which they belong to (or let's say to which they would like to belong to) or even to the society (Bitektine, 2011, p. 163). When the organization is trying to defend its position after its results have been assessed as being poor or after some inadequate behavior, then it could be in favor of causing shareholders to consider narrow (and at the same time more concrete) spectrum of consequences and the use of impression management techniques may appear to be useful in such occasion. At the same time, when the organization appears to implement symbolic communication due to the need to emphasize its real favors made to external environment, it may be interested in causing stakeholders to ask about wider spectrum of all possible positive consequences that result from organizational behavior. That all can suggest that future researches can focus also on the range of the communication process as it may turn out that differences in corporate intentions in this field may turn out be important from the point of view of assenting possible sincerity of communication.

In order for the environment to evaluate the legitimacy of organizations, it is necessary that possibly all key characteristics of the legitimacy of organizations will be taken into account. That is why steps to build new legitimacy typologies are repeated. Nevertheless, the question can be posed as to how specific behaviors of organizations that look for legitimacy using impression management techniques can contribute to the emergence of the new important aspects that need to be legitimated. For example, in case of previously discussed "over conforming" trials in corporate communications symbols used can help stakeholders to recognize that the organization has the distinctive identity, that it can be perceived as a leading

example in the environment within which it operates (van Halderen, van Riel, and Brown, 2011, p. 287-288). The issue here is whether those claims are to be analyzed on the basis of how they shape the image of the stakeholders related to how organization (more or less skillfully) tries to present itself or those messages would become the source of public discussion on what the real extent of moral responsibility of the company should be and when hitherto undertaken (and confirmed) activities by the company that try to "over conform" institutional requirements begin to be perceived as the standard. In case of the latter situation, symbols used will have first of all symbolic value related to making customers aware that the organization is really as good as it should be. Otherwise actually there can be some doubts over the status of symbols which may be a source of distortions impacting on the view on what normative environment should really be like.

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INFORMATION TECHNOLOGY SYSTEM FOR ESTABLISHING INDUSTRY CONTACTS IN THE PROCESS OF ARCHITECTURAL DESIGN

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Purpose: The aim of the work is to present the concept of an application that enables people from various industries to establish contacts in the process of architectural design.
Design/methodology/approach: The best solution to the problem would be to develop and design application and implement it on Android devices.
Findings: Different types of business models will be compared with their effectiveness and popularity. In addition, the advantages and disadvantages of different strategies will be reviewed.
Research limitations/implications: The work focuses on presenting the concept of an application that facilitates establishing contacts between representatives of architecture industries.
Practical implications: This is an important issue for future users as it allows for product improvement.
Originality/value: The application can be a preliminary step to developing a conflict management strategy.

Keywords: information technology, architectural design, strategy, implementation, Android.

Category of the paper: Research paper.

1. Introduction

Along with technological progress and the development of computerization, new virtual forms of communication have emerged. All modern forms of communication, such as telephone, SMS, e-mail have a disadvantage – the lack of interaction with another human being. However, a direct conversation of a business partner is a necessary condition for an entrepreneur to establish cooperation. To solve this problem, it is necessary to offer

an IT system supporting the process of establishing industry contacts in the field of architecture. In the available literature on the subject, there are computer programs such as AutoCad (AutoCAD Web App, 2021), Revit (Revit, 2021), ArchiCad (ArchiCad, 2021). From all those programs mentioned above, only ArchiCad can model and manage building information (BIM-Building Information Modeling). After analyzing the existing solutions, no work was noticed in the field of establishing mobile industry contacts. The aim of the work is to present the concept of an application that enables people from various industries to establish contacts in the process of architectural design.

In the available literature on the subject, apart from the above-mentioned computer programs, there is no application supporting the establishment of industry contacts. The best solution to the problem would be to develop and design application implemented on Android devices (Stasiewicz, 2013). This system is the most popular system for mobile devices in Poland (Android, 2021). Its great advantage is the lack of fees or development licenses, and thus the lack of initial costs required to start the architectural design of the facility. There are four applications on the market that facilitate contacts between businessmen:

- Meeting Aplication (Meeting App, 2021; Google Play and Meeting App. Shop, 2021),
- IBM Conference App (IBM Conf App, 2021; Google Play and IBM Conf. App. Shop, 2021),
- EventPilot Application Conf. App. (Google Play and Event Pilot Conf., 2021; Google Play and Event Pilot Conf. Shop, 2021),
- Conference Management Application (Conf. Management, 2021; Google Play and Conf. Management, 2021),

Table 1 shows the number of downloads, average ratings, and the number of app ratings.

Table 1.
Table of the number of downloads of average ratings and the number of ratings of the application (Górski and Jamka, 2015)

	Meeting Application	**IBM Conference**	**EventPilot**	**Conference Management**
Number of downloads	1000-5000	1000-5000	1000-5000	100-500
Average grade [max 5]	4,2	4,4	3,2	5,0
Number of ratings	29	38	25	3

2. Functional and non-functional requirements of the application

The application is created for people representing various industries that must appear in the design process. This means, in particular, meeting new people representing various industries, establishing business contacts with them, and exchanging experiences between them. Users should be able to present their design concepts.

The user will be able to start using the platform after registering in the application by logging in, for example, on the social networking services, such as Facebook. He can also register and login with his own e-mail address and password. After logging in to the program, the user has the opportunity to see all the industries available to him. These data can be entered into the system via the website. The application will allow you to view industries and activities scope of an industry representative.

The architect designs the concept of a given building. Next, the project has to go through the hands of a constructor, environmental engineers, electrical and electronic engineers, dendrologists, geodesy engineers. Often, architects complain about difficult contact in order to conduct consultations and speed up the implementation of changes to the project. The article presents the concept of a strategy for the improvement and acceleration of contacts between various industries representatives in the field of architectural design. This system will be intended for people who may often be based in very distant places in the country or the world. Thereby, system users really need help in reaching the right person who will quickly consult the project assumptions for a given industry.

As part of the application requirements, it is necessary to define its main functionalities. Based on the analysis of existing solutions and user feedback, a list of functionalities of the platform for establishing contacts between representatives of various industries in the process of architectural design was defined:

1. user registration by entering an e-mail address and password,
2. user registration using an account on the Facebook social network,
3. viewing the profiles of other registered people,
4. adding people to the group of debaters,
5. inviting people to make contact,
6. consultation with industry representative on the details of the project,
7. the option to send an opinion on industry consultations.

The application supporting the establishment of industry contacts should consist of a mobile application and an administration panel. The mobile application should be made for the Android platform. Implementation should take place in an environment using Java and XML. This is due to the fact that it can be done easier by using libraries such as AngularJS (AngularJS, 2021). The application programming interface should be developed using the Node.js (Node.js, 2021) environment.

The basic stage of developing the technical documentation of the project is adopting the design assumptions of the application. The following are functional and non-functional requirements. The basic functional requirements include the so-called User Stories, which are a set of user requirements for the system. The first type of user is the end user, in other words, the owner of an Android phone with the appropriate application installed. Another type of user is the system administrator who manages the content available to end users via the website (Górski, and Jamka, 2015). The controller is responsible for entering and sharing information

into the app. However, the most important thing is to add a list of event participants and enter their details.

Taking into account the future development of the application, it just sounds reasonable to adopt functional requirements.

In order to ensure the proper operation of the mobile application, the basic components of the website should be implemented, without focusing on its graphic interface, but only on the selected functionality. When analyzing the existing mobile applications, the need to create an application that meets the requirements of:

- the application is to work on devices with the Android operating system installed, which is to support newer versions of the system,
- the application must have a built-in bilingual function, i.e. allow the user to switch the application language to the English version,
- the application user must have e-mail accounts configured on the phone to ensure proper operation of the application in relation to the e-mail account,
- the application user should have a Google account configured on the mobile phone to ensure the application works in relation to the functions offered by Google, such as: synchronization with the Google calendar and Google e-mail account.

The most important non-functional requirements include bilingual operation of the system, cooperation with the Google calendar and e-mail account, and compatibility with older operating systems.

The website requirements should also be mentioned. It must have a graphically friendly interface, and must meet market standards as well as be compatible with existing web browsers. It is important that the graphical interface is end-user friendly. Below are the basic rules that should be followed, to obtain a user-friendly product:

1. the application must have a transparent, intuitive and aesthetic interface,
2. the application cannot have multiple nested functions,
3. the application is to display texts in both Polish and English,
4. the application must graphically comply with the adopted norms and standards.

The product should consist of two interacting modules: the mobile application and the admin panel. In order to ensure the proper operation of all functionalities of the application, an internet connection between mobile devices and the admin panel should be ensured. The data will be transferred through the application programming interface, which is the point of information exchange between the mobile application and the server with the database.

3. Application design

The basic element of the application design is the presentation of system use cases along with their scenarios. The actors of the system, i.e. the users of the application, will also be presented. The following are the individual use cases of the system in chronological order:

- registration via Facebook,
- user registration via e-mail address,
- logging in using Facebook,
- logging in with an e-mail address,
- logging out of the mobile application,
- changing the password to the mobile application,
- event selection screen,
- viewing participants' profiles,
- selecting a participant for the meeting,
- sending an invitation to a meeting,
- viewing the participant's presentation,
- consultation with a representative of the industry on the details of the project,
- viewing the map and location of the event,
- sending the user's business card,
- displaying a page about the authors of the application,
- sending feedback about the application.

In accordance with the accepted design standards, the application must be easy to use. This means that the end user of the mobile application must be able to use the main functions easily. This approach ensures that the application will be well received by its users. Application functionality and use cases should be presented in the use case diagram as well as in the activity diagram. Due to the limited number of pages of the article, these diagrams are not presented in the article.

The database for the platform supporting the establishment of industry contacts in the field of architecture should be created in a relational scheme (Nixon, 2021; Mazur, 2004). Careful design of the database will facilitate the implementation of the system.

The proposed design of the mobile application should be implemented.

4. Implementation of a networking support platform

The proposed platform supporting establishing contacts between representatives of various industries is based on two main components: a mobile application and a website.

The application for the Android platform is the most important part of the system. It is the only item that the end user has access to. It should be developed in a native environment using Java and XML. The development tool used in the development of the application should be Android Studio, produced by Google. For version control management, we use GIT (Bell, and Beer, 2021), which is GNU GPL licensed software, and Bitbucket, which is the most popular web hosting service.

The website should be made with the use of HTML5, CSS, PHP and JavaScript (Stark, and Jepson, 2013). The library is AngularJS, which will support the development and testing of web applications based on the MVC pattern. It is suggested to use a MySQL (Nixon, 2021) database which has high speed.

The platform API should be developed based on the Hapi.js (Hapi.js, 2021) and Sequelize (Sequelize, 2021) frameworks. Their main advantage is their ease of use. Both are widely used now, which will mean supporting a large number of users.

The interface should be made available via the Heroku platform. This platform is the most commonly used solution in the case of websites that are the subject of creating an analyzed at work application. Application implementation should take place in stages presented in the literature (Android Dev., 2021; Collins, Galphin, and Keepler, 2021).

According to the recommendations for Android users (Android Dev., 2021), the application design should distinguish the following parts (Collins, Galphin and Keepler, 2021):

1. Activities.
2. Adapters.
3. Database.
4. Fragments.
5. Models.
6. Networking.
7. Util.
8. Witgets.

Implementation of the application should take place in the following stages: designing the appearance of the application and the necessary views, creating the application logic and connecting the application with the database via API. Android views are programmed in XML. Once the views were ready, the next step was to create the logic. The primary class here is the Main Activity (Main Activity, 2021) class. Operating on fragments is a big problem here. They are necessary for the developed platform to have several views. Thanks to the

implementation of the getFragmentByTag (GetFragment, 2021) method to change fragments, it was possible to switch between views, i.e. navigate through the application.

The peculiar task was to create a mechanism responsible for inviting participants to contact. It was necessary to use the built-in calendar into which the application should enter selected data. The populateView and setupCalendar methods are used here. Multilingual functionality is natively built into the system. This is described by the Android Developers website (Android Dev., 2021).

The final step is to connect the application to the API to access the data in the database. This was achieved thanks to the Gson (Gson, 2021) library, which converts Java objects to their JSON (JSOM, 2021) representations.

The PHP language should be used to create the website backend and the application programming interface. The above-mentioned frameworks from the Node.js environment should be used for implementation.

5. Application testing

An important element in software development is testing it at every stage of design and after its completion. Testing at every stage of work allows you to avoid costly system errors. As a result, the end user will receive the product without defects. The following tests should be performed: use case testing, immunity testing from the console, and munkey tests (Android Dev. – monkey tests, 2021).

When testing the software, the focus was on the mobile application that has contact with the end user. The scenario of the selected test to validate registration via email is presented below as Test 1.

Test steps no. 1 are as follows:

a. the scenario concerns the registration of an account that has already been registered,
b. purpose of the test: validation test in validating user registration data,
c. test method, user actions:
    - application download,
    - installing the application on a Smartphone with the Android operating system,
    - launching the Business Connector application,
    - selecting the "Register" option,
    - the data for which the account has been previously created is entered,
    - pressing the "Register" button,

d. test method, system responses:
   - displaying a message about the installed application,
   - displaying the initial screen with registration and login options,
   - displaying the registration screen,
   - the system checks the data entered into the system and displays the loading screen,
   - the system returns to the data entry screen and displays "Please try later",

e. evaluation of the test: positive.

The above test relates to the correct functioning of user registration to the mobile application. This is a very important step, because in order to be able to use the mobile application, you must go through the registration process. During the functioning of this functionality, the authors of the work focused on registration via e-mail accounts. This functionality was tested correctly.

Similarly, as part of conducting use case tests, you should perform the following tests: validating the entered credentials, validating that the meeting invitation was sent, validating that the business card was sent, and verifying that the application feedback was sent correctly.

The resistance tests carried out from the console are automated tests of the correct operation of the mobile application (Monkey tests). Based on the recommendations contained in the literature (Android Dev. – monkey tests, 2021), parameters were adopted that test the software at a given time of the program operation. Monkey tests are run through the console.

Manual tests of third parties are used to detect errors in the application. This method has a high cost associated with the application testing time by third parties. User-identified GUI errors are implemented immediately.

The developed application showed no errors during test implemented with the use of test scenarios and system use cases.

6. Conclusion

Due to the limited number of pages, the article does not present the details of the application development, its implementation, and testing results. The work focuses on presenting the concept of an application that facilitates establishing contacts between representatives of architecture industries.

To support the functioning of the application, a function has also been planned that allows end users to send feedback about the application. This is an important issue for future users since it makes the future improvement of the product possible. This application can be a preliminary step to developing a conflict management strategy.

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ORGANIZATION AND MANAGEMENT SERIES NO. 155

A STUDY ON THE PERCEPTION OF QUALITY OF LIFE BY STUDENTS OF THE SILESIAN UNIVERSITY OF TECHNOLOGY DURING THE PANDEMIC

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Purpose: The aim of this study is to collect information on students' perception of their life quality during a pandemic. It aimed at gaining information on how quality of life changed before and during the pandemic.
Design/methodology/approach: The research method used was a questionnaire survey. For this purpose, Google Form was used. The survey contained 22 multiple choice questions.
Findings: The pandemic had a negative impact on the perception of life quality. Using a categorization into 8 areas in the hierarchy of values in the students' lives, the most important were found to be family, mental and physical health and friends.
Research limitations/implications The major limitation was the number of votes collected in the survey. The next research should be extended to include the issue of hierarchy of values in relation to the perception of life quality and a larger research group, for example, students from different universities in different provinces.
Social implications: This study will provide insight into the issues and changes in the perception of life quality that affect students during a global pandemic. The article presented here is a voice in the discussion of students' perception of life quality during a pandemic.
Originality/value: The research presents changes in the perception of life quality by students of the Silesian University of Technology during a global pandemic.

Keywords: quality of life, pandemic, students, questionnaire.

Category of the paper: Research paper.

1. Introduction

Man is a social being, and in order to exist in the world and develop properly, they need the society. A fact in favour of this statement is the impossibility of living alone in the first years of life - a child requires the active participation and help of other human beings. People have a number of basic needs that they wish to satisfy, and the society is needed to satisfy basic needs such as safety, sense of belonging, respect, self-fulfillment and development. In shaped societies, where every human being has a role and has his or her duties and priorities, there appear such concepts as well-being, standard of living or quality of life.

In literature, the term quality of life was first introduced after World War II in the United States, but then the quality of life was understood only as material well-being (de Walden Gałuszko, 1997, p. 77-82). However, Kolman stated that it is not a new concept, he compared it with such terms as living conditions, living arrangements, way of life or lifestyle (Kolman, 2002). He acknowledges that relevant information on quality of life was already appearing in the 1870s but in different forms. Rebenda-Bajkowska differentiated two approaches to quality of life: objective and subjective (Rabenda-Bajkowska, 1979, pp. 135-149). Other authors who wrote about two different views of quality of life were Browne, McGee and O'Boyle. They distinguished a theoretical approach in which the quality of life is understood as the degree to which universal needs are satisfied – this approach refers to objectivity, which means that we should focus on the group itself (nomothetic approach). The second approach is the so-called processual approach. It turns to subjective perception. The focus should be on the interviewees and information should be collected from them (idiographic approach) (Dziurowicz-Kozłowska, 2002, pp. 77-99). The popularization of research on the quality of life took place after the research project initiated in 1971 by Cambell (Kowalik, 1995, pp. 75-85). The summary of its results is a statement appearing in the article by Wnuk, M. and Marcinkowski, J.T., and it reads as follows: "The relationship between objective living conditions and life satisfaction proved to be ambiguous, confirming that as objective living conditions increase, subjective feelings of satisfaction or happiness do not always follow" (Wnuk and Marcinkowski, 2012, pp. 21-26).

The concept of quality of life is an interdisciplinary one, involving not only sociology, but also such sciences as medicine, philosophy, economics and psychology. It is a debatable concept, its definition depends on the scientific discipline in which it is considered, e.g. "by economists it is treated as a simultaneous term for welfare and well-being" (Adamiec and Popiołek, 1993). The concept of quality of life is multi-layered, emotionally laden, impossible to clearly define, and additionally often linked to politics and culture. One of the researchers of this concept (Krystyna Jaracz) claims that the confusion about the standards of quality of life has its basis in the impossibility of creating a precise definition, and in the different aims of different scientific disciplines that try to deal with this issue.

In medical science, the term quality of life has emerged with the very quick progress of the field. The main objective of medicine used to be to keep the patient alive at all costs – no attention was paid to the decline in the patient's quality of life (Wnuk and Marcinkowski, 2012). Interest in the notion of quality of life in medicine not only led to the analysis of therapeutic methods, but also showed how the improvement of this aspect of life had a positive impact on patient outcomes. In the 1980s a special concept of quality of life was introduced into medicine, which consisted of two components: behavioral and survival (Walker and Rosser, 2012). The QALY index was also introduced, describing the years of life gained through medical intervention in relation to the quality of that life (Stańczak-Mrozek, Biłant and Mućka, 2019). In psychology, the term quality of life was derived from the ancient philosopher Socrates. One of the latest trends in psychology is positive psychology, i.e. the search for positive sources of happiness and satisfaction. New research on quality of life places particular focus on the subjective feelings of the research subject to the conditions in which they find themselves. In sociology, quality of life appeared as a specific value system to compete with the concept of standard of living used in economics. If we consider the concept of quality of life in sociological terms in the present day, there are many variations of this concept, but they have a common pillar: they reflect the ways and levels of satisfaction of different human needs (Kaleta, 1998).

Nowadays we have many definitions of quality of life, touching on different areas of our lives. One of the many definitions has identified the following elements of quality of life the state of the natural environment, the material state, the spiritual state, the sense of security, health, and the sense of belonging (interpersonal relations). The elements that are extracted when attempting to define quality of life can be grouped into the three basic and most common spheres of quality of life found in the literature, which are: "to have", "to be" and "to love" (Włodarczyk, 2015, pp. 3-16).

The above-mentioned spheres start to gain importance in a person's life when they become adult. This means that the spheres become clear in young people, who, from a national point of view, are one of the most important social groups that finish a stage in education – we are talking about students. In the various research on quality of life, the focus has usually been on adults, however, the interest in young people should be obvious in view of the future roles and responsibilities they will assume in the society. It is the young people, especially university students, who will shape the future world, therefore they should be more often the research target as far as perception of life quality is concerned. The evidence supporting the thesis that scientists should take more interest in this research group is the fact that "Students are forced, according to sociologists, to break the barrier of environmental and generational separation with every subsequent year of studies, to become more and more involved in the circle of issues of "adult life". The time of studies is for them a kind of transition stage between the "carefree" youth " (Strózik, 2009, p. 64). This makes university students even more attractive for various types of research.

In December 2019, the SARS-CoV-2 pandemic broke out and shocked the world. It affected many aspects of life and affected practically each person individually. Many restrictions concerning meeting people, remote teaching and lockdown have been imposed. Not being able to meet other people as usual has taken a big toll on the value system and the whole perception of life (Leong Bin Abdullah, Mansor and Mohamad, 2021). It has also had a very strong impact particularly on the life quality of university students, who have suddenly been deprived of the opportunity to freely enjoy the benefits of student life. Moreover, these are the last years before adulthood in which young people still have the opportunity to live a carefree life, as far as their private situation allows, of course.

The main aim of this study is to collect information on students' perceptions of life quality during a pandemic. The achievement of the goal was preceded by theoretical considerations concerning the term "quality of life", which were extended by the author's own survey on students' perception of life quality during a global pandemic.

2. Method

Being a part of the PBL project at the Research University of Silesian University of Technology, a group of students conducted a study on student perception of life quality during a global pandemic. The project was implemented under the Excellence Initiative – Research University program. The main scientific supervisors was Mariusz Ligarski, Ph.D., a professor of Silesian University of Technology, and Krzysztof Michalski, Ph.D.

The research was planned to be conducted on a sample group of one thousand students from the following faculties of the Silesian University of Technology: Faculty of Organization and Management, Faculty of Applied Mathematics, Faculty of Automatic Control, Electronics and Computer Sciences. One of the implemented research methods was a survey. A research tool used for this purpose was a Google forms questionnaire. It included 22 questions from the following areas: physical and mental health, family and friends, physical activity, hobbies and passions, sense of security and stability, quality of education and leisure time. These questions were in closed-ended form, primarily answered on a five-point scale described next to each question. There were also two yes or no questions. Several questions consisted of selecting one of the given answers. The survey also included a metric that included questions about gender, place of residence, and department. The questions in the metric were also closed-ended i.e. they required choosing one of the given answers. Before creating the questionnaire, the research group brainstormed on the notion of life quality and the aspects which influence it. From the discussion emerged the areas of life, with more questions to add. The next stage was to optimize the questionnaire so that it would not be too long, which was supposed to promote feedback. The questionnaire was distributed electronically among students and also QR codes were posted in the area of selected departments. The problem faced by the research group included

collecting the target number of responses. Due to various methods along with the support of the research supervisors, 196 correctly completed questionnaires were collected.

3. Results

The object of this study was to determine students' perceptions of their life quality during the global pandemic. The results presented here are a summary, expressed as a percentage distribution of responses to the individual questions that were included in the survey. The survey included a metric with several questions. The final respondents to the questionnaire were 103 men i.e. 53% and 93 women i.e. 47%. Then, referring to their situation both before and during the pandemic, six different types of residence were identified (Table 1 and Table 2). This was to illustrate the basic changes associated with the pandemic such as the place and type of residence.

Table 1
The place of residence during the pandemic

Answers	The place of residence during the pandemic
Single-family house	51%
Flat	39%
Flat shared with a partner	6%
Dormitory	3%
Flat shared with friends	1%
Flat shared with roommates	0,5%

Note: own study.

Table 2
The place of residence before the pandemic

Answers	The place of residence before the pandemic
Single-family house	38%
Flat	41%
Flat shared with a partner	4%
Dormitory	9%
Flat shared with friends	3%
Flat shared with roommates	7%

Note: own study.

Table 3
The place of residence

Answers	The place of residence
Village	18%
City with population below 50,000	17%
City with population between 50,000 and 150,000	27%
City with population between 150,000 and 500,000	33%
City with population over 500,000	5%

Note: own study.

Summarizing tables no. 1 and no. 2, among the respondents there was a noticeable increase in living in a single-family house during the pandemic. This has resulted in a decrease in the number of people living in other places such as dormitories and flats. Table no. 3 shows that the largest number of students live in large and medium-sized cities. The next 35% live in small towns and in the countryside. Only 5% of the respondents live in cities of over 500,000 inhabitants.

Most of the questions were created in the form of a five-point scale, where the scale is described in each question. The first question using this scale related to the quality of life. In Figure 1, it can be seen, according to the respondents, what impact the pandemic had on their perception of the quality of life.

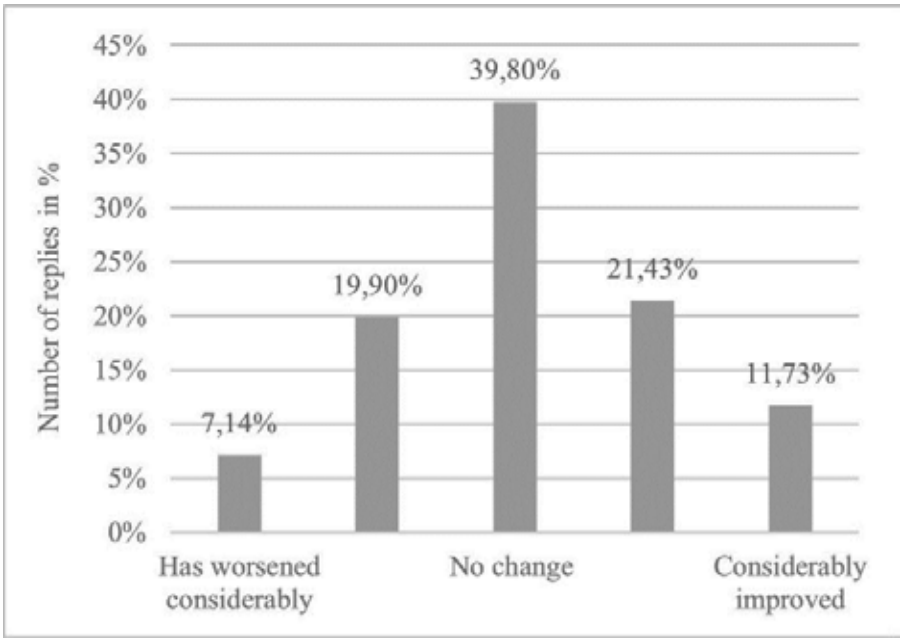

Figure 1. Change in the quality of life during the pandemic. Own study.

Figure 1 shows that the largest percentage of people believe that the pandemic has not affected their current quality of life. The remaining respondents felt that the pandemic had had an impact on their perception of their life quality. Among them, 33% felt that despite the pandemic and many other changes, it had improved their perception of life. 27% of respondents felt that the pandemic had worsened their perception of their quality of life. Despite the many difficult changes that have occurred in society, the pandemic has had a positive impact on one in three students.

In the survey, 8 factors affecting the quality of life were analyzed. These were: family, friends, mental and physical health, hobbies/passions, sense of security and stability, physical activity, leisure time and quality of education. An eight-point scale was used to formulate this question. The respondents had to select the values that seemed more important to them than others, numbering them from 1 to 8. To calculate the hierarchy of values (Table 4), an analysis was done using linear regression. For each option, a straight line was drawn showing the relationship between the number of responses and their position in the hierarchy. The final

position results from the value of the slope coefficient of the straight line. The smaller the coefficient, the higher in the final hierarchy. The results are presented in table 4 in descending order according to the answers of the students surveyed.

Table 4
Hierarchy of values before and during the pandemic

	Hierarchy of values before the pandemic		Hierarchy of values during the pandemic
1	Family	1	Family
2	Friends	2	Physical and mental health
3	Physical and mental health	3	Friends
4	Hobbies/passions	4	Sense of security/stability
5	Sense of security/stability	5	Hobbies/passions
6	Physical activities	6	Physical activities
7	Leisure time	7	Leisure time
8	Quality of education	8	Quality of education

Note: own study.

The results of the hierarchy distribution (Table 4) allowed us to establish that the pandemic situation had changed the hierarchy of values among the students surveyed. The most important value both before and during the pandemic was the family. The effect of the pandemic was an increase in the value of a sense of security/stability and physical and mental health, which influenced a decrease in the importance of friends and passions. However, the last three positions: physical activity, leisure time and quality of education did not change their place in the hierarchy.

Furthermore, the questionnaire contained detailed questions related to the different areas of life, created on the basis of the hierarchy of values. The analysis of the answers from the area concerning the family shows that the pandemic had a positive impact on both the amount of time spent with the family and the relationship with the immediate family (Table 5).

Table 5
Questions related to the relationship with the family

Answers / Questions	1 Has worsened considerably	2	3 Nothing has changed	4	5 Considerably improved
1. How has the pandemic affected the amount of time you spend with your family?	2%	9%	33%	33%	24%
	1 Nothing has changed	**2**	**3**	**4**	**5 A lot has changed**
2. How has your relationship with your immediate family changed during the pandemic?	3%	11%	47%	27%	13%

Note: own study.

It can be deduced from the table that for more than half of the respondents, the time spent with family increased during the pandemic. The responses also showed that for a small number of people the time spent with relatives decreased, which means that more time spent at home had a positive impact on family life. This fact not only affected the amount of time with family, but their relationship as well. Although almost half of the respondents (47%) believed that their relationship with their immediate family did not change during the pandemic, for a significant proportion (40%) the relationship improved. Only 13% believed that the relationship with their relatives has deteriorated. It can therefore be concluded that the pandemic had a positive impact on better family relationships.

The next questions dealt with the field of mental and physical health. These showed that for a significant proportion of respondents the pandemic had a negative impact on their mental health (Table 6).

Table 6
Questions about mental and physical health during a pandemic

Answers **Questions**	**1** **Nothing has changed**	**2**	**3**	**4**	**5** **A lot has changed**
1. How has the pandemic affected your mental health?	18%	28%	28%	16%	10%
	1 **Worsened considerably**	**2**	**3** **Changed nothing**	**4**	**5** **Considerably improved**
2. How has the pandemic affected your physical health (e.g. Chronic illness, bad habits, etc.?	10%	29%	36%	15%	10%

Note: own study.

Over 80% of the respondents agreed that the pandemic had affected their mental and physical health, with as many as 10% admitting that the pandemic had had a very large impact on their mental health (Table 6). The remaining students stated that the pandemic had not impacted their health. However, the pandemic has negatively affected the mental health of the students. From the responses given, it can be inferred that the pandemic also had a slight negative impact on their physical health. More than 30% of the respondents felt that nothing had changed and 25% felt that their physical health had improved. In contrast, as many as 39% believed that during the pandemic, their physical health deteriorated. In both cases, the pandemic had an adverse effect on health.

Another scope of analysis were the relationships with friends (Table 7). The majority of students admitted that the time of the pandemic had adversely affected their relationships with their friends. In this case, the scale was divided into 5. However, 3 meant no change, 1 deterioration and 5 improvement (Table 7).

Table 7
Questions related to the relationship with friends

Answers / Questions	1 worsened considerably	2	3 changed nothing	4	5 Considerably improved
1.How did the number of friends you were in contact with change during the pandemic?	16%	27%	41%	9%	7%
2.How did your relationship with your friends change during the pandemic?	10%	28%	34%	19%	9%

Note: own study.

In the first question in Table 7, as many as 43% of respondents admitted that they had fewer friends they were in touch with during the pandemic. Contact with friends changed because of the pandemic and the lockdown that occurred at that time. It was probably also influenced by the change of place of residence, as many people returned to their family homes for the duration of the remote studying. A similar number of the surveyed students admitted that their group of friends had not changed. Only 16% responded that their number of friends had increased. The situation with the relationship with friends during the pandemic was similar. The majority of people answered that their relationship deteriorated. The rest of the respondents claimed that their relationship with their friends had not changed (34%), but 28% of the respondents answered that their relationship had improved to some extent. This shows that the pandemic has been unfavorable for both contact and relationships with friends.

The next important factor in the hierarchy is the feeling of security, which played an important role during the pandemic. From a given point in the hierarchy, several factors were separated that could influence safety. Three spheres were selected: financial conditions, sense of freedom and support from administrative units (Table 8).

Table 8
Questions related to the feeling of security/stability

Answers / Questions	1 Has worsened	2	3 Has not changed anything	4	5 Has improved
1.How did the pandemic affect financial conditions in your life?	9%	15%	43%	16%	17%
	1 No support	**2**	**3**	**4**	**5 Strong support**
2.Did you feel that the pandemic/lockdown deprived you of your freedom?	17%	14%	11%	24%	35%
3.Did you feel supported by public administration units (hospitals, dispensaries, health services (protection), etc.)?	34%	30%	27%	7%	2%

Note: own study.

Most respondents answered the first question (Table 8), related to finances, that their financial situation had not changed. Despite many changes, the situation improved for more students, while it worsened for only 24%. However, this fact did not have a large impact, as the largest percentage of respondents noticed no change whatsover. A lockdown was

introduced during the pandemic, which may have created a sense of incapacitation. Among the respondents more than half admitted that the lockdown limited their freedom, as many as 35% admitted that it limited their freedom considerably. Only 17% did not feel deprived of their freedom. Another factor which influenced the feeling of security was the perception of support from public administration units. In response to this question, most respondents answered that they did not feel supported. Only a dozen respondents answered that they felt a lot of support (9%), which means that the pandemic did not only come as a surprise for citizens, but also for the services and administrative units that failed to deal with it adequately.

Next, the impact on the possibility of pursuing hobbies/passions, which may have been significantly limited for many students due to the pandemic and isolation, was examined (Figures 2 and 3).

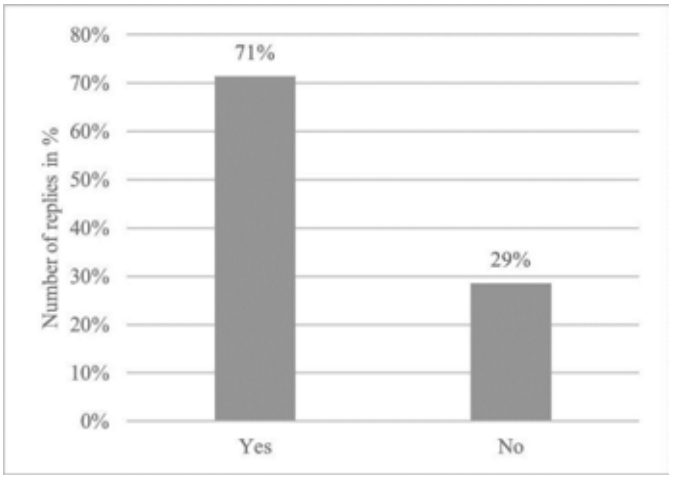

Figure 2. New passions/interests. Own study.

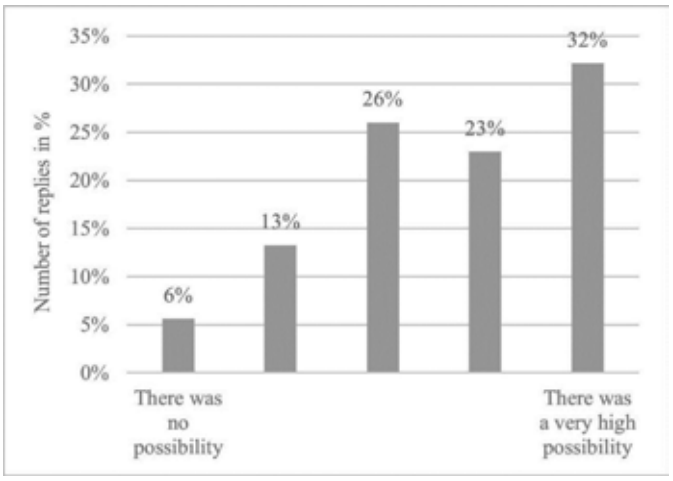

Figure 3. Possibility of pursuing their current passions/interests. Own study.

More time during the pandemic had a positive impact on the pursuit of their passions, with as many as 71% of those surveyed admitting that they had pursued new passions (Figure 2). Only 29% admitted that they did not try new passions. On the other hand, as many as 94% of the respondents stated that there was a possibility of pursuing their current passions and interests, 32% of whom believe that they had a lot of opportunities. This meant that despite

numerous restrictions, students tried to make the most of the their time and developed their existing passions as well as new ones.

The lockdown also had a significant impact on the question of physical activity and the opportunity to participate in sports. The questionnaire included a question about the frequency of practising sports before the pandemic and the changes that occurred during the pandemic period (Table 9).

Table 9
Questions related to physical activity and its frequency

Frequency of sporting activities / Questions	No, never	Several times every six months	Several times a month	1-3 times a week	More than 3 times a week
1. How often did you play sports (gym, team games, jogging, etc.) before the pandemic?	33%	25%	17%	11%	14%
	1 worsened	**2**	**3 changed nothing**	**4**	**5 improved**
2. How has the pandemic affected the issue of physical activity in your life?	16%	26%	32%	16%	11%

Note: own study.

The table shows that one third of the pre-pandemic respondents did not play sport at all. The remaining group of respondents played sports with varying frequency, but the largest number of people played sports several times in six months. Therefore, more than 50% of the students did not regularly play sports before the pandemic. During the pandemic there was a downward trend which means that a large proportion of people reduced the amount of time they spent on physical activities. For 32% the lockdown had no effect, only for 27% it had a positive effect on this issue. This data shows that students do not do sport and only a few do it regularly.

Due to the pandemic and temporary isolation, leisure time increased significantly, due to the need to stay at home. Therefore, questions relating to leisure time were included (Figure 4).

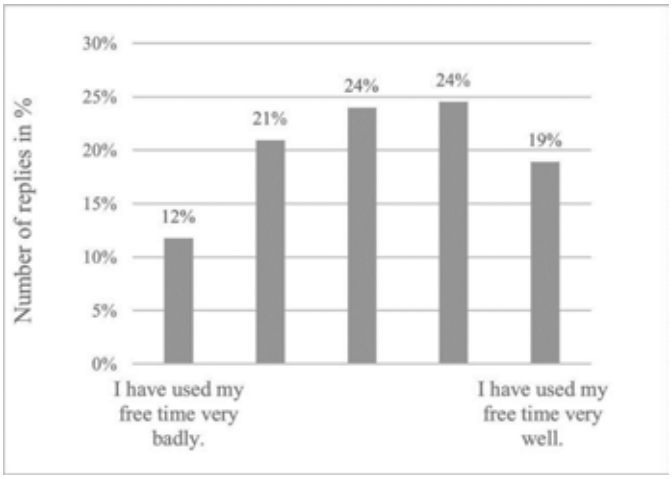

Figure 4. Assessment of quality of leisure time spent during the pandemic. Own study.

The vast majority of students made positive use of their leisure time during the pandemic, meaning that students were satisfied with their leisure arrangements. As many as 19% used it very well and only 12% think they used it very badly.

Another big change during the pandemic was the shift to distance learning. The last factor that was examined in the questionnaire was the impact of the pandemic on the quality of education and the effect of remote teaching on students' efficiency and their approach to learning (Table 10).

Table 10
Question related to quality of education

Answers / **Questions**	**1 Negatively**	**2**	**3 changed nothing**	**4**	**5 Positively**
1.How do you assess the quality of education during the pandemic?	31%	21%	20%	17%	11%
2.How has remote learning changed your approach to learning?	27%	18%	24%	17%	14%
	1 I felt nothing	**2**	**3**	**4**	**5 I felt a lot**
3.Have you felt frustration about remote learning?	34%	20%	15%	12%	18%

Note: own study.

In question one of table no.10, an increasing trend can be seen for answers denoting a deteriorating quality of education during the pandemic. As many as 31% indicated that the quality of education during the coronavirus pandemic significantly deteriorated, only 11% indicated a significant improvement in teaching during this time. Among those surveyed, only 20% of students believed that the quality of education during the pandemic compared to before the pandemic did not change. Learning remotely during the pandemic also negatively affected the respondents' approach to learning. Only some people admitted that online classes improved their view of learning (31%). The remainder of them felt that it had not affected their approach (24%). The survey included a question about feelings of frustration towards remote learning. The vast majority of students stated that they felt more or less frustrated about remote learning. Only 18% felt considerable frustration about it and 20% felt little frustration about remote learning.

The analysis presented here shows how important these spheres were for the respondents before and during the pandemic. All these factors influenced the students' perception of their quality of life.

4. Discussion

From the analysis of the survey results, it can be seen that many students believe that the pandemic has negatively affected their lives to some extent. Over the past few months, some articles have been written presenting a similar hierarchy of values. These documents display different results of perceived quality of life during the pandemic. Some show a positive impact of social isolation on quality of life, while others indicate a negative impact.

In one of T. Strózik's articles on value system vs. life evaluation of students of Poznan universities, the most valued values are: family, friends and health (Strózik, 2014, pp. 5-23). Students of the Technical University of Silesia adhere to the same hierarchy of values during the pandemic. This approach was influenced by the forced lockdown, during which people reevaluated their lives realizing how important these aspects of life are and the impact they make on them.

During the time of social isolation, the state authorities recommended staying at home. People were encouraged to leave their homes only for necessities such as going to work, grocery shopping, etc. As a result, outdoor physical activity decreased. Among the students of the Silesian University of Technology only 25% declared that before the pandemic they did sport at least once a week, however, in response to the question of change in physical activity 42% declared a decrease in the frequency of sport. In the article "Quality of life under the COVID-19 quarantine", when asked about how they spent their time during the pandemic, only 11.7% of study participants responded that they did sports outside (Ferreira, Pereira, da Fé Brás, and Ilchuk, 2021, pp. 1389-1405). Among those who do sports regularly, the vast majority of them run or attend gyms or other organized activities such as fitness, Zumba, etc. Before the pandemic, a healthy lifestyle which included regular physical activity was very popular and was receiving increasing attention especially among university students. However, due to the pandemic, the percentage of people participating in sports that required getting out of the house decreased significantly.

The pandemic has caused anxiety and fear in society. Because of this, there appeared new tasks for the services of public administration units, such as providing support and security in the current situation. The students of the Silesian University of Technology believe that the administrative units did not fulfil this task, and for the most part they did not feel supported by authorities. Surveys among students in Krakow described in the research report "Krakow students in a coronavirus pandemic emergency" that nearly half of the respondents claim that the services of administrative units are fulfilling their task well (Długosz, 2020). It can be deduced that each city dealt with the changes caused by the pandemic in a different way. The results show that each city fulfilled its responsibilities to a different extent.

The pandemic has had both positive and negative effects on many areas of our lives. The mentioned examples allowed us to compare the selected results, with different outcome data. This helped to observe differences and similarities among other subjects on the topic of quality of life during the pandemic.

5. Summary

The pandemic has had a big impact on the quality of life of every person, including university students. The time of study is the last time in which students have the opportunity to live a carefree life, of course, if their private situation allows it. They want to use this time to the most, often spending it on various types of activities not related to study or work. Therefore, their perception of quality of life during a pandemic is an interesting topic of research. For this reason, it was decided to investigate this topic among students of the Silesian University of Technology from three faculties: the Faculty of Applied Mathematics, the Faculty of Organization and Management, the Faculty of Automatic Control, Electronics and Computer Science. For this purpose, a survey was conducted with a number of questions concerning the following areas: physical and mental health, family and friends, physical activity, hobbies and passions, sense of security and stability, quality of education and free time.

The research allowed to bring closer the perception of the quality of life of students in the times of the coronavirus.

Results of responses

1. In the analysis of the hierarchy of values, according to the respondents, the most important values during a pandemic are family, mental and physical health and friends.
2. 39% of the respondents confirmed no change in the quality of life during a pandemic. However, as many as 33% found an improvement in the quality of life and only 28% a deterioration.
3. According to the students, the lockdown had a positive impact on the following areas of life:
   - Family (relationship with loved ones).
   - Hobbies/passions (pursuing new and existing ones).
   - Free time (spending free time).
4. Other answers indicate a negative impact of the pandemic on the quality of life.

Despite a negative impact on individual factors, the overall perception of life quality is positive. Looking at other studies on the quality of life of academic youth, it can be noticed that the perception of the quality of life by students are diverse, e.g. depending on the city in which the students live. This is due to, among other things, differences in the structures of power and

administration. These differences have a large impact on how a given city or province functions during a pandemic, which affects the lives of all inhabitants of this area.

The perception of the quality of life depends on many external factors and personal experiences. The research makes it possible to understand what impact the pandemic had on the lives of university students. Changes in their lives occur every day, so it is worth doing more research on this subject.

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CIRCULAR ECONOMY FROM THE PERSPECTIVE OF SMES SECTOR

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Purpose: The main objective of the paper is to determine the way SMEs perceive the circular economy concept and to establish factors influencing introduction of CE pratices. In particular, answers to the following research questions are sought: (1) Is the CE concept familiar to and well-understood by entrepreneurs?; (2) What are the strongest challenges and barriers for SMEs with regard to the introduction of the CE?; (3) Which factors determine SMEs' introduction CE practices.
Design/methodology/approach: SMEs were selected as the subject of the research. The study was quantitative in character. A questionnaire study and statistical analysis (structural equation modeling in it) were used.
Findings: The paper focuses upon challenges associated with the implementation of the circular economy in SMEs, barriers for implementation and determinants. The results revealed that the concept is familiar and well-understood. However, businesses do not perceive it as a source of economic benefits. The following fields were considered as problematic: improvement of recycling efficiency, exploitation of production by-products, and substitution of non-renewable resources. Structural equation modeling revealed that introduction of CE practices is determined by several institutional factors, perceived risk and external standards and norms.
Originality/value: The paper extends previous work concerning the management of SMEs by undertaking the issue of CE introduction. In particular, it focuses on the perception of barriers and stimulators CE practices and responding to several recent calls for research on CE awareness in SMEs. Another novel element can be find in using the theory of reasoned action (TRA) to explain the factors conditioning the introduction of CE practices into SMEs.

Keywords: circular economy, SME sector.

Category of the paper: Research paper.

1. Introduction

The hitherto economic system has been characterized by the linear flow of materials and resources. The past decade brought about a new concept – circular economy (CE) – which revolves around recycling/reuse and reintroduction of resources from preceding economic cycles (Feng, Yan, 2007; Allwood, 2014; Lehmann et al., 2014; Bicket et al., 2014). The CE has been defined as "an economic system that represents a change of paradigm in the way that human society is interrelated with nature and aims to prevent the depletion of resources, close energy and materials loops, and facilitate sustainable development through its implementation at the micro (enterprises and consumers), meso (economic agents integrated in symbiosis) and macro (city, regions and governments) levels" (Prieto-Sandoval et al., 2018). This concept aims to conserve natural resources, limit waste and offer economic benefits. It is estimated that the introduction of the circular economy will enable the demand for resources to be decreased by 17-24% by 2030 (Towards a circular economy, 2014). In addition, it will result in 600 billion EUR savings in the European industry sector (Guide to resource efficiency, 2012). Environment-related benefits will also emerge. These will include an annual greenhouse gasses reduction of 2-4% (The European Commission, 2019) and a general improvement of the quality of life (Wijkman, and Skånberg, 2018). The transition from the linear to circular economy has already been researched. Previous studies focused upon society level (e.g. Hobson, and Lynch, 2016; Scheel, 2016) or investigating the CE at the regional (e.g. Geng et al., 2009), provincial (e.g., Ormazabal et al., 2016; Du et al., 2009) or national levels (e.g. van Buren et al., 2016; Yaduvanshi et al., 2016). Our considerations were focused on the level of the organization. From the perspective of organizations, the transition to a CE implies a change at the strategic level of business model innovation, with modifications in terms of product design, supply chain design and commercial strategy (Bocken et al., 2016). Such changes require growing awareness and interest among managers, who have a central position in putting CE into practice (Carayannis, and Campbell, 2012). Knowledge of their views and beliefs about this concept constitutes important, first step in introduction. Earlier work on the perception of the concept of a circular economy is of a general nature and does not take into account the specifics of SMEs (Xue et al., 2010; Liu, and Bai, 2014; Masi et al., 2018). Empirical studies carried out on this group of organizations focused only on business areas most suitable for the implementation of CE actions (Cristoni, Tonelli, 2018), business models (Ceptureanu et al., 2018), decision models for undertaking circular economy practices (Zamfir et al., 2017). Moreover, motivations, barriers and enablers for CE implementation into SMEs have been explored only by focusing on a single segment of firms (Gusmerotti et al., 2019) or have experienced only limited investigation (Agyemang et al., 2019; Núñez-Cacho et al., 2018). Studies that provide wider evidence are still lacking (Lieder, and Rashid, 2016). In the light of these gaps, this paper presents the results from a survey-based study from the perspective of 630 polish SMEs.

The main objective of the paper is to determine the way SMEs perceive the circular economy concept and to establish factors influencing introduction of CE pratices. In particular, answers to the following research questions are sought: (1) Is the CE concept familiar to and well-understood by entrepreneurs?; (2) What are the strongest challenges and barriers for SMEs with regard to the introduction of the CE?; (3) Which factors determine SMEs' introduction CE practices. Considering the previous studies in the field, paper extends previous work concerning the management of SMEs by undertaking the issue of CE introduction. In particular, it focuses on the perception of barriers and stimulators CE practices and responding to several recent calls for research on CE awareness in SMEs (Liakos et al., 2019). Another novel element can be find in using the theory of reasoned action (TRA) to explain the factors conditioning the introduction of CE practices into SMEs. We expand the interpretative schema of the study with perceived risk and internal norms as additional predictive components. To the best of our knowledge, additional components and CE practices have never been used in conjunction with TRA model to address the issue of circular economy. The research results will endow information for encourage further normative research on CE introduction at the level SMEs.

This paper is structured as follows: Section 2 describes the theoretical framework, including the circular economy concept and its significance for further economic development (Section 2.1), theories the study is based upon (Section 2.2), grounds for hypotheses development (Section 2.3). Section 3 presents research methodology. Section 4 explains research results, and Section 5 outlines the discussion and final implications of the study.

2. Conceptual background

2.1. Literature review

A modern economic system is characterized by the linear flow of resources, materials and products (Ness, 2008). According to several scholars (Geng et al., 2012; Lehmann et al., 2014; Fletcher, and Dunk, 2018), due to growing consumerism, the linear process management system leads to the emergence of numerous negative phenomena, the most critical of which include: 1) repletion of natural resources, 2) degradation of the natural environment due to the diversification of waste types and the growth of their volume, 3) development of restrictions for prospective industrial production (Feng, and Yan, 2007). The negative outcomes of the linear model threaten the stability of economies and integrity of natural ecosystems (Ellen MacArthur Foundation, 2013; Park, and Chertow, 2014; Song et al., 2015). The circular economy is to offer a response to the threats. The concept is built upon the retention of products and materials in economy, which will satisfy the demand by the exploitation of resources

derived from preceding economic cycles (Allwood, 2014; Ghisellini et al., 2016; Moreau et al., 2017).

The Three Rs (replace, reduce, recycle) illustrate the circular economy concept. It is founded upon effective waste management and its integration with industrial production (Chiu, and Yong, 2004). The effectiveness is delivered by the reuse of products, components and materials, renovation and modernization, as well as the exploitation of renewable energy throughout the value chain and product life-cycle (McDonough, and Braungart, 2002). In addition, the circular economy is connected with the concept of clear production (Ghisellini et al., 2016; Lieder, and Rashid, 2016). The concept is grounded in the improvement of resources' productivity and production performance, it facilitates the minimization of waste by its reduction at the source as well as the circulation.

From the perspective of organizations, the CE is perceived as the impetus for economic development with an alternative flow model which is cyclical and regenerative (Kok et al., 2013; Geissdoerfer et al., 2017). It provides opportunities for new value creation (Linder, and Williander, 2015), innovation (Schulte, 2013) and achieving synergy-related benefits (Dong et al., 2016). The analysis of success concerning CE-based business models (especially sustainable business models) confirmed positive outcomes of the CE in organizations which primarily pertain to the reduction of costs (The European Commission, 2019), job creation (Bastein et al., 2013; Behrens, 2016). Economic, social and environmental benefits emerging from the circular economy result in the concept's increasing popularity also at microeconomic level.

A systematic literature review on the circular economy and organizations identified 9 main thematic research areas: systematic literature review on CE and environmental economics, design, socio-political issues, performance measurement, manufacturing specific technique focused on CE, business case framework, organizational symbiosis, alternative concepts, barriers and enablers (Thorley et al., 2019). This paper fits into the last area. The preliminary studies on the entrepreneurs' perception combine this factor with conditions, barriers, challenges. The results of various survey studies published in peer-reviewed scientific journals and identified by the authors through a review of the literature are summarised in Table 1.

Table. 1.
Survey studies published in peer-reviewed scientific journals on the perception and others determinants of the CE

Attribution	Reference
Determinants	Geng and Doberstein (2008); Xue et al. (2010); Zhang et al. (2013); Van Eijk (2015); Agyemang et al. (2019); Gusmerotti et al. (2019); Govindan and Hasanagic (2018); Pichlak (2018)
Barriers	Shi et al. (2008); Geng et al. (2012); Kok et al. (2013); Mutz (2015); Rizos et al. (2015); Agnello et.al (2015); Möllemann (2016); Masi et al. (2018); Ormazabal et al. (2018); Tura et al. (2019); Bjoern and Upadhyay (2019); Mura et al. (2020)
Enablers	Zhang et al. (2013) ; Singh (2017); Zamfir et al. (2017); Tura et al. (2019); Mura et al. (2020)
Awareness	Xue et al. (2010); Liu et al. (2009); Zhu, Geng, and Lai (2010) ; Liu and Bai (2014)

An analysis of the studies suggests three key conclusions. First, an introducing CE practices at a firm level requires a comprehensive analysis and understanding all determinants, including the motivational factors and barriers. Secondly, awareness/ knowledge of the CE concept is a factor that should be considered in research on the introduction of CE practices. Thirdly, these papers have based their analyses on firms in general, or specifically on SMEs. In relation to SMEs further works on determinants of the the introduction of CE practices should also be interpreted from the perspective of well-established, scientific theories. They will be presented in the next section.

2.2. Supporting theories

For the theoretical grounding of the present considerations, a search for innovative and critical literature, one which provides a base for further discussion, was conducted. Focus was placed upon the model of behavioral change and two theories: reasoned action, and environmentally responsible behavior.

In light of the behavioral change model, the level of knowledge influences the awareness and beliefs, which in turn, results in a change of behavior. With regard to environment-friendly actions, this means that when knowledge increases, environmentally favorable attitudes and responsible environmental actions are developed (Hungerford, and Volk, 1980). The behavioral model, though very simplistic, provides a base for the consideration of possible relationships existing between environmental knowledge, environmental awareness and attitude and how these can translate into action or inaction. Based upon the model, the change of a company's behavior – the transition towards circularity – results from the change in entrepreneurs' awareness. The level of awareness determines behaviors, CE practices in this case. At the same time, good knowledge of the CE may not necessarily imply the introduction of CE practices. These are also determined by other intervening factors.

The reasoned action theory stipulates that the intention of acting has a direct impact on behavior, and that it can be predicted by attitudes. These attitudes are shaped by subjective norms and beliefs. Situational factors influence these variables' relative importance (Ajzen, and Fishbein, 1980). Studies by Hanna (1995) confirmed that developing environmentally favorable attitudes towards relevant issues leads to the intention to act responsibly becoming reinforced. Attitudes and subjective norms contribute to behavioral intentions, which can be used to predict behavior. Subjective norms denote an individual's beliefs concerning the involvement in a specific behavior. The application of the reasoned action theory in this study acknowledges the connection between knowledge, attitude and behavior. In the context of the CE, this means that attitudes towards the CE generate the intention to undertake action. In more general terms, a premise ought to be made that the way entrepreneurs perceive the CE determines the intention concerning the introduction or abandonment of CE practices.

This paper fits well within the environmentally responsible behavior theory (Hines et al., 1987). The ERB theory indicates that the following variables: intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility, and knowledge, suggest whether a person would adopt a behavior or not (these factors ought to be considered conjunctively). In relation to the circular economy, no single factor is responsible for current practices or is sufficient to initiate the implementation of practices. Separate constructs of attitudes, locus of control and intention to act may not be enough to create an intention to act. United under one overarching concept, they become a base on which predispositions for pro-environmental behavior are formed. The implementation of CE practices is likely to be determined by several factors. For that reason, studies of the issue ought to involve predictors and variables which can affect behavior towards the circular economy.

The mentioned theories form a basis of theoretical reasoning for hypotheses development.

2.3. Hypotheses development

In developed countries, the circular economy concept is perceived as a direction of prospective growth and has the support of political decision-makers and research community (Ghisellini et al., 2016; Manninen et al., 2018). This support focuses primarily on promoting this concept (Ladan, 2018; EU Circular Economy Action Plan) and introducing solutions dedicated to her (Zhu et al., 2015). Strong emphasis is also placed on building awareness about the benefits of circular economy practices, in effect of what the term is intuitively perceived as a field which may prospectively offer benefits for users (Geng et al., 2012; Smol et al., 2018) and new business opportunities (Rizos et al., 2015; Ormazabal et al., 2016). In addition, the emerging environmental education programs in schools and universities increase people's interest in the value of nature, which results in a change in preferences customers in the direction of firms that use CE strategies (Prieto-Sandoval et al., 2018). Along with the growing public awareness, one can notice the growing knowledge of entrepreneurs about circular economy. Results obtained by World Business Council on Sustainable Development indicate that 76% of respondents effectively monitor circularity aspects related to their companies, (WBCSD, 2018). Carried out by Liakos et al. (2019) on a group of 103 people, the study showed that with the growing emphasis on CE across the globe by governing bodies, organizations are becoming more aware of CE. So it increases knowledge of how to transform the firm's current operations into circular business. An expression of this awareness in the group SMEs are managerial practices for circular economy business models (Unal et al., 2018). Bassi and Diaz confirm variability in the adoption of CE practices. They found that 73.2% of the organizations undertook or were in the process of undertaking at least one CE activity in the past three years. The contrary results were obtained by Mura et al. (2020). They indicate that circular economy practices appear weakly developed among the SMEs, with the exception of separated waste collection, which is likely to have been influenced by the stricter regulation in this field.

What's more, Yongtao (2015) notes that SMEs are characterized by lack awareness of technological innovation cycle and insufficient understanding of circular economy. The diversity of CE practices used, confirmed by other authors, however, contradicts its conclusions. According to Law and Gunasekaran (2012), "It is clear that for a SME working towards a circular economy, that individual mind-sets, the way an individual thinks and behaves, are key factors supporting this transition". Liu and Bai (2014) confirm good understanding and a high willingness of firms to move to a circular. Pursuant to the above, the following may be argued:

H1*: The circular economy concept is familiar to and well-understood by SMEs.*

TRA theory can be the basis for prediction of organization's readiness to introduce circular economy approach (Singh and Chakraborty, 2017). According to it, one of the main factors conditioning the intention to implement CE practices are external norms. They are identified with social pressure from the government, customers, market, which shapes the perception of the organization regarding the desired behavior. Many papers demonstrate that policymakers have a key role to play in advancing CE practices by a) enacting effective regulations or eliminating regulatory hurdles to CE practices; b) providing incentives to organizations engaged in such practices, c) providing financial support, and d) raising awareness about the issue. Legal context, plays an important role in explaining the business decision in favor of green innovation and waste minimization (Singh et al., 2016; Dong et al., 2016; Velis, and Vrancken, 2015; Witjes, and Lozano, 2016). Directing regulations and standard requirements encourage entrepreneurs toward more proecological behaviors and it is inevitable that introduction of CE is led from government policy and regulation. Apart from legal regulations factor exerting pressure on the introduction of CE is market internalization (Zhu et al., 2011). Planing (2015) draws attention to the importance changing consumer behavior toward proecological activities. Confirms it Sharma et al. (2010) reports that an important driver for product reuse and remanufacturing is the growing segment of marginal customers. Macroeconomic conditions are also an external norm. Gumley (2014) highlights the roles taxation policies, funding and royalty regimes. Providing financial support to entrepreneurs in the form of grants, low interest loans, or business incubators, is critical for supporting smaller companies (Iacondini et al., 2015). Furthermore, few studies explored the importance of technological development. New technologies not only provide cleaner solutions for the future, but also help in avoiding and overcoming problems caused by the current technologies (Ghisellini et al., 2016). They generate potential for improving existing operations and increased information sharing, so they can stimulate introduction of CE practices. Our study considered environmental, economic, institutional and technological factors as the components of external norms.

The other important factor pointed out by TRA theory are perceived benefits associated with attitude. If CE introduction associate with economic benefit, cost effectiveness and resourcefulness, the attitude will tend to be positive (Tseng et al., 2009), and a situation in which organizations do not see the benefits of the concept results in reluctance in its implementation (Lieder, and Rashid, 2016). Linder and Williander (2015) summarize the key drivers for implementing circular business models, including cost savings, differentiation, improved customer relations, improved margins, reduced environmental impacts and increased brand protection. Previous studies have confirmed that CE is seen to provide opportunities for cost savings (Murray et al., 2017; Pitt, and Heinemeyer, 2015) and business development (Kok et al., 2013).

The behavioral change model and ERP theory indicated in section 2.2 indicate the importance of knowledge and awareness of the CE concept for its introduction. This is confirmed by further studies (Xue et al., 2010; Liu, and Bai, 2014; Rizos et al., 2015). It can be concluded that there is a high agreement of the authors as to the significant role of knowledge in readiness to implement CE practices. Scientific knowledge and research will give a clear idea of the environmental impacts. Thus, knowledge on the circular economy, attained by different means and ways, will work as a strong driver to implementing CE practices (Diabat, and Govindan, 2011; Moktadir et al., 2018).

Two additional factors have been added to earlier theories. The first is perceived risk. Liu and Bai (2014) indicate the significance of uncertainty regarding the marketplace and risk aversion. A strong risk aversion on the part of entrepreneurs can hinder the enactment of the circular economy, even following the evaluation of the benefits associated with its implementation. If entrepreneurs perceive the financial risk to be low, it can be assumed that they invest in circularity sooner. They take this position for example Bechtel et al. (2013).

The second factor introduced is internal standards. They are conditions that can stimulate or limit readiness to introduce CE practices through the availability of resources and competences. Various research has demonstrated that organization's CE activities are positively predisposed by environmental objectives (Tonelli, Cristoni, 2018). Circular economy is often seen as a possibility to conciliate the competing objectives of economic, environmental and social benefits (Velte, and Steinhilper, 2016). Hart et al. (2018) suggest combining these goals with stakeholder management and a long-term perspective. As a bundle of goals, they should be a reference point for the practices introduced. Strategies are also included in the internal norms. Circular strategies have the potential to save embodied energy and reduce resource intensive primary production and waste generation by first slowing resource loops and then closing resource loops (Bocken et al., 2016; Laubscher, and Marinelli, 2014). They can be part of a sustainable development approach. Stewart and Niero (2018) show that circular economy has started to be integrated into the corporate sustainability agenda. Strong relationships between circular economy-oriented and sustainability-oriented business model emphasize Pieroni et al. (2019). Hence the definition of circular strategy as well as the adoption of

sustainability orientation enable CE practices. The last factor shaping internal norms is supply chain pressure. The supply chain is a critical unit of action for the implementation of a circular economy model. Implementing a circular business model encourages the design of circular or reverse supply chains, allowing products at the end of their life cycle to reenter the supply chain as production inputs through recycling, reuse, or remanufacturing (Nasir et al., 2017). As a results the supply chain is seen as an important platform for CE activities (De Mattos, and De Albuquerque, 2018). Lack of coordination and collaboration among supply chain members, as well as being dependent on other network members is a barrier to pro-ecological initiatives (Mangla et al., 2018). Thus, present study considered environmental objectives, supply chain, chain network management, organizations' sustainable development strategies to explain SMEs' perceived external norms.

H2: *Introduction of CE practices in SMEs largely depends upon external norms (a), internal norms (b), perceived benefits (c), perceived risk (d) and CE familiarity level (e).*

Despite diverse limitations, several pro-environment companies have implemented the circular economy. Various models have been adopted including slowing, closing and narrowing resource loops (Bocken et al., 2016), short cycle, long cycle, cascading, pure cycles, digitization, and produce on demand (Wolde, 2016). Bocken et al. (2014) introduced eight sustainable business model archetypes, described as businesses that a) maximize material and energy efficiency, b) create value from waste, c) substitute with renewables and natural processes, d) deliver functionality rather than ownership, e) adopt a stewardship role, f) encourage sufficiency, g) re-purpose the business for society/environment, and h) develop scale-up solutions. Product design/material composition for high quality reuse of products, components and materials, constitutes one of the most frequently employed models. The role of design has been widely acknowledged as DfX practices by many authors (design for remanufacturing and reuse, df recycling, df environment) (De los Rios, and Charnley, 2017; Moreno et al., 2016). It is believed that organizations which implement practices of DfX nature have a high (or medium-high) degree of circularity (Urbinati et al., 2017).

In recent years, the popularity of the rationalization of energy consumption, i.e. restriction of energy consumption, and the exploitation of alternative energy sources, has been growing. A business model based upon these aspects was developed by Sądeckie Wodociągi (Nowy Sącz Waterworks). The company has been focusing upon limiting greenhouse gasses emission by replacing traditional energy sources with renewable energy produced in-house, as well as reducing electric energy and conventional fuel consumption. Actions in the field are delivered via the introduction of high-performance and energy-saving equipment (multi-step pump systems, automatic pressure regulators) in water purification stations and sewerage and waterworks infrastructure (Kudlik, and Wysowska, 2017). The analysis examining value creation revealed that companies primarily focus upon limiting energy consumption and

reduction of the need for new materials in the course of materials' recovery. Pursuant to the above, the following may be argued:

H3: *SMEs are the closest to introducing a business model based upon material/ resource efficiency.*

3. Research methodology

3.1. Survey development

The awareness and behavior of entrepreneurs towards developing a circular economy constitute multidimensional constructs. Therefore, Churchill's (1979) research paradigm was applicable to create measures. Aimed at developing constructs, this paradigm was successfully employed in previous research (Liu, 2009; Bai, and Liu, 2013). The objective of our study was to determine the way in which Polish businesses perceive the circular economy concept and establish factors influencing their transition towards circularity. The choice of country results from its specificity in comparison to other EU countries. Poland is one of the counties where ambitious recycling objectives were introduced but were not accompanied by information campaigns or transition-supporting instruments were missing in the initiatives. As a consequence, at a first glance, Poland may seem to be amongst the lesser, circular-economy-focused EU member states. However, there are a few notable areas where Poland exceeds the majority of the competition, particularly the per capita waste production, and EPR coverage. Additionally, the country ranked very respectably in POLITICO's circular economy index (Hervey, 2018). Such results make Poland an example among the developing countries and those pursuing the introduction of the CE.

SMEs (employing up to 250) were selected as the subject of the research. The study was quantitative in character. The sample is characterized further on. The study was conducted by post. Respondents were notified by telephone on the objective and scope of the study beforehand. Initial consent was obtained. In case of a lack of response, respondents were re-invited after a month's time. Company owners (30%) or designated specialists – environment protection (48%) and quality control (22%) staff – were selected as respondents.

The research had a three-stage character (Figure 1). In the first stage, familiarity with the CE concept and its impact on organizations were determined (section 3.1). In particular, we focused on entrepreneurs' perception of challenges, opportunities, barriers and effects related to introduction CE practices. In the second stage, circular business models used by SMEs (section 3.2) were analyzed. In the third stage, the research model regarding factors determining CE practices was verified (section 3.3, for model – see Figure 2).

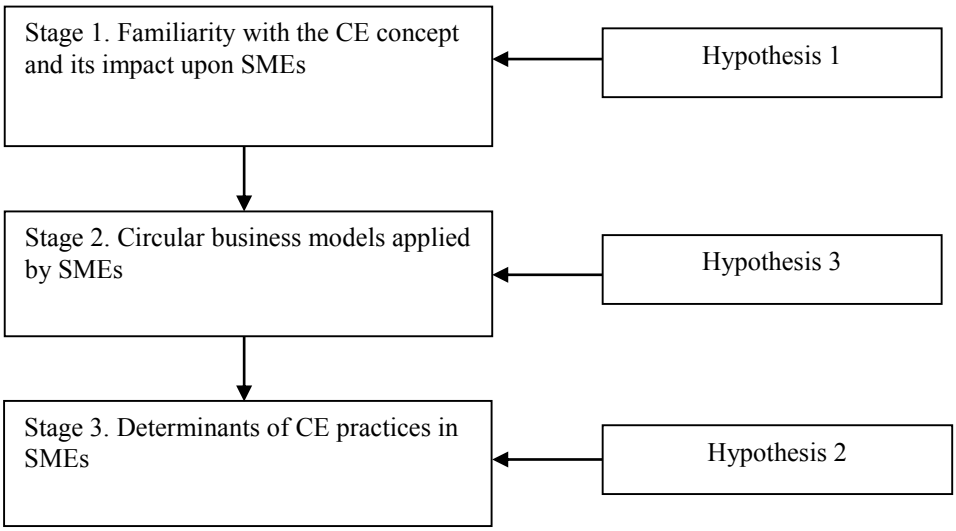


Figure 1. Research framework.

Variables

An original survey questionnaire was applied as the research tool. The questionnaire was developed specifically for the purpose of the study. Closed, cafeteria-type or yes/no questions were employed. The questionnaire consisted of two sections pertaining to 1) familiarity with the CE concept and its perception by companies, and 2) factors determining introduction of CE practices.

The first part of the survey pertained to selected matters associated with respondents' perception of the circular economy, including the familiarity with the concept, challenges associated with its implementation, innovations for the CE, impact of the circular economy upon the operation of companies, implementation barriers, and circular business models. Questions concerning the barriers were drawn from Rizos et al. (2015). Issues connected with opportunities for companies were derived from Ormabazal et al. (2018).

The second part of the survey pertained to factors determining introduction CE practices. The level of delivered circular economy practices was adopted as the dependent variable. The practices were selected on the basis of business models' characteristics featured in literature. Five independent variables were offered (constructs). The first is the level of familiarity with the CE concept as a factor determining potential interest of the management in the CE. The next factor, the perceived risk, was viewed via the company's adaptation to the CE cost and costs/benefits ratio. Pressures managers experience in connection with the implementation of the circular economy were embraced as external and internal norms. Tura et al. (2019) and Su et al. (2013) were employed to identify these. Environmental objectives, supply chain, chain network management, organizations' sustainable development strategies were accepted as internal norms. The external norms were divided into: 1) environmental and health-related (limitedness of resources, opportunity to reduce negative impact upon the environment, health improvement), 2) economic (market internationalization,

customers' demands), 3) institutional (environmental regulations, economic support), 4) technological (technological development). Possible benefits emerging from the transition towards circularity presented the final variable (after: Ormabazal et al., 2018). All variables were operationalized by means of a 1-5 Likert scale (1 as the least significant factor).

In addition, the model included 3 control variables: company size (expressed by employment, divided into small and medium-sized businesses), market the company operates on, and sector of activity. The model verified in the second section of the study was outlined in Figure 2.

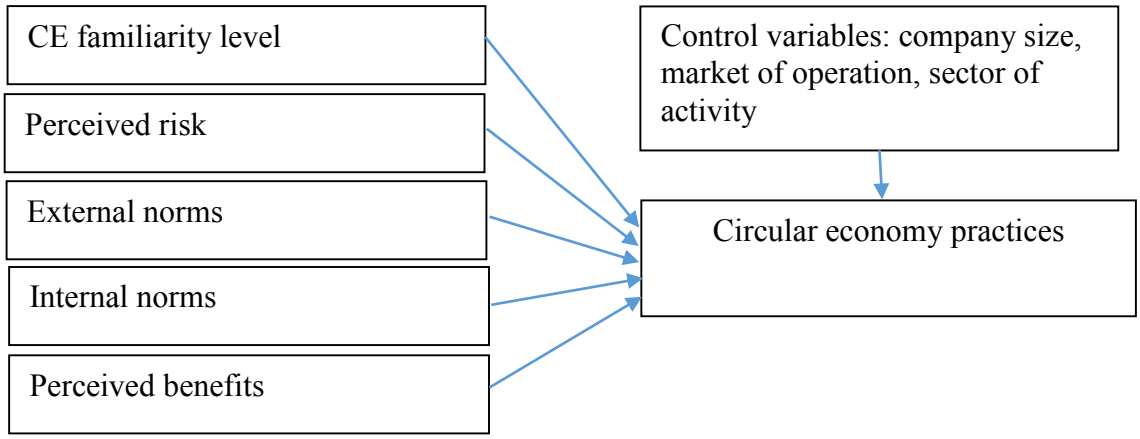


Figure. 2. Research model

The research tool (as a whole) was initially verified in the course of a pilot study which encompassed 3 small, local companies (2 production companies, 1 service company). Feedback was taken into consideration in order to redesign the content of the questionnaire. Subsequently, the questionnaire's reliability was verified.

3.2. Analysis of the reliability of the scale

Unidimensionality was ascertained through exploratory factor analysis (EFA) to determine factor loadings, and the results of factor loadings are presented in Appendix 1 with most items showing significantly high loadings of above 0.50. AVE and CR values were calculated according to the equations given by Fornell and Larcker (1981). For internal consistency of the constructs, the CR values exceeding 0.7 and preferably 0.8 (Hair et al., 2010), and AVE values exceeding 0.5 (Wu, 2002), are regarded to be acceptable. The average variance extracted were less than 0.5 for two constructs in this study, only in the case of one construct (external norms) AVE was below 0.3. The assessment of convergent validity was ascertained through factor loadings of 0.4 (Hair et al., 2010). As shown in Table 2, all the CR values exceed the cut-off values depicting internal consistency. Table 2 also shows information on Cronbach's coefficient with values ranging between 0.7 and 0.9 which indicate significant reliability. Consequently, no item weren't eliminated.

Table. 2.
Analysis of the reliability of the scale

Construct, factors	No. of questions	Cronbach's alpha	CR	AVE	MSV	ASV
External norms	11	0.899	0.85	0.32	0.211	0.115
Internal norms	4	0.847	0.78	0.47	0.135	0.106
Perceived risk	2	0.845	0.88	0.52	0.269	0.138
Perceived benefits	4	0.732	0.81	0.58	0.269	0.153
CE familiarity level	1	0.905	0.92	0.75	0.135	0.069
CE practices	1	0.864	0.89	0.59	0.189	0.125

CR – Construct Reliability; AVE – Average Variance Extracted; MSV – Maximum Shared Squared Variance; ASV – Average Squared Variance.

3.3. Research sample

For the purpose of the study, 1600 SMEs were selected at random (100 in each 16 voivodeship). The selection was made by drawing from GUS database (Central Statistical Office), where the selection criterion was belonging to the SME group (determined by number of employee). Out of the total, 630 responded- the response rate was 39%. The sample was dominated by service sector companies (56.3%, see Tab. 3). The share of small (up to 50 employees) and medium-sized companies (50-250 employees) was similar. The companies operate chiefly in East-Central Europe (36%). To a lesser extent, they operate on the European (25%) and regional (23%) markets.

The lack of time (48%), no knowledge of the issue (37%), absence of the decision-maker or a person competent to supply answers (25%) were offered as the most frequent reasons behind the refusal to participate. With regard to the group of 37% of respondents who refused to participate in the study due to the lack of familiarity with CE-connected issues, the group does not affect the results of the population. Further studies pertaining to the perception of the CE in this group would be groundless.

Table. 3.
Sector-specific distribution of the sample (in %)

Sector	Share
Food & Tobacco Manufactures	8.8
Textile Mill Products/Apparel	3.8
Lumber & Wood Products	1.9
Office, Computing & Accounting	7.4
Communication	5.5
Chemicals & Drugs	5.2
Rubber Products	1.5
Stone & Glass Products	1.9
Ferrous Metal & Products	8.4
Non-ferrous Metal & Products	7.6
Electronic Components & Equipment	4.6
Transport	4.1
Hotels & Gastronomy	2.0
Trade	9.8
Services and other	26.9

3.4. Analysis of results

Statistical tools were applied in order to conduct the analysis of results. The first part of the study employed the frequency of respondents' responses (in %), contingency tables and correlation coefficients. In the second part (analysis of the model), Structural Equation Modelling was applied. This enabled the shape and strength of relations among variables to be determined. Due to the lack of normal distribution, normalization (logarithmic transformations) was conducted. The maximum likelihood estimation method was employed in order to assess the fit of the model. The standardized root mean square residual (SRMR) amounted to 0.06, which is below the threshold of 0.08. The comparative fit index (CFI) equaled 0.954, the Tucker–Lewis index (TLI) 0.945, and the incremental fit index (IFI) 0.955, which exceed the recommended value of 0.90. The remaining fit indexes prove a good fit of the model: $\chi 2 = 641.965$, CMIN/DF = 1.562, RMSEA= 0.048.

4. Research results

4.1. Results pertaining to the familiarity with the CE concept and its impact upon SMEs

The surveyed businesses are, to an extent, familiar with the concept of the circular economy (50%). The familiarity with the concept was declared by 46% of respondents. These were chiefly medium-sized companies which operate on European markets. The familiarity with the CE concept was determined neither by size nor the sector of activity. On the other hand, the relationship between the familiarity with the concept and the market companies operate on was confirmed ($r = 0.26$, $p = 0.03$).

Respondents considered recycling and the reduction of waste volume as the most significant aspects of the circular economy. This is convergent with definitions of the circular economy which highlight the lack of waste accumulation and recycling as characteristic features of such economies. To a lesser extent, the circular economy was associated with materials efficiency and the growth of recycled waste volume (Fig. 3).

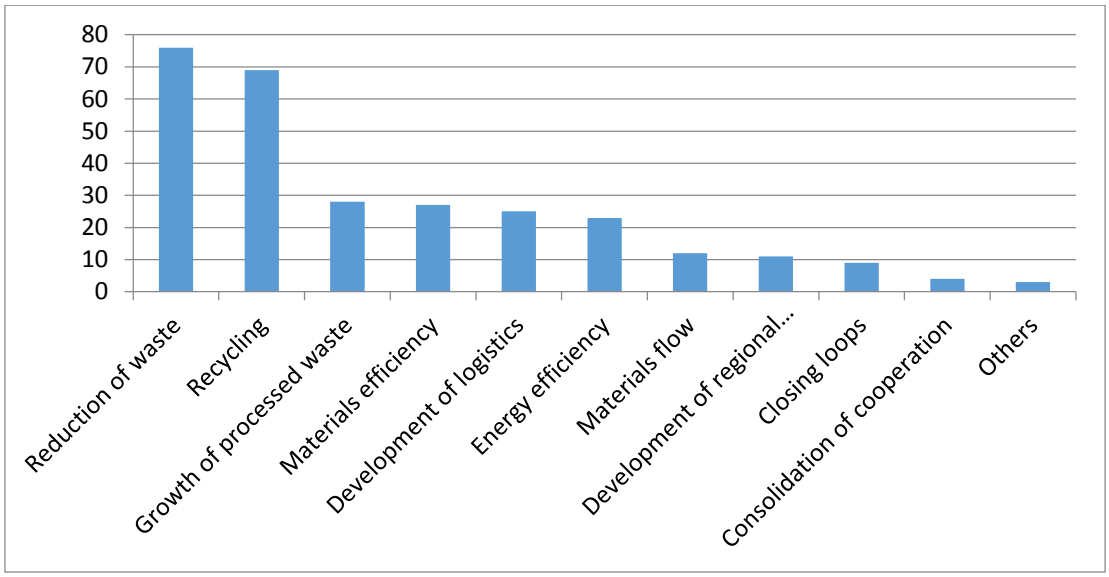


Figure 3. The most significant fields of the circular economy (in %).

Respondents observed that the way in which the circular economy is promoted is insufficient (46%). This is especially valid for government initiatives, which lack reports and incentives associated with the concept. In addition, access to public information pertaining to the circular economy is insufficient (31%). This points to a pressing need for information and promotion initiatives in the public space. The argument was confirmed by respondents, who stressed the need for actions concerning education/ communication (52%), support of environment-friendly innovations (61%), transfer of knowledge on the regional level (22%), and development of legal regulations (42%). Respondents' opinions concerning the promotion of closed-loop systems within companies conducted by the management were much more favorable: 42% of respondents believed information campaigns in organizations were average and 31% claimed these were suitable.

Respondents argued that the following constitute the most significant challenges for the development of the circular economy: increase of the effectiveness of recycling (41%, Fig. 3), improved exploitation of production by-products (35%), and substitution of non-renewable resources (33%). As far as the size of the companies is concerned, small businesses believed the substitution of non-renewable resources was the greatest challenge, while for medium-sized companies it was the growth of recycling's efficiency. For companies operating regionally, the greatest challenge was presented by recycling and the exploitation of production by-products, while for those operating internationally it was recycling.

Respondents argued that the following constitute barriers hampering the implementation of the circular economy: lack of government support (41%), insufficient financial resources (42%), and lack of technical skills (43%). On the other hand, respondents do not perceive organizational culture (15%) and engagement of the management (20%) as barriers.

The weak conviction concerning benefits emerging from the CE application constitutes a factor limiting interest in the concept. This is valid for both cost reduction and image improvement (Fig. 4). Respondents argue that positive outcomes of CE implementation are primarily associated with the state of the natural environment. The results indicate that businesses are not aware of economic benefits generated by the CE. Therefore, these benefits are not stimuli for the introduction of the concept. The results contradict those of Ellen MacArthur Foundation's (2013) where the opportunity to reduce costs constituted the chief premise behind the interest in the CE. This discrepancy emerged from the type of enterprises. The present study (as opposed to the study by the Foundation) encompassed SMEs, whose revenue stream is generated through virtual services/products more frequently.

The impact of the circular economy on SMEs is expressed in the external and internal sphere (Fig. 5). External consequences consist in the increase of connections (mainly cooperative) with stakeholders and redesigning supply chain. In turn, internal nipples result from the creation of closed circuits and better management of materials. Introduction CE practices in approximately 20% of SMEs lead to the transformation of the business model.

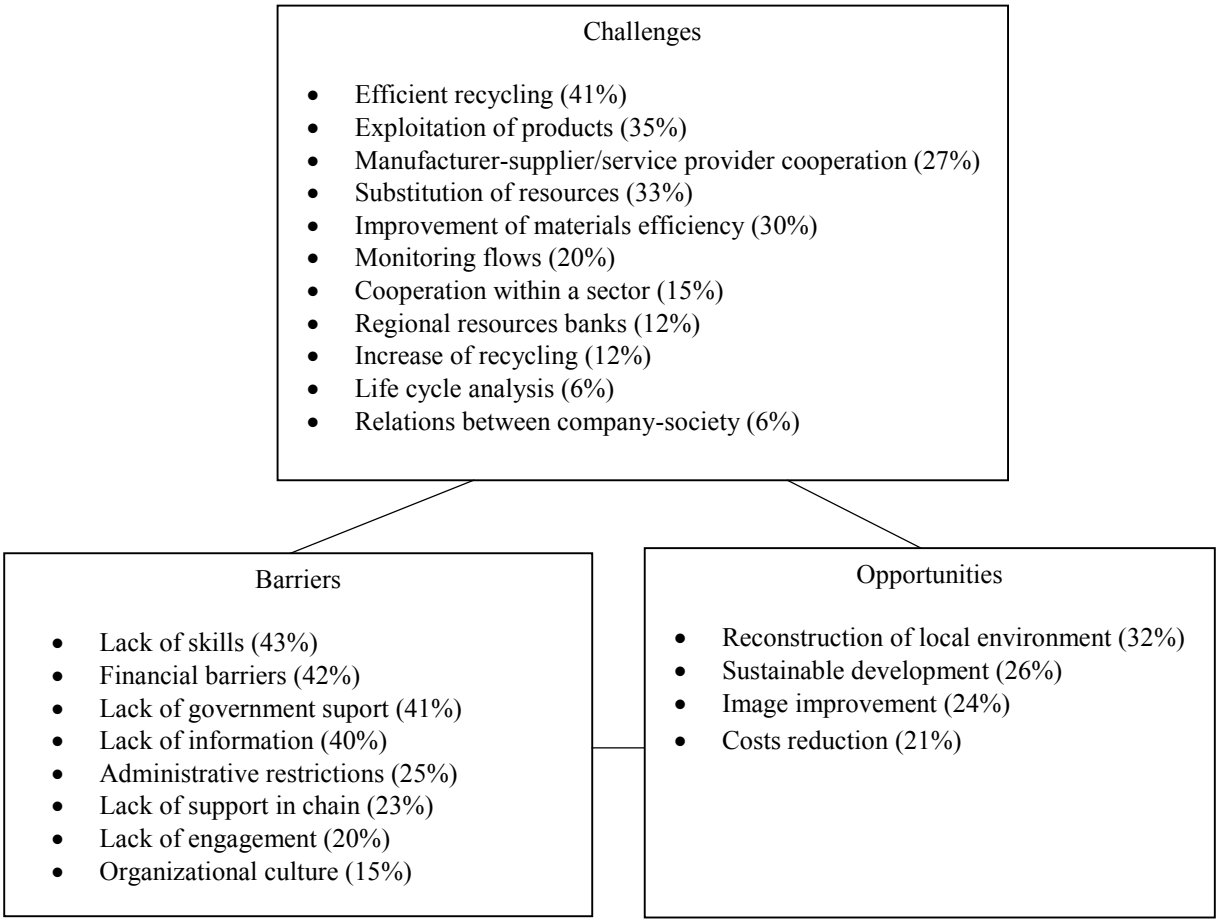


Figure 4. Challenges, barriers and opportunities CE for SMEs.

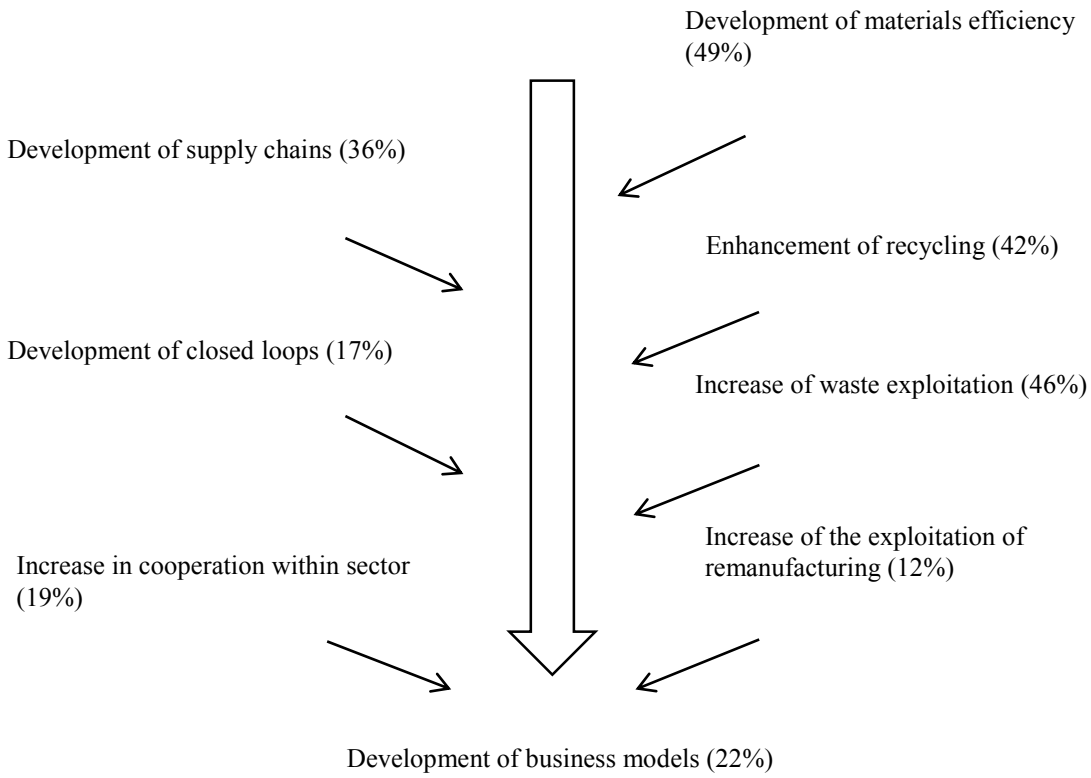


Figure 5. The impact of the circular economy upon the operation of companies.

In the operational aspect, the impact of the circular economy will manifest in the following: applied materials (58%), product design (34%), organizational structure (30%). The impact of changes in recycling, material management and waste exploitation practices on selected functions/areas of SMEs is presented in Appendix 2.

4.2. Results pertaining to the development of circular business models

As far as circular business models are concerned, SMEs are the closest to introducing materials/energy efficiency-based models (41%) or recovering value from waste (39%, Fig. 6). The model based upon scaled solutions emerges sporadically.

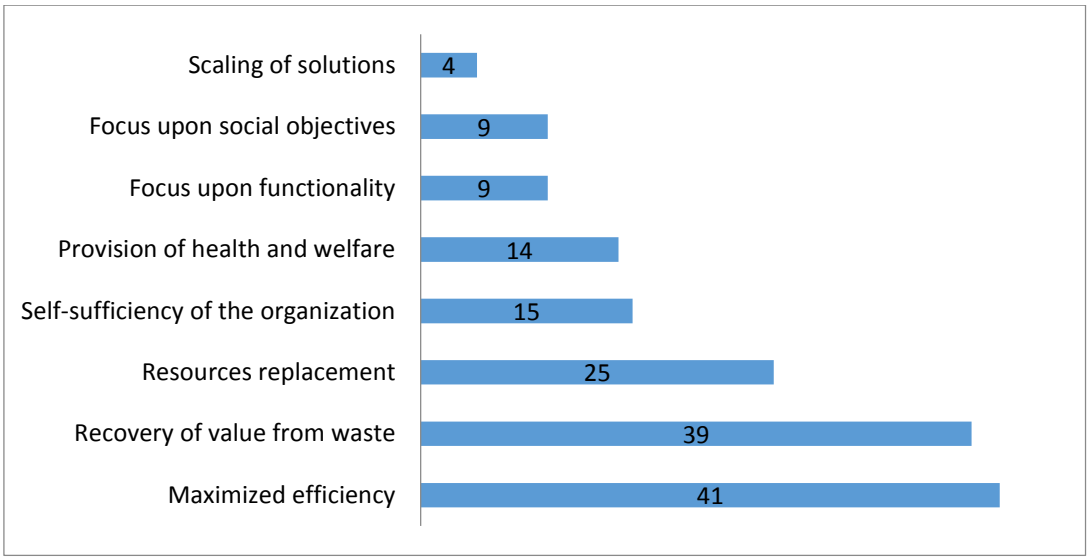


Figure 6. Circular economy models employed by SMEs (in %).

With regard to two most popular models: the maximization of efficiency and value recovery their relationship with control variables, including the market and the familiarity with the CE concept in-depth research was not confirmed[1]. For that reason, we suppose that the selection of models does not depend upon the features of the company but is determined by other factors (e.g. organizational strategy, key competences).

The results indicate that the dominant position is occupied by models which were the most straightforward to introduce because of experience or significant, potential economic benefits. The exploitation of other circularity-related models will occur along with entrepreneurs' growth of awareness. The shift from ownership to usage- and performance-based payment models constitutes an element of such business models. Here, too, we expect an accelerating uptake over time as manufacturers become more familiar with such alternative models.

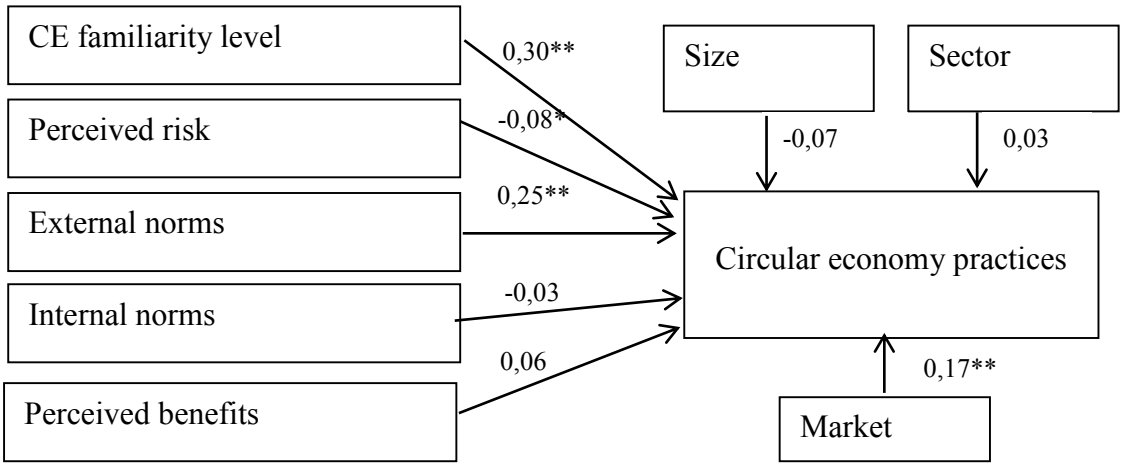
4.3. Results pertaining to the determinants of introduction of CE practices

The level of familiarity with the CE concept, perceived risks, expected benefits, internal and external norms and standards are considered as factors determining the introduction of CE practices by companies (see Methodology). The model's parameters were examined by means of the SEM (Fig. 7). The explained variation amounted to 42%.

The results confirm the relationship between CE practices and external norms ($\beta = 0.25$, $p < 0.001$). The norms include environmental, institutional, technological, economic and social norms whose impact upon the interest in the CE concept is positive and significant. The impact of internal norms (environmental objectives, reduction of supply chain dependence, improvement of chain network management, organization's sustainable development strategy)

[1] The analyzes were carried out for two models most frequently indicated by respondents, i.e. Efficiency maximization and Value recovery. The relationship of these models (Pearson's correlation) with control variables (size, market of operation, CE familiarity level) was determined. In all cases statistically insignificant results were obtained; significance > 0.1.

and perceived benefits upon the introduction of the CE was not confirmed at the statistically significant level (β = -0.03; β = 0.06). On the other hand, the study confirmed the impact of the perceived risk upon the practices. However, the relationship is not strong (β = -0.08, p < 0.05). In addition, the relationship between the familiarity with the concept and the introduction of CE practices was positively verified (β = 0.30, p < 0.001).



*p < 0,05; **p < 0,001

Figure 7. Results of SEM parameters estimation

The results indicate that the perceived risk associated with the introduction of circular economy practices exerts a negative impact upon the interest in these (t= -2.17, p = 0.03). Entrepreneurs perceive actions connected with the implementation of the CE as risky; the practices are not considered as potential investments or sources of prospective profits. On the other hand, the familiarity with the CE concept strongly determines the introduction of the practices (t = 3.68, p < 0.001). A higher level of knowledge increases the likelihood of the practices' application.

As far as the internal and external pressures are concerned, their impact upon CE practices was confirmed merely in relation to selected external factors (t = 6.44, p < 0.001). Environmental and health-related aspects raise the interest in the CE. This is especially valid for the limitedness of resources and minimization of negative environmental impact via the improvement of materials' exploitation and usage of post-production waste. Legal regulations, which may become a foundation for companies transitioning towards circularity, stimulate a strong interest in the CE (Govindan, and Hasanagic, 2018). On the other hand, it ought to be noted that the impact of technological factors is low. The development of technologies, i.e. mobile technologies, the Internet of Things, data analytics, which facilitate the development of innovations concerning the CE (e.g. effective waste collection systems) is not perceived by entrepreneurs as a stimulus for the pursuit of CE practices. This is convergent with the results of Agyemang et al. (2019) where 1% of respondents recognize (in the context of CE) the potential emerging from technological progress. Companies see little significance in the strategy of sustainable development. The CE concept is deeply-rooted in sustainable

development (Esken et al., 2018). However, businesses believe that the strategy offers little contribution to CE-benefiting actions. Entrepreneurs do not perceive the CE as an element supporting sustainable development; they separate it from corporate social responsibility. As far as the final correlation is concerned, the results indicate that there is no relationship between the perceived benefits and CE practices. This denotes that benefits managers associate with the circular economy do not emerge from the applied practices.

5. Conclusions

The main objective of the paper is to determine the way SMEs perceive the circular economy concept and to establish factors influencing introduction of CE practices. Considering the previous studies in the field, the major contributions of the present study lie in the focus posed on SMEs as a specific industrial segment and collection of a representative set of empirical data that encompass different sectors. This paper makes a valuable insights to understanding the core factors that influence SMEs in undertaking CE practices. This can prove to be especially important, since the switch of SMEs to a circular economy is applicable for several sectors and can follow similar paths. At the same time, empirical verification of the conditions of CE practices creates a background for the contextualization of other studies with a narrow focus on specific contexts or on pockets of good practice.

Another major contribution is that this work substantiates the suitability of the three research hypotheses initially discussed. These hypotheses constitute an original contribution to the state of the art.

The present results indicate that Polish enterprises are familiar with and understand the CE concept well. This confirms Hypothesis 1. This result corresponds with the finding of Xue et al.'s (2010) that most entrepreneurs at municipal and county levels have high awareness and understanding of the circular economy concept and its significance. The concept is synonymous with the minimization of waste volume in the course of a variety of actions and recycling, which fits well within the definition by Geissdoerfer et al. (2017). The CE practices introduced by SMEs the most frequently pertain to cleaner production, recycling and energy efficiency. The introduction of these practices stems from the need for the improvement of materials efficiency and increase in the share of waste reuse. However, managers fail to perceive the CE as a source of economic benefits for organizations. They believe that this method of management offers neither a boost in profits nor improved sustainability. Such beliefs do not have a positive impact upon the interest in CE-related solutions. Furthermore, the perceived benefits are not motivating enough to facilitate the transition towards circularity.

Barriers entrepreneurs face in the course of the CE introduction are diverse in character. As a consequence, a variety of strategies to deal with these is required. The strongest barriers include the lack of government institutions' support, insufficient financing, and the lack of technical skills. Actions removing the barriers may encompass the introduction of economic and legal instruments supporting the circular economy (e.g. dedicated credits/loans, tax reliefs for companies developing closed-loop systems, recycling subsidies or tradable permits), information and promotion campaigns (including trainings, publications, support of research). Another barrier is posed by the strong risk associated with the implementation of the CE. This supports the findings of Song et al. (2005) showing that strong risk aversion hindered the development of the circular economy. Managers who perceive the risk as high are likely to show little engagement in the introduction of CE practices. Only the change in risk perception may contribute to a stronger interest in the CE and may translate into investments in circular business models.

The study did not confirm the impact of all organizational factors upon the introduction of CE practices. As a consequence, Hypothesis 2 has been partially confirmed. The factors, i.e. environmental objectives, reduction of the supply chain dependence, improvement of chain network management, and organizations' sustainable development strategies do not determine introduction of CE practices in SMEs. Businesses argue that there is no relationship between the above factors and the circular economy. At the same time, the study confirmed the significance of institutional factors and the familiarity with the CE concept. Environmental aspects, i.e. limitedness of resources, reduction of materials' consumption, improved exploitation of post-production waste, attract interest in practices in the field. Legal regulations constitute a vital aspect stimulating the interest in the CE. This confirms the results of hitherto papers, which highlight that the pressure exerted by governmental regulations is the main factor influencing a firm's environmental behavior, such as waste reduction (Wang et al., 2007; Wen et al., 2009).

Another original contribution to the literature is the suggestion of the suitability of Hypothesis 3. The hypothesis argues that SMEs are the closest to introducing the model based upon the efficiency of materials/energy or recovering value from waste. Other business models are employed sporadically.

As far as implications for enterprises are concerned, the present study confirms the significance of CE-related knowledge for the economy's perception by mangers and for the introduction of CE practices in SMEs. The familiarity with the circular economy is positively correlated with the pursued practices. It ought to be noted that the higher the CE knowledge, the greater variety of CE practices is employed. The greater the companies' familiarity with the concept, the more benefits from the application of CE practices they recognize, and the lower the risk they perceive. This translates into positive decisions made concerning the implementation of the concept. SMEs' high awareness level appears to be necessarily pivotal in making decisions regarding the circular economy. Secondly, the study revealed a striking

gap between awareness and actual behavior. The in-depth interview results showed that many factors contributed to the gap, e.g. financial and competence-related ones. Therefore, managers of SMEs should focus on the use of incentives to build an effective modern management system to overcome the barriers. Third of all, on the society level, the CE's significance for future growth, and changes the transition towards this type of economy entails, ought to be presented. Educational initiatives which will facilitate the social reception of the concept are of critical importance. From the point of view of SMEs, information and promotion actions, including the presentation of the most suitable solutions, business models, and support mechanisms will facilitate the transition of the concept from the theoretical domain to implementation. In addition, changes in the enterprises' environment are also required. These will involve legal regulations and economic mechanisms in support of CE introduction which will stimulate the companies' transition towards circularity. Consequently, without appropriate external determinants, most firms may be unable to actively develop a circular economy.

The study is limited by the sample, which was narrowed down to a single country. As a consequence, the final sample does not represent the whole economy. Therefore, further studies ought to include more regions with more diversified external conditions. The selection of organizational factors constitutes a next limitation. Prospective studies may encompass an additional variable, i.e. companies' environment-friendly policies, businesses' level of technological development, firms' structure, or may focus upon the characteristics of entrepreneurs (age, experience). This explorative research helps to further the study relating to the development of the circular economy. Furthermore we also suggest breaking down the analysis to specific CE processes, as well as expand research from a single location to an international context. A comparison of different countries might also be interesting with regard to cultural differences and levels of acceptance of CE by SMEs in different geographies.

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Appendix 1.
Factor loadings, Cronbach's alpha, AVE, CR

Factor	Item	Factor Loading	Cronbach's α	AVE, CR
External norms	EN1	,591	,899	AVE=,32 CR=,85
	EN2	,604		
	EN3	,504		
	EN4	,636		
	EN5	,582		
	EN6	,535		
	EN7	,566		
	EN8	,613		
	EN9	,502		
	EN10	,634		
	EN11	,368		
Internal norms	IN1	,708	,847	AVE=,47 CR=,78
	IN2	,769		
	IN3	,640		
	IN4	,630		
Perceived risk	PR1	,758	,845	AVE=,52 CR=,88
	PR2	,897		
Perceived benefits	PB1	,827	0,732	AVE=,28 CR=,81
	PB2	,606		
	PB3	,512		
	PB4	,822		
CE Familiarity level	Fam	,850	0,905	AVE=,75 CR=,92
CE practices	Prac	,776	0,864	AVE=,59 CR=,89

Appendix 2.
The impact of materials efficiency improvement, waste exploitation and recycling upon companies [in%]

	Materials efficiency	Waste exploitation	Improved recycling
Management style	22.2	24.1	34.8
Applied materials	44.4	58.6	65.2
Profits model	29.6	31.0	21.7
Offer for clients	22.2	20.7	30.4
Clients groups	11.1	13.8	8.7
Companies competences	37.0	27.6	13
Supply chain	11.1	17.2	4.3
Product design	25.9	37.9	43.5
HR practices	0	0	0
IT systems	0	3.4	21.7
Organizational culture	48.1	41.4	26.1

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INNOVATIVE TECHNOLOGIES, HUMAN CAPITAL AND THE COMPANY'S MISSION FROM MANAGEMENT OUTLOOK

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Purpose: The purpose of the work is to present the research results conducted among managers the largest companies in the world and in Poland provided by KPMG Report from 2021.
Design/methodology/approach: Due to the cognitive nature of the work, the aim of the work will be achieved using the method of analyzing the literature and KPMG research results on the subject. Literature studies include Polish and foreign publications.
Findings: Innovative technology, human capital and company's mission is very widely described in international literature. Many reports have been created and the most updated brings new CEO's outlook on management issues. Top managers and employees with technology are creating a mission of every firm.
Originality/value: The analysis either literature and reports with 2021 statistics presents all areas where CEO's during this pandemic world need to improve and develop old and new solutions. The data base presented in the world is most updated data developed in the work and science market.

Keywords: innovation technologies, human capital, mission, management, outlook.

Category of the paper: Research paper.

1. Introduction

CEO's are aware of the digital transformation, what is happening before their eyes. They don't ignore this revolution and according to the plugged-in principle, they make decisions that are associated with increasing investments in technologies, developing the skills of employees including scope, establishing innovative alliances and a specific approach to cybersecurity.

Organizations that care about sustainable development increasingly more often they work according to the people-focused idea. CEO's appreciate the benefits of being a diverse and inclusive company and proactively they approach the areas of commitment and motivation and employee productivity in a world in which hybrid work is becoming more and more common. The pandemic made managers aware the need to put more emphasis on mission companies. Being guided by it when building a strategy and setting operational priorities is essential, to grow your organizations and become stronger. Therefore, more and more often the CEO of the largest companies on the world try to propose the purpose-led approach in their organizations.

CEO's face new challenges as their organizations face up to each day with the direct or indirect effects of a pandemic. They balance the potential to drive growth and transform its operations under uncertain conditions and with varying risks. Despite this, the CEOs the largest companies in the world are optimistic about development, feeling a strong connection with their missions companies and thinking about future expansion.

The word 'innovation' is "derived from the Latin word innovates, the noun form of innovare meaning 'to renew or change,' stemming from in ('into') and novus ('new'). Thus, innovative technology is technology that is changed or developed to improve products and services. Various notions that relate to such changes in technology are considered innovative technology" (Kim, 2015, p. 231).

Several definitions of innovation sourced from the business and literature:

- "A process that includes the generation, development, and implementation of new ideas or behaviors. Further, innovation is conceived as a means of changing an organization, either as a response to changes in the external environment or as a preemptive action to influence the environment. Hence innovation is here broadly defined to encompass a range of types, including new products or services, new process technologies, new organizational structures or administrative systems, or new plans or programs pertaining to organizational members" (Damanpour, 1996, p. 694).
- "The embodiment, combination, and/or synthesis of knowledge in novel, relevant, valued new products, processes, or services" (Leonard, Swap, 1999, p. 7).
- "Things that change the way we can do what we want to do; [things that] have added value to our daily lives … new, desired, or needed services that add value for university faculty, students, and other scholars… . Innovation is more significantly about what our target audience can do—about the increased capacity of library users to do what they want and need to do in the way that most benefits their productivity, pleasure, and excellence … facilitating the work of our primary constituents in ways that are new and useful to them" (Deiss, 2004, pp. 18-19).
- "Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace" (Baregheh, Rowley, Sambrook ,2009, p. 1334).

- "An innovation is a change, in a product, service, process or, more widely, an organization" (Rowley, 2011, pp. 252-253).
- "A wise person once told me that innovation isn't just about doing things that are new or different; it's about doing things that in the eye of the beholder (the user, patron, or customer) meet a need that may not have been appreciated before. Innovations are the things that truly alter and improve how we do things; they may even shift our proverbial paradigms" (Kaser, 2011, p. 4).

According to Investopedia the term human capital refers to the economic value of a worker's experience and skills. Human capital includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality. As such, it is an intangible asset or quality that isn't (and can't be) listed on a company's balance sheet. Human capital is perceived to increase productivity and thus profitability. The more investment a company makes in its employees, the chances of its productivity and success becomes higher (Investopedia).

In Cambridge dictionary human capital is defined as employees, and all of the knowledge, skills, experience, etc. that they have, which makes them valuable to a company or economy" (Cambridge dictionary).

Britannica defines as „intangible collective resources possessed by individuals and groups within a given population. These resources include all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed individually and collectively, the cumulative total of which represents a form of wealth available to nations and organizations to accomplish their goals" (Britannica).

"A mission statement defines what an organization is, why it exists, its reason for being. At a minimum, your mission statement should define who your primary customers are, identify the products and services you produce, and describe the geographical location in which you operate" (Entrepreneur).

A mission statement defines what line of business a company is in, and why it exists or what purpose it serves. Every company should have a precise statement of purpose that gets people excited about what the company does and motivates them to become part of the organization. A mission statement should also define the company's corporate strategy and is generally a couple of sentences in length.

For purpose of the work following thesis have been stated:

1. Innovation technologies and human capital are important part of top management.
2. Company's mission is in hands of top management.

Following research questions have been created:

1. What are key success factors for ensuring employee engagement, motivation and productivity in a world where hybrid work is more and more common?
2. What are key steps planned over the next three years to build digital resilience?

3. What is the most important methods of consolidating the assumptions of the organization's mission in its strategy over the coming years three years?
4. What planned activities supporting the implementation of the organization's development goals over the next three years?

2. Methods

KPMG study was conducted between 500 General Directors in 2021. All CEOs surveyed manage companies with annual revenues in excess of 500 million dollars, one-third of which generate annual revenues greater than 10 billion dollars. The organizations represented in the survey come from 11 key sectors. These are: banking, energy, infrastructure, life sciences, automotive, manufacturing, consumer and retail sectors, technology and telecommunications, insurance, asset management. The survey was conducted among 25 CEOs from Poland too, compared with the responses of the leaders with the so-called Core Countries (1325). The Core Countries group includes countries such as: Australia, China, France, Spain, India, Japan, Canada, Germany, the United States, Great Britain and Italy.

The study provides an in-depth three-year forecast of the CEOs of the largest organizations about enterprise and growth economic.

3. Results

The results contain following empirical responses about:

- key success factors for ensuring employee engagement, motivation and productivity in a world where hybrid work is more and more common,
- key steps planned over the next three years to build digital resilience,
- the most important methods of consolidating the assumptions of the organization's mission in its strategy over the coming years three years,
- planned activities supporting the implementation of the organization's development goals in the next three years.

3.1. Key success factors for ensuring employee engagement, motivation and productivity in a world where hybrid work is more and more common

In a world where hybrid work (Figure 1 and Figure 2) has become a standard rather than a privilege, creating flexible working conditions has become mandatory. The general directors took note and accurately identified the needs resulting from the rapidly changing job

perspective in the new reality. Investing in flexible working conditions is not the end, however opportunities to meet the needs of employees. After such a long period of remote work, it is no longer the time to learn how to meet needs, share opinions or show empathy in virtual conditions. We are already a step further, both at the level of awareness and investing in factors that ensure commitment and motivation and employee productivity. Polish directors general want to speak clearly on important matters and create a work environment in which environmental, ideological and social responsibility issues. As many as 60% of the leaders from Poland participating in the survey treat the problem of the ongoing changes seriously climate change, racism or increasing inequality. At the same time (56% of respondents' indications) they focus on the mental health and well-being of employees (KPMG 2021 CEO Outlook).

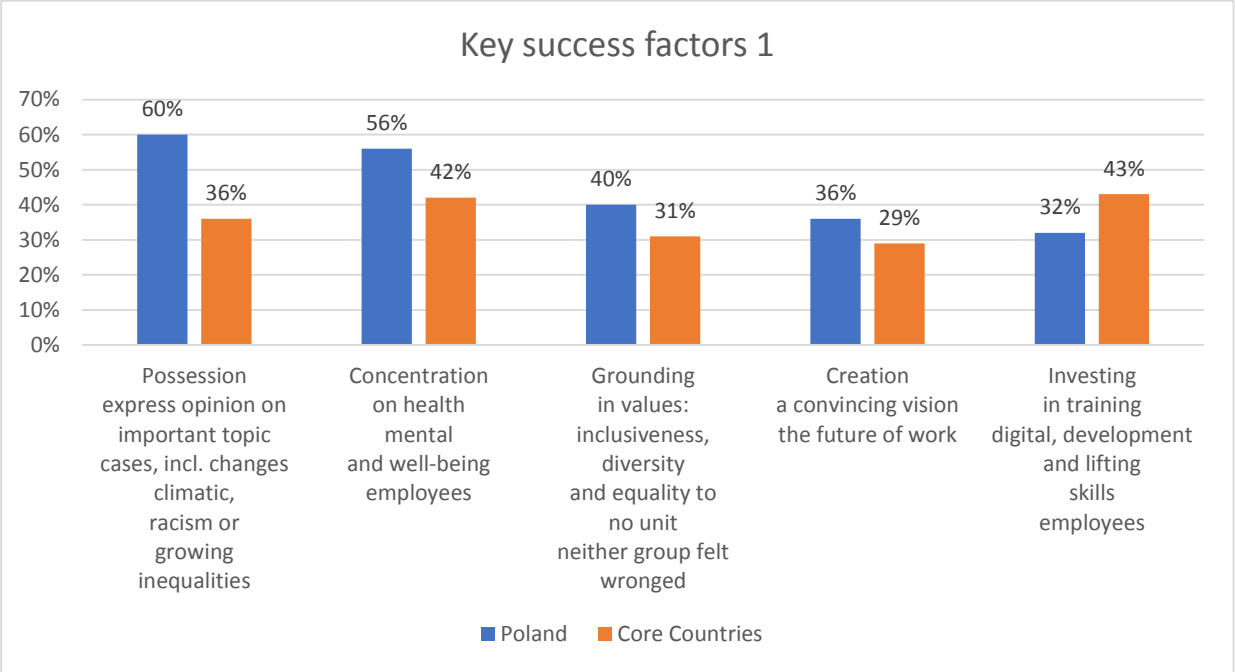

Figure 1. Key success factors for ensuring employee engagement, motivation and productivity in a world where hybrid work is more and more common. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

Creating a culture targeted at target and resisting on the values, in which the leaders they do what do preach in Poland and in Core Countries is the key success factor to achieve targeted goals. It helps employees to belong to some group of society which follows the same principles. To receive feedback by listening opinions and needs employees and carrying them out ideas Core Countries with 32% show the ability to adapt and change the work environmental and create good standards of work (Figure 2).

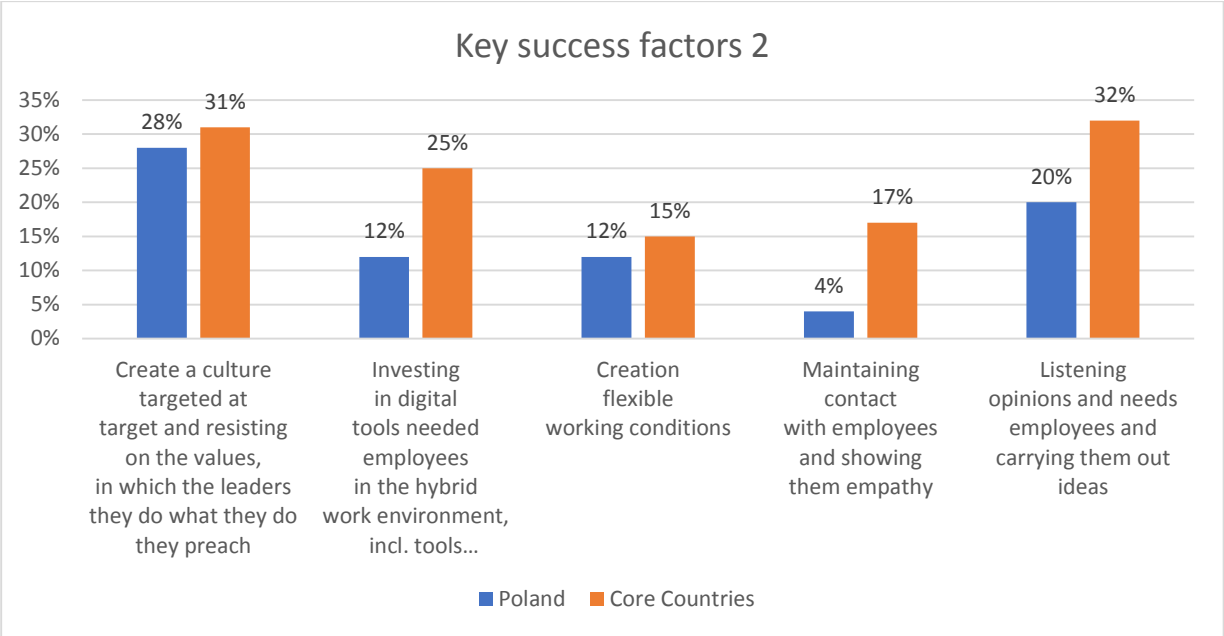

Figure 2. Key success factors for ensuring employee engagement, motivation and productivity in a world where hybrid work is more and more common. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

3.2. Key steps planned over the next three years to build digital resilience

The digital transformation (Figure 3 and Figure 4) has accelerated significantly during the pandemic, contributing to the expansion of the scale of operations many enterprises which thus gained a competitive advantage. The vast majority of CEOs of Core Countries (76%) see the technological revolution more as an opportunity for growth than a threat, but only slightly more than half (56%) believe that their company is properly prepared for potential cyberattacks. New technologies, revolutionizing the world of business, bringing with them new risks related to cybercrime. Test shows that executives recognize the importance of implementing cybersecurity practices. Core Countries in equal measure to a large extent, they focus on strengthening management in terms of operational resilience and recovery after major accidents, and focus on improving cybersecurity and other skills technological risk areas. Moreover, building awareness and prioritizing organizational culture they want to support digital security issues directly through their own attitudes and example from leaders. Both surveyed groups of respondents (both the CEO from Poland and Core Countries) recognize the provision of security and supply chain resilience as the most essential step taken to build digital resilience over the course the next three years. Nearly three-quarters of Polish CEOs indicated the above issue as a key issue (KPMG 2021 CEO Outlook).

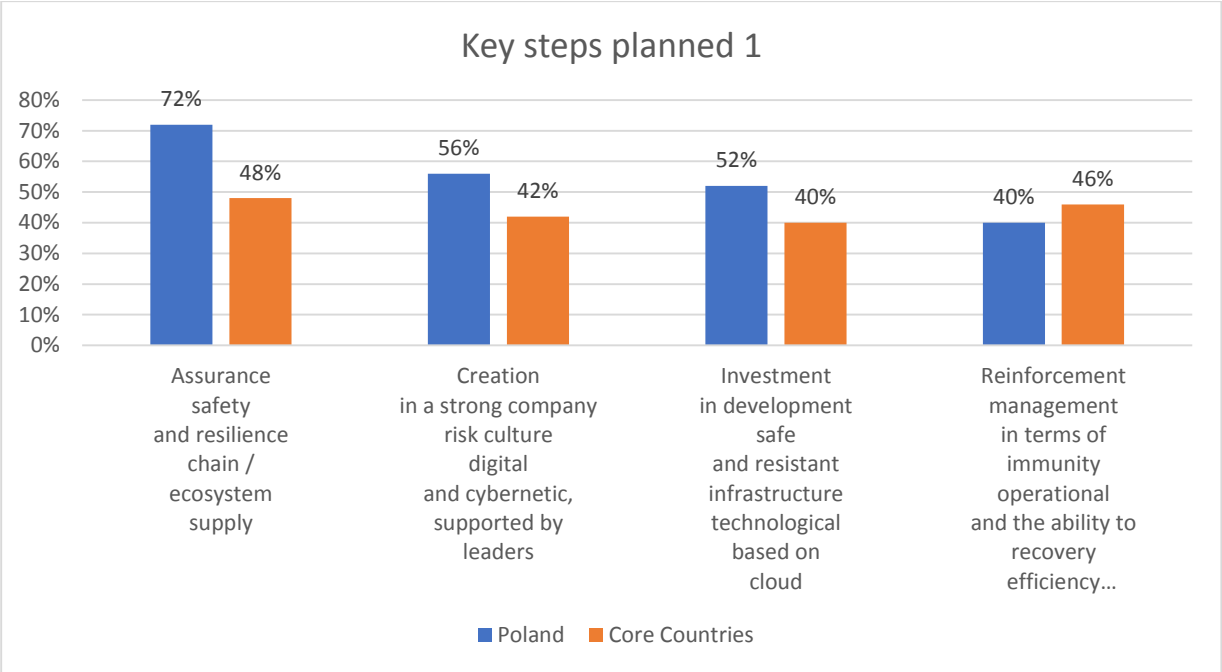

Figure 3. Key steps planned over the next three years to build digital resilience. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

Very important for CEO's Core Countries and Poland is focus on improvement skills (46% and 40% accordingly). Improving skills of employees helps to gain safety in unpredictable environmental. With difference of 14% between CEO's from Core Countries and Poland of in automation any possible process in order improvements and optimalization and risk management in the scope of safety it clear states to achieve the goals financial sources are needed. Core Countries posses much higher financial sources to develop the automation improvements processes. 25% in Core Countries is application comprehensive approaches to ethics and privacy data. In Poland with 9 % it is still very low and it could be explained by mentality of Polish people and previous economic system (Figure 4).

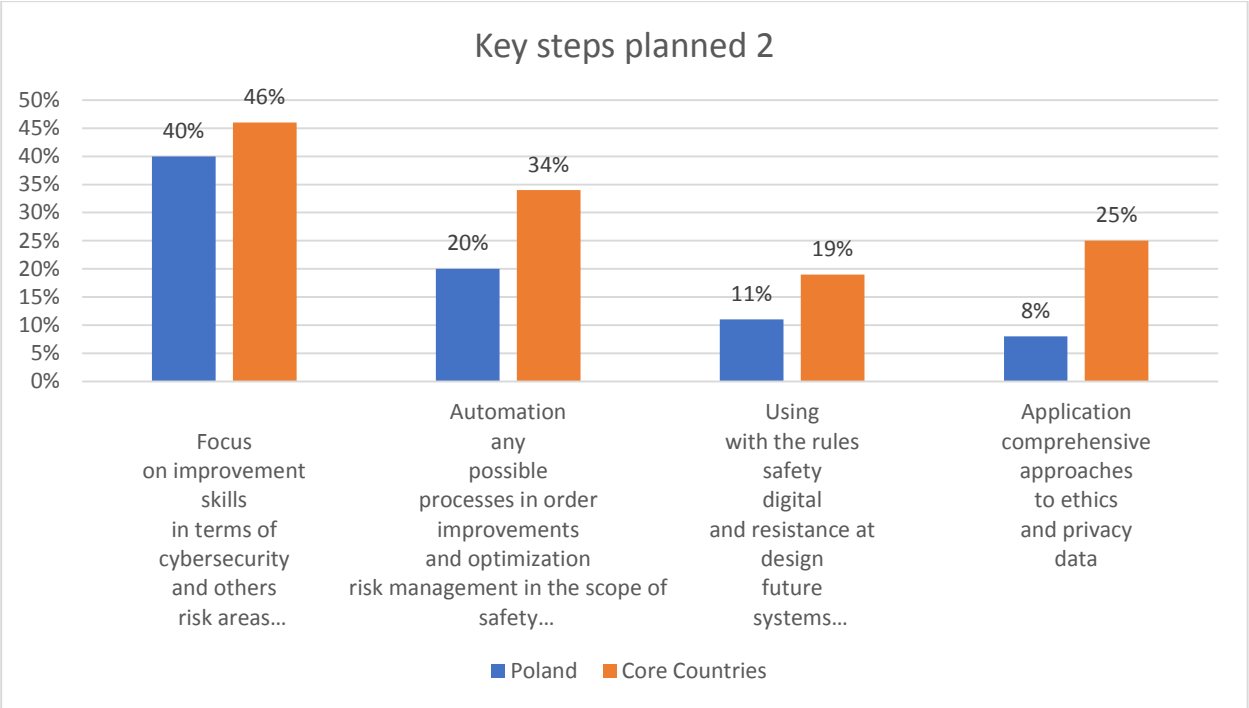

Figure 4. Key steps planned over the next three years to build digital resilience. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

3.3. The most important methods of consolidating the assumptions of the organization's mission in its strategy over the coming years three years

The way the company's performance is perceived has changed and is no longer viewed solely through the prism of issues financial. In Poland, it is the fourth time that large listed companies must publish ESG data in their non-financial reports, but soon they will have to pay more attention to this aspect also medium and smaller entities. It also seems likely that the scale of the responsibilities involved with non-financial reporting will expand and, consequently, will create a uniform, European one standard for reporting ESG-related issues. It is not surprising then that as many as 56% of Polish CEOs participating in the survey treat them as a priority issues related to how to inform investors about the results and believes that they will play a significant role in consolidating the assumptions of the mission in the organization's strategy. This factor may be crucial in the coming years how to influence the decisions of e.g. insurers or banks assessing whether the company is acting in compliance with the principles of sustainable development, which make decisions based on the assessed risk on granting it financing (KPMG 2021 CEO Outlook). In Core Countries the most important for General Director's is rewarding and motivating employees with score of 28%. It is so, as believe this activity increase achieving strategic goals through Key Performance Indicators (KPI). Based on this methodology of thinking informing investors and other stakeholders about results is the second most important value for top managers in Core Countries. Either CEO's from Poland and Core Countries emphasize allocating capital (11% and 14% accordingly), training and providing possibilities learning employees to improve productivity and knowledge to

achieve better results and to develop long term strategy. Very disturbing for Poland are results in recruitment and employees and evaluation, rating suppliers and compensation the highest rank of leaders. These methods of consolidating the organization's missions in Poland need to be looked into for further development for improvement (Figure 5).

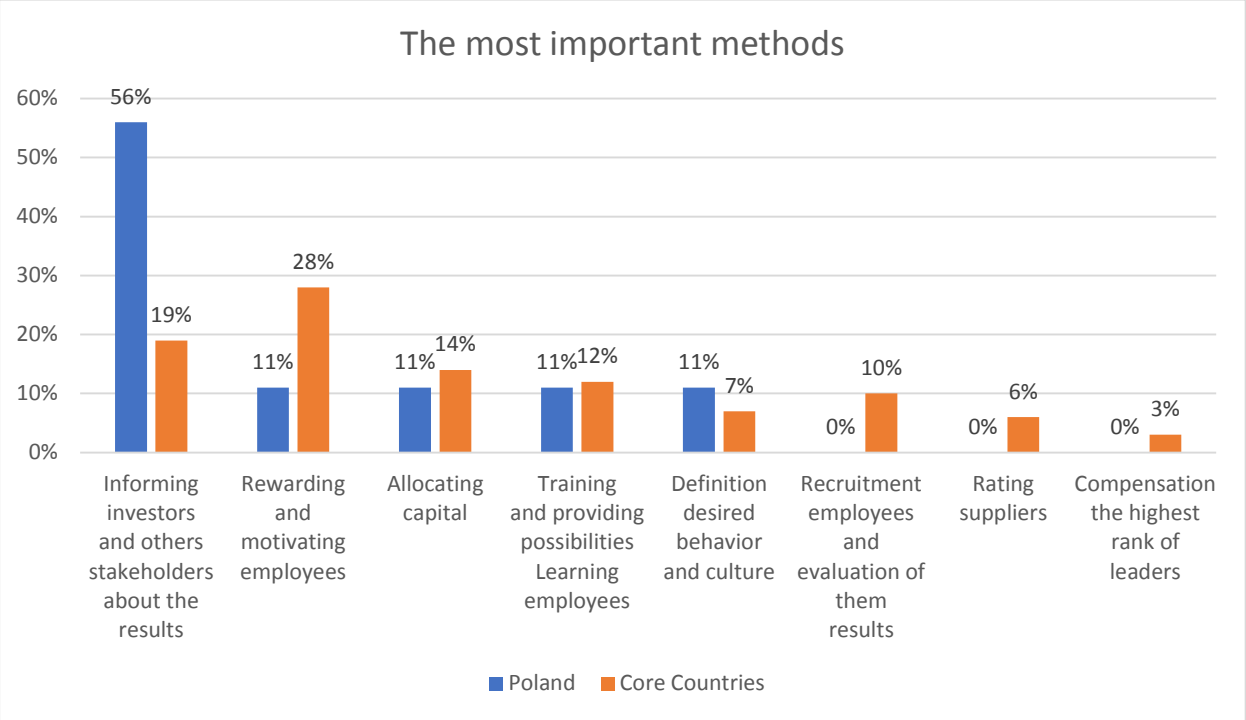

Figure 5. The most important methods of consolidating the assumptions of the organization's mission in its strategy over the coming years three years. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

3.4. Planned activities supporting the implementation of the organization's development goals over the next three years

Based on the results (Figure 6) of the study can be drawn conclusion that the presidents of Poland have clear specific in what forms of innovation they want invest. They are the least willing to approach to finance external companies under corporate venturing (only 20% of responses), however, they are optimistic about investing in software development accelerators or incubators for start-ups (52% of responses, second highest the number of indications in the question about the planned actions to help achieve goals development of the company). Corporate venture building it is different from accelerators or incubators the fact that the said programs support existing ideas, and venture a builder is a company that undertakes to build new companies, however, in the first place independently creates ideas for business and this base is looking for people to guide them. It can be seen that among Polish directors there is a growing tendency to support general creativity, but also use external (non-corporate) potential intellectual and skills and knowledge. This translates into more and more frequent references partnerships with external suppliers data (56% - the most indications in Poland) and cooperation with external suppliers cloud technologies (48%). Undoubtedly, among the CEOs of Core

Countries, there is a conviction that there is a need to increase investments in disturbance detection and innovative processes (67%). The presidents of Polish companies have a different opinion, who almost twice less often (36%) indicated this option as an activity aimed at helping the company's development in the next three years (KPMG 2021 CEO Outlook).

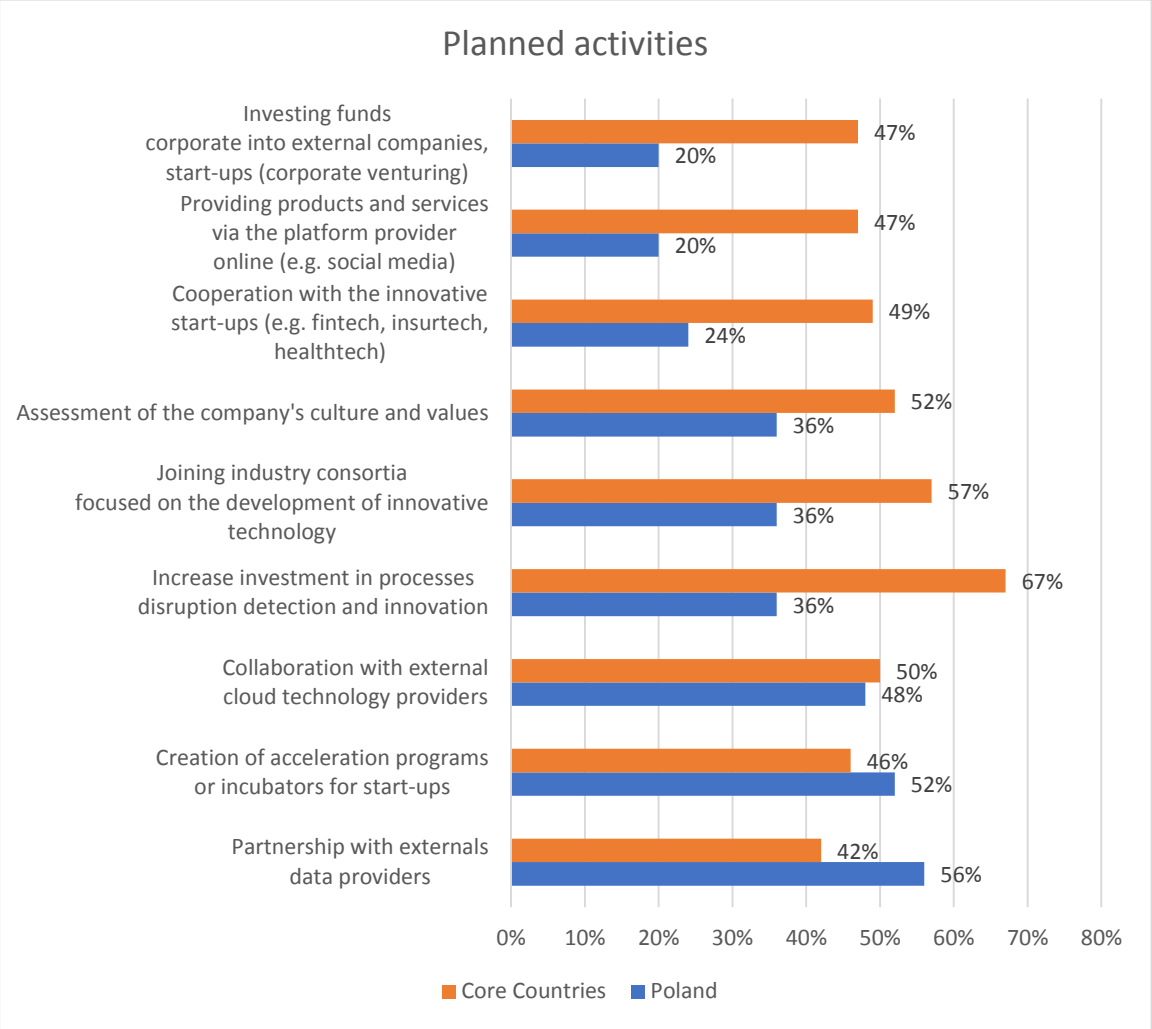

Figure 6. Planned activities supporting the implementation of the organization's development goals in the next three years. Source: KPMG 2021 CEO Outlook. Innovative technologies, human capital and the company's mission.

4. Discussion

The key conclusion based on the KPMG 2021 CEO Outlook Report are:

- 60% interviewed CEO from Core Countries is convinced about the development perspective world economy within the next three years,
- 88% participating in the study CEOs of Core Countries is expecting to increase employment,

- 50% Core Countries respondents in the next three years plans to make mergers/ acquisitions, that will have a significant impact on the company,
- 36% respondents from Poland believe that that strategic alliances with third parties will have of utmost importance for achievement development goals in the near future,
- 52% general directors from Poland replied that no changes are planned in employment,
- 72% study participants in Poland recognizes security and supply chain resilience for the key steps towards building digital resilience in the next three years,
- 76% Polish respondents are noticed there is a clear need for stakeholders increasing reporting and transparency in the field of ESG,
- 28% interviewed CEOs from Poland indicates reputational risk as a threat to the development of the organization in the next three years,
- 56% of the interviewed CEOs from Poland believe that informing stakeholders about the company's performance will be crucial a method of preserving the assumptions of the mission organization in its strategy over the course the next three years.

5. Summary

We are at the moment where digital transformation is so important like never before. The pace of development and the complexity of IT technology make it a security gap information systems are a common phenomenon. Progress technological is essential in companies, so that they can remain competitive, nevertheless nowadays cybersecurity has to go with it paired with. The directors general realize that the future of work means more than that than just the place where it is performed. The best performing organizations can take both your abilities to new heights technological and a tendency to increase qualifications of its employees. It is possible, but depends on being motivated and highly motivated skilled digital workers who they work quickly and efficiently.

Innovation technologies and human capital are important part of top management. Through permanent improvement of technologies and processes company can be competitive on the very demanding market. To achieve the goals human capital is needed which needs constantly new trainings by learning. Feedback from employees about internal company issues is at least required to improve the whole organization. Therefore the top management needs to be very assertive and knowledgeable and observing internal and external firm’s environmental to lead and achieve better and better results and heading to perfection. Therefore company’s mission is in hands of top management. To predict, develop, assess and implement suitable path for to follow is in hands of CEO’s but with huge employee engagement. All of this is set of connected activities without the company is not bale to exist on very competitive and demanding market.

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MAXIMISING PERFORMANCE OF A HOSPITAL'S HBOT LABORATORY USING THE THEORY OF CONSTRAINTS

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Purpose: The paper presents an application of the Theory of Constraints (TOC) aimed at defining and maximising the potential of hyperbaric chamber as a key resource in a specialist hospital.
Design/methodology/approach: The authors developed their own TOC based method of process improvement, supported by tools of Lean Management. Various constraints including an external one were taken into consideration. As a follow-up a project using the method was carried out in a hospital's Hyperbaric Oxygen Therapy laboratory.
Findings: The developed and implemented practical solution has improved patients' access to the service at about 40% per day, shortened patients' waiting time at about 90% and helped to overcome the threat of financial underperformance. Moreover, in combination with strict safety rules, the solution has proven its high resistance against difficulties caused by the COVID-19 pandemic.
Research limitations/implications: A hyperbaric therapy is a narrow branch of medicine, therefore application of the method in other healthcare domains will require an appropriate adaptation.
Practical implications: Despite the narrow subject of the study, the described approach is universal and can be used to maximise the capacity utilisation of various critical resources in hospitals and other healthcare providers.
Originality/value: This is the first known to the authors application of a TOC/Lean based systematic hybrid approach to improve performance of a healthcare provider, which is taking into account several constraints including an external one. Additionally, this is the first paper on TOC in healthcare published in Poland.

Keywords: critical resource, healthcare improvement, hyperbaric oxygen therapy, theory of constraints, lean healthcare, throughput.

Category of the paper: case study.

1. Introduction

Scientific advances in the past 120 years are associated with a great progress in diagnostics and treatment. At the same time, broad access to new treatment methods, even in well-developed countries, is still limited. The quality of medical services often leaves much to be desired, while an immense amount of public and private money spent on healthcare is wasted and the results achieved are far from being satisfactory (Nadziakiewicz, 2019a).

Improvement of the quality of medical services became a topic of interest for physicians after the first World War. Over the subsequent years many countries established institutions to develop and popularise standards of medical and medicine-related management. These bodies conduct audits of healthcare centres willing to undergo an evaluation, and they issue accreditation certificates to the units that meet clear-cut criteria. In some countries this may lead to the possibility of additional funding by the payer.

Effective hospital management is crucial for the implementation of the tasks defined by the Cost/Quality/Access (CQA) triangle (Bergeron, 2006). In the 1980s, researchers studying the problem of healthcare quality pointed out the similarity between the accreditation requirements and the principles of total quality management (TQM) described by Deming based on Japanese experiences in various types of industries. The trend started gaining momentum after 2000, when the management approaches developed primarily for production, such as Lean Management (Lean), Theory of Constraints (TOC), Six Sigma, and the tools used in their implementation (Kosieradzka et al., 2011) found successful applications in healthcare (Graban, 2008; Kenney, 2011; Sproull, 2019; Lisiecka-Biełanowicz, and Lisiecka, 2020). The other, more general quality management systems eg. based on ISO standards are also being widely used within healthcare industry (Nadziakiewicz, 2019b).

To the knowledge of the authors this is the first publication on such a hybrid approach dealing simultaneously with various types of constraints including an external one in case of a healthcare provider. The method has also proven to make a positive impact on CQA-triangle based global measures applied in healthcare.

TOC, like TQM and Lean Management is based on the principle of continuous improvement. In Lean the rules of continuous improvement use the concept of kaizen (Graban, and Swartz, 2012). In TOC it is referred to as POOGI (Process Of On-Going Improvement). Goldratt suggested three POOGIs: Change Question Sequence (CQS), which provides gap analysis, five focusing steps (5FS), which provide general framework for improvement and buffer management (BM) which is a mechanism ensuring utilizing the constraint to its full capacity (Bacelar-Silva et al., 2020).

There are three major categories of constraints: physical, policy and paradigm. All three exist in any given system at any given time and they are related (Scheinkopf, 1999). Other types of constraints can also occur, such as seasonal peak-time resource constraints or dummy

constraints, often resulting from a faulty policy or following outdated procedures (Ronen et al., 2018).

Problem solving is inherent to management. The vast number of analytical and problem solving management tools was developed over the past 70 years. Basing on his experience, Goldratt developed an integrated set of methods comprising the Logical Thinking Process (Dettmer, 2007). They are presented in a form of logical diagrams which can be used as a complete system or stand-alone tools:

a. Intermediate Objective Map (IO Map) – serving as a roadmap to destination.
b. Current Reality Tree (CRT) – diagnostics; examining logic of current situation.
c. Evaporating Cloud (EC) – conflict resolution diagram.
d. Future Reality Tree (FRT) – presenting and verifying the future/desirable situation.
e. Prerequisite Tree (PRT) - presenting the sequence of actions.
f. Transition Tree (TT) – implementation of actions.

In the first decade of the 21st century only a limited number of publications regarding TOC in healthcare were available, compared to TQM or Lean. The first TOC applications in healthcare environment were referring to buffer management aiming at improvement of patients' throughput as defined in Section 2 without compromising the quality of care (Umble, and Umble, 2006; Knight, and Stratton, 2010; Stratton 2012). Application of logical thinking tools and overcoming resistance to change in the British hospital were described in a form of business novel (Wright, and King, 2006). As the popularity of the TOC concept increased, more cases were reported to use a variety of tools in different hospital operations (Aguilar-Escobar et al., 2015; de Souza, Souza, Vaccaro, 2016). The complete models of for-profit medical centre (Wadhwa, 2010) and large scale health systems (Wright, 2010) in *The theory of constraints handbook*, provided a major step ahead in TOC healthcare applications.

Over the past decade, researchers have examined the unique, TOC-specific logical processes (Mabin et al., 2017; Bauer et al., 2018; Cox, and Schragenheim, 2019) in healthcare settings. An increased number and extended range of materials published on TOCICO websites – medical appointment systems (Cox and Robinson, 2012), solving complex problems (Cox, and Schragenheim, 2019), and managing private medical practice (Bacelar-Silva, 2019) have demonstrated the advantages brought about by focusing on the constraints. Several books offering practical solutions for healthcare environment were published. In 2014, Alex Knight's experience with the complete implementations of TOC in British hospitals was encapsulated in the form of a novel which provides a valuable guide for the managers and doctors alike (Knight, 2014). Simultaneously, a methodology combining TOC, Lean and Six Sigma (TLS) was proposed (Inozu et al., 2012; Ronen et al., 2018; Sproull, 2019; Strear, and Sirias, 2020). The outcomes of managing healthcare services using TOC were assessed and summarized in the first systematic literature review (Bacelar-Silva et al., 2020), almost exactly 10 years after the first literature reviews regarding Lean (de Souza, 2009; Mazzocato et al., 2010).

Historically, Lean preceded TOC in wide-scale healthcare applications at about 10 years and became probably the most popular modern management system approach in healthcare (Lean healthcare). While the main goal of TOC is to focus on what is most important namely to improve the performance of the whole organization, Lean concentrates on waste elimination and process flow. Like in case of TOC, Lean has developed specific tools and concepts, including: 5S (workplace organisation), standard work, Just-in-Time, Value Stream Mapping (proces flow mapping), Kanban (pull system), Heijunka (production levelling), visual management, mistake proofing (Jackson, 2009; 2012; 2017; Jimmerson, 2010; Kerpchar et al., 2015).

Although the Lean healthcare application cases provided researchers and practitioners with encouraging results, the drawbacks were also identified. Several authors reported actual and possible barriers for Lean implementations, resulting from fragmented and undisciplined approach. (Radnor, and Osborne, 2012; Noori, 2015; Leggat et al., 2015; Leite et al., 2019). The abovementioned combination of TOC, Lean and Six Sigma facilitates keeping focus, flow, waste elimination and variability under strict control and increases the opportunity for improvement as mentioned above (Inozu et al., 2012). Combining the strengths of various management concepts depending on the needs was further described in details by Ronen et al. (2018) and Sproull (2019) and became a basis for the method described in this paper.

The paper has been divided into 5 sections. Section 1 presents the purpose of the article in the context of hitherto applied healthcare improvement practices based on the concepts developed primarily for manufacturing industry. In Section 2 structure and tools of the authors' own method have been described. Its detailed application oriented at performance improvement of hospital's critical resource (HBOT chamber) is the subject of Section 3. The discussion of findings has been presented in Section 4. Section 5 summarises the case and presents recommendations on dealing with the resistance against change in continuous improvement projects in healthcare.

2. Materials and Methods

The method developed for the project is based on all three POOGI-s as mentioned in Section 1. It comprises goal and measures and original Goldratt's 5S model which therefore becomes 7FS as described by Ronen and co-workers (Pass, and Ronen, 2003; Ronen et al., 2018):

1. **Determine the goal of the organisation** – The general goal of the hospital is to maximize the number of succesfully treated patients in a shortest possible time ensuring the best economic result possible.

2. **Define the measures for the organisation** – Every action undertaken inside the organisation should be evaluated in relation to its effect on the whole organisation. Ronen and co-workers suggested six global measures adapted to the specific healthcare environment (Ronen et al., 2018):
   a. Throughput (T) – a concept originating in accounting; it is the rate at which the system produces *goal units* through sales. In healthcare context, the meaning of throughput changes. Goldratt stated: *it is how many health units have you created – that's what counts* (Goldratt, 2001). Another definition is the *rate at which a patient moves through a location* (Strear, and Sirias, 2020). Measuring and standardising *health units* would be difficult to define and perform, therefore Goldratt introduced suggested to increase T indirectly, by eliminating undesirable effects (UDE) (Dettmer, 2007). This, he assumed, would result in growth of T and wider access to medical services. According to the most universal definition, T comprises two components: goal units, expressed as the number of patients who went through the system within time unit, and the related financial aspect (Ronen et al., 2018).
   b. Investment (I) – Goldratt introduced a classification into passive inventory – inventory being worked on – and active inventory (Dettmer, 2007). In production companies, passive inventory indicates raw materials, in hospitals it refers to the patients. Active inventory is all of the money tied up within the system.
   c. Operating Expenses (OE) – all of the money used by the organisation to transform inventory into throughput.
   d. Response Time (RT) is a measure or a set of measures to determine the time in which the system responds with an action to a patient's need. Depending on the situation, one or several RT measures can be introduced.
   e. Quality measures (Q) are one or more parameters measuring the degree of fulfilling or exceeding the client's (patient's) needs.
   f. Due-date Performance (DDP) is a measure or a set of measures assessing the hospital's capacity to deliver services within the planned time-frame.
3. **Identify the constraint** – A resource constraint (bottleneck) is a resource that prevents an organisation from achieving better results measured against its goals. Usually, such a constraint is identified through the observation, with special attention paid to the areas that generate the longest queues.
4. **Exploit the constraint** – To exploit the constraint to its maximum capacity, it is necessary to identify all of the possible reasons of incomplete exploitation of its potential, policy constraints. A schedule to maximise the use of resource constraint should be developed. This schedule is referred to as Drum, and is a part of the DBR (Drum-Buffer-Rope) concept application.

5. **Subordinate all other resources to the constraint** Typically, the schedule of maximising the use of the bottleneck is insufficient to provide proper operation, as its implementation is affected by various disturbances generated by other resources. Therefore, additional parts of DBR – Buffer and Rope – must be applied, in order to subordinate other actions in the analysed system to a flawless functioning of the constraint (according to the Drum schedule). These additional solutions are classified as:
   a. Buffer (physical) – a limited number of patients in the queue placed before the constraint in order to guarantee timely work at the bottleneck, even if adverse events impair its normal operation.
   b. Rope (time buffer) is a mechanism to determine the time for starting the first operation in the process, so that the right number of patients could get on time to the constraint, considering the performance time of all of the operations conducted prior to the bottleneck operation, and all potential breaks.
   c. The next step when the remaining policy constraints should be identified and eliminated is subordination of all resources to the resource constraint. Policy constraints are identified in a control test: *If we could break the policy constraint, could we increase throughput?* If the answer is *yes* then the policy constraint affects the system (Ronen et al., 2018).

The next step when the remaining policy constraints should be identified and eliminated is subordination of all resources to the resource constraint. Policy constraints are identified in a control test: *If we could break the policy constraint, could we increase throughput?* If the answer is *yes* then the policy constraint affects the system (Ronen et al., 2018).

6. **Reinforce the constraint, and strive to finally overcome it** – Reinforcing of the constraint is taken into consideration only after the advantages offered in the previous steps have been exploited. E.g. if the constraint is the capacity of an internal resource, more of that capacity is acquired. If the constraint has been overcome, it is not a constraint anymore.
7. If steps 3-6 result in breaking the constraint, **the next weakest resource of the system becomes the new constraint**. At that point, one should return to step 3 and repeat the 5FS cycle from the beginning taking care to prevent inertia caused by outdated procedures. The cyclic overcoming of subsequent constraints is, however, not practical. Whenever possible and justified, the original constraint should be left in place, and prior to its extension, the next weakest link(s) should be identified and exploited to the capacity bigger than that of the widened original bottleneck (Goldratt, 2001).

Table 1 presents the phases and tools used in the method of improving processes using TOC, developed at the hospital. The first two steps of the model (the goal and the measures) are prerequisites for the remaining ones.

Table 1.
Phases and tools of the method used at the hospital

Phase	Description	Basic tools
I	Why change? Identification and description of the causesbehind the project	Analysis of the statistics of resource use Financial data analysis (based on the contract with the National Health Fund)
II	What to change? Problem identification/constraint identification	Current Reality Tree (CRT)
III	What to change to? Development of the direction of change	Future Reality Tree (FRT)
IV	How to implement the change? Development of the method to implement the change	Exploit the constraint – DRUM
		Subordinate BUFFER – ROPE
		Elevate the constraint
		TT – Transition Tree
		PRT – Prerequisite Tree
V	How to measure and sustain the change? Measuring and sustaining the change with appropriate tools	Measures: • Throughput • Investment • Operating Expenses • Response Time • Quality • Due-date performance

Source: own elaboration.

3. Results. The HBOT laboratory performance improvement – case study

The hyperbaric laboratory is equipped with a multiplace hyperbaric chamber with capacity designed for up to 14 patients. A session in the chamber lasts 1.5 hours. The pressure inside the chamber is 2.5 times higher than the atmospheric pressure. Oxygen is delivered through masks. Hyperbaric oxygen therapy (HBOT) is used in the treatment of wounds of various aetiology, including burns, sudden idiopathic hearing loss, decompression sickness, and in carbon monoxide (CO) poisoning. Treatment in such a chamber requires a physician's referral.

During each session, a trained attendant must be present. He or she participates in the session together with the patients, and reacts in case of adverse situations. An anaesthesiologist trained in hyperbaric medicine must also be present at the HBOT laboratory.

The project started in April 2018. Treatment of patients in most cases usually requires a series of 30 therapeutic sessions, conducted on weekdays for six consecutive weeks. Exceptions to this rule include emergencies, e.g. CO poisoning, when prompt therapy is required. The project focused on improvement of the chamber's use on weekdays only. Emergencies are irregular, and require immediate action, but they do not have a significant effect on the total number of procedures performed. The average total daily target of 80 patients was based on the contract with the National Health Fund. Prior to the project implementation, 5 sessions per day were scheduled for only 70 outpatients. Hospitalised patients participated in the separate session after the planned ones were completed.

Participation in the planned therapeutic sessions requires regular and punctual arrival of patients at the HBOT laboratory on the appointed dates. It was never a problem with the hospitalised patients, however, some of the outpatients did not notify in advance about their absence on a given day, or came to a different session than the one that had been planned for them. As a result, during many sessions, the chamber was used only partially. The absence of a mechanism to fill in the empty places, and overlapping of the described situations often made it impossible to schedule sessions for the required 80 patients for the following day.

Deficient use of the chamber prevented ongoing reduction of the queues of patients waiting for sessions, which resulted in limited accessibility to this medical service, meaning a prolonged (5-6 months) waiting time for the initiation of the therapeutic cycle in the case of outpatients. It also meant additional use of the hyperbaric chamber for the patients who did not come to the planned session during the day but came after the last session had been completed.

Furthermore, using the chamber at incomplete capacity was leading to imbalanced personnel workload. The limit of compressions for attendants in a given time interval (one compression in 24 hours), based on the work and safety regulations, was a potential peak-time constraint that prevented conducting a higher number of compressions per day. Additional sessions were associated with additional costs related to chamber operation (oxygen, materials), overtime of the personnel operating the chamber, and costs of additional activities, e.g. disinfection. It posed a threat to the hospital's financial performance, as the number of compressions continued to remain 10-25% below the year-to-date target in the months preceding the project's implementation If a contract executed by a hospital is less than 98% of the target, it contributes to reduction of contract for the next financial year. Due to the chamber operating at incomplete patient capacity, the throughput at the hospital was lower than that established in the contract, while the costs were higher than they would have been if sessions were held regularly and at full patient capacity. The hospital was able to perform more sessions (7 to 8 per day), and saw prospects for further expansion in this direction, e.g. by co-operation with other hospitals and emergency services. The chamber seemed an apparent bottleneck, whereas the actual cause of the constraint was the lack of a policy for full use of the chamber during each session.

3.1. What to change?

This problem was illustrated with an aid of a Current Reality Tree (Figure 1). The core problem, i.e. absence of a coherent policy for the use of the chamber at 100% patient capacity, resulted in only partial utilisation of the chamber in successive sessions. As a consequence, additional sessions were required, which generated extra costs, prevented implementation of the target, increased waiting time for therapy initiation, and – together with the limited number and accessibility of attendants – could lead to session cancellations. This, via a feedback loop, increased the source problem, further aggravating the situation.

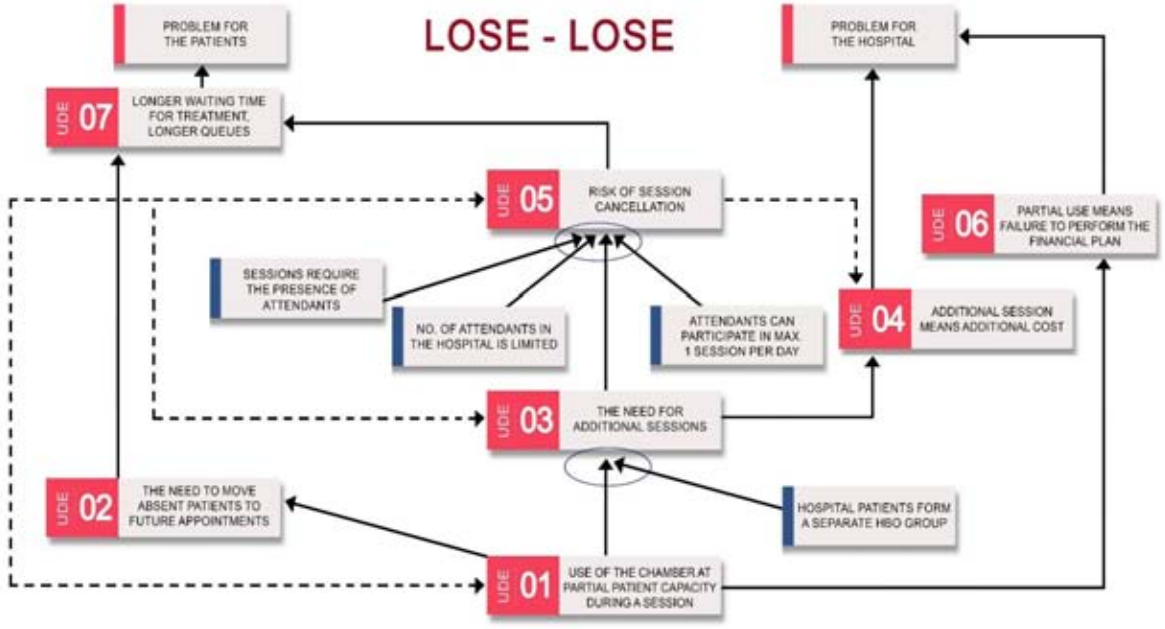

Figure 1. Hyperbaric chamber – Current Reality Tree. Source: Own elaboration.

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3.2. What to change to?

The analysis revealed that at the time of project initiation, the number of attendants at the hospital was sufficient to cover the current market demand under the abovementioned existing safety regulations. This was enough to achieve annual targets, provided the chamber was used to its full patient capacity.

As the potential of the HBOT laboratory was greater than the number of patients referred to it, the constraint associated with the chamber is, in fact, external. The primary constraint preventing an accurate diagnosis of the situation was the lack of the appropriate policy. As this was part of standard practice for years, the problem was difficult to detect.

It should be noted that in the case of not using the chamber to its full capacity, the risk of an internal constraint has been detected as a result of limited number of attendants, due to their workshift limits regulations on their participation in sessions. The decision to exploit the constraint to its maximum had to involve breaking the constraints resulting from earlier habits and procedures. Figure 2 presents the evolution of the constraint.

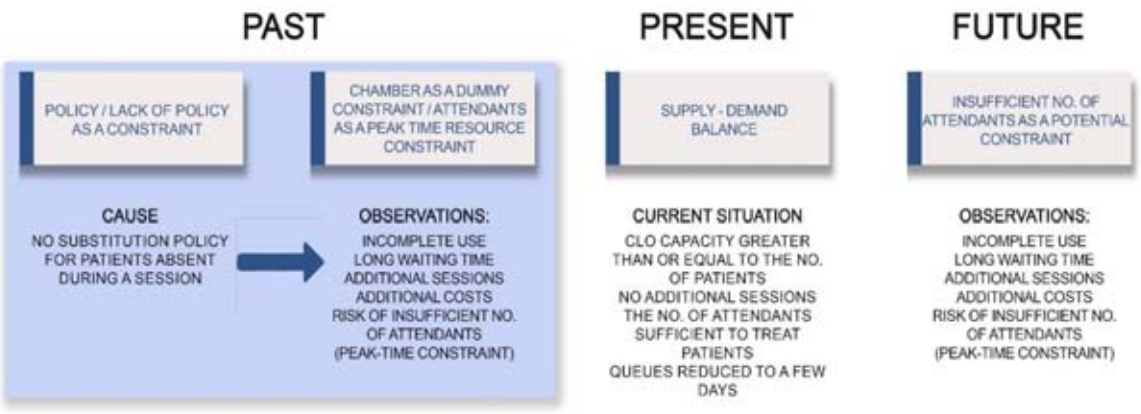

Figure 2. Constraint/constraint perception evolution in the course of the project. Source: own elaboration.

To fully exploit the external constraint, the chamber throughput had to be subordinated to it. This is achieved by maximising the number of patients during each session. The solution was based on dynamic control of the chamber's performance, so that it would always be used to its full capacity. This allowed to overtake for the delay in contract execution since the beginning of the year, and enable more extensive use of the chamber in the future.

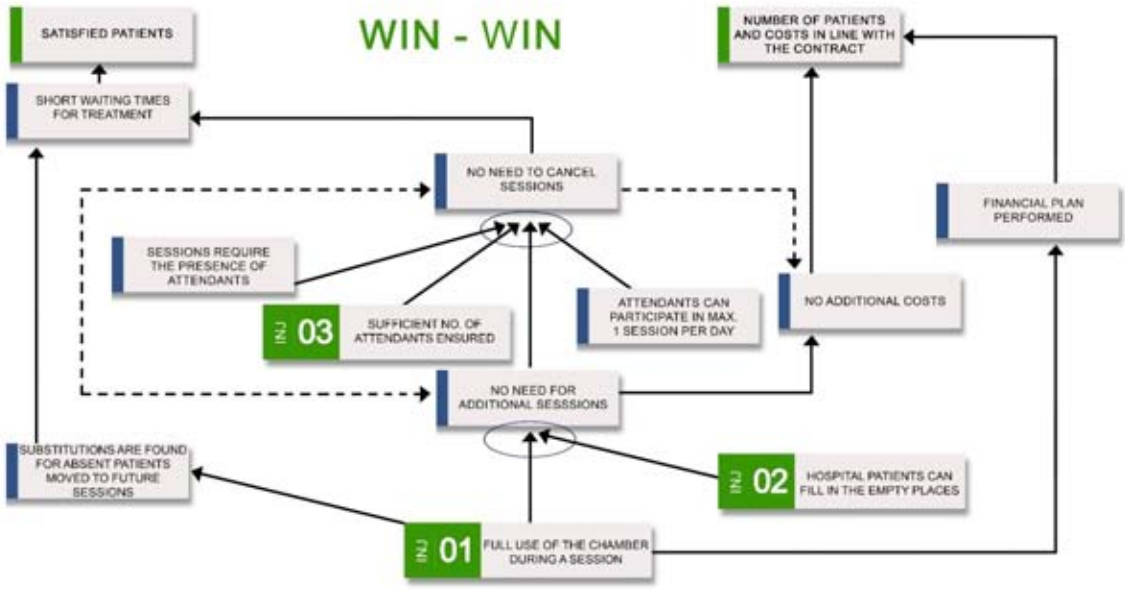

Figure 3. Hyperbaric chamber –Future Reality Tree. Source: own elaboration.

Figure 3 presents the Future Reality Tree. If the chamber is used to its full patient capacity, and hospital patients can substitute for the absent outpatients, all available seats are used, and the absent patients are allocated dynamically to future sessions. Therefore, the waiting time for the first session after the qualification for hyperbaric oxygen therapy is reduced.

In the case of a sudden increase in market demand, it would be possible to break the existing constraint, and identify a new one, i.e. a shortage of attendants. It is much more beneficial for the hospital, to retain the external constraint; therefore, as a solution INJ3 (injection #3 - training

of the attendants) was introduced. With the existing external constraint and an predictable slow increase of the demand for HBOT, it enables the staff to run a higher number of sessions than that provided at present.

3.3. How to implement the change?

1. Exploitation of the constraint:
   a) Development of a schedule for utilisation of the hyperbaric chamber (Drum).
   b) When the personnel is informed in advance about the absence of a patient (see point 2c), they notify a buffer outpatient (Rope 1) who declared to be available during the entire therapy time and is able to get to the hospital within two hours from the time he/she is informed. This patient substitutes the absent one.
   c) Each outpatient qualified for the hyperbaric treatment signs declaration that three consecutive absences without an excuse will result in removal from the list of patients, and restarting of the qualification process anew.
   d) If no outpatients are available, a hospital patient qualified for the therapy replaces the absent person.
2. Subordination of the remaining resources of the system to the constraint.
   a) Creation of quantity buffers (inpatients) and quantity/time buffers (time to get to the hospital for selected outpatients).
   b) If no outpatients are available, the laboratory uses the quantity buffer, i.e. a hospital patient qualified for the therapy.
   c) The wards where the buffer patients are hospitalised transport the patient to the chamber within 10 minutes following the notification obtained from the HBO laboratory (Rope 2). Therefore, it is possible to fill in for a late outpatient (see 2a).
   d) Session scheduling and management of buffers and queues are conducted visually, using a simple magnetic board with moveable tokens, on which post-its with medical record numbers are placed (Fig. 4). This enables identification of patients by the personnel, but not by third parties. Each session, identified by the hour it starts, has a proper number of tokens (patients). To the right of the session field there are three columns marked as: just. (justified absence), unjust.
   e) (unjustified absence) and remarks. Information about patient availability is displayed on the board on an ongoing basis.

Figure 4 demonstrates the therapy plan for a given day, and the changes introduced if needed. For example one of the patients planned for the session at 6:45 informed about his absence the day before, and the HBOT laboratory personnel contacted a patient planned for 14:45, a patient from the outpatient buffer, and corrected the schedule. Another patient planned for 6:45 did not come to the session, so the one from the hospital buffer replaced him.

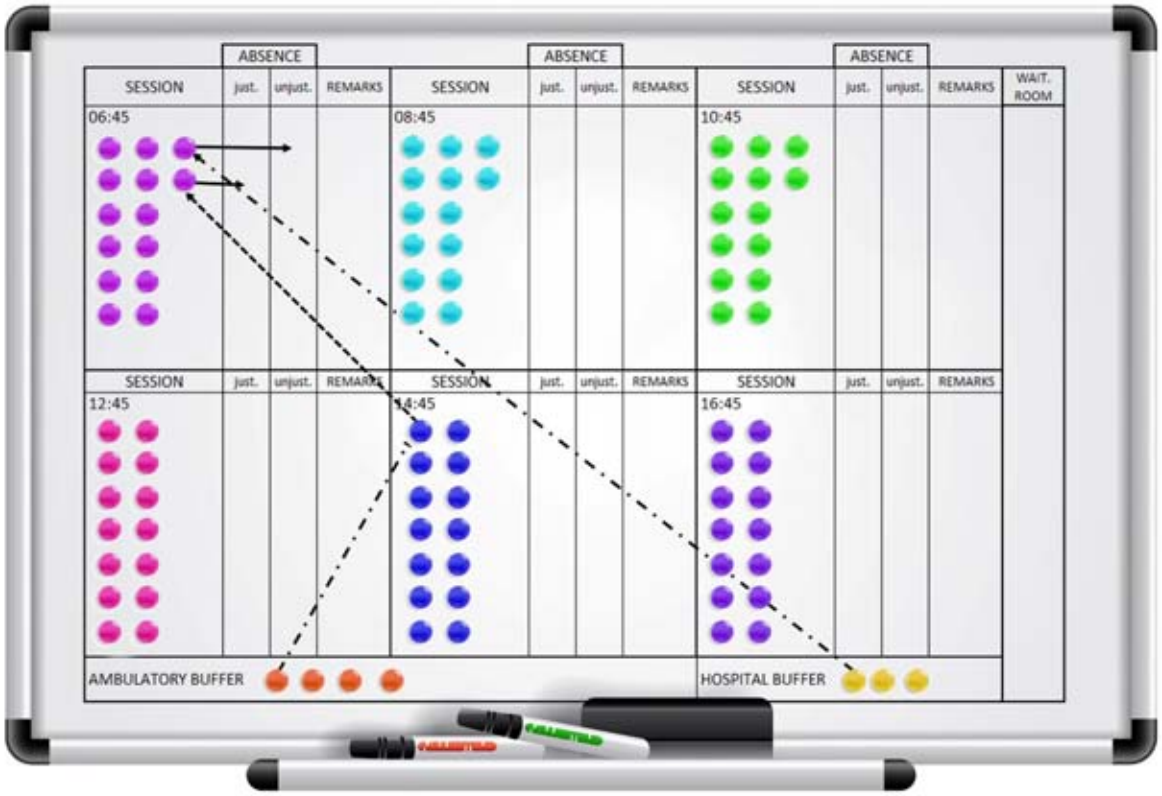

Figure 4. Monitoring table scheme – original schedule and the mechanism of substitution. Source: own elaboration.

3.4. How to measure and sustain the change?

The HBOT team monitors the number of patients on a daily basis, so any variances from the plan are immediately identified. The monitoring includes both planned and actual number of sessions, the number of absent patients, inpatient and outpatient buffer, and current use status of the buffers. This information is sufficient for the HBOT team undertaking actions on an ongoing basis. Financial reports are prepared weekly by the department of medical statistics.

The HBOT team introduced the education of patients. The information about HBOT therapy is presented in the form of brochures and films, what makes them aware of the need to participate in sessions regularly, and to meet obligatory safety requirements.

3.5. Results

The project was implemented in the period from April to October 2018. Fig. 5 illustrates the initial situation, and the results obtained between January 2018 and December 2019. Initially, both the number of planned patients and those actually participating in sessions were below the daily schedule requirement (80 patients/day).

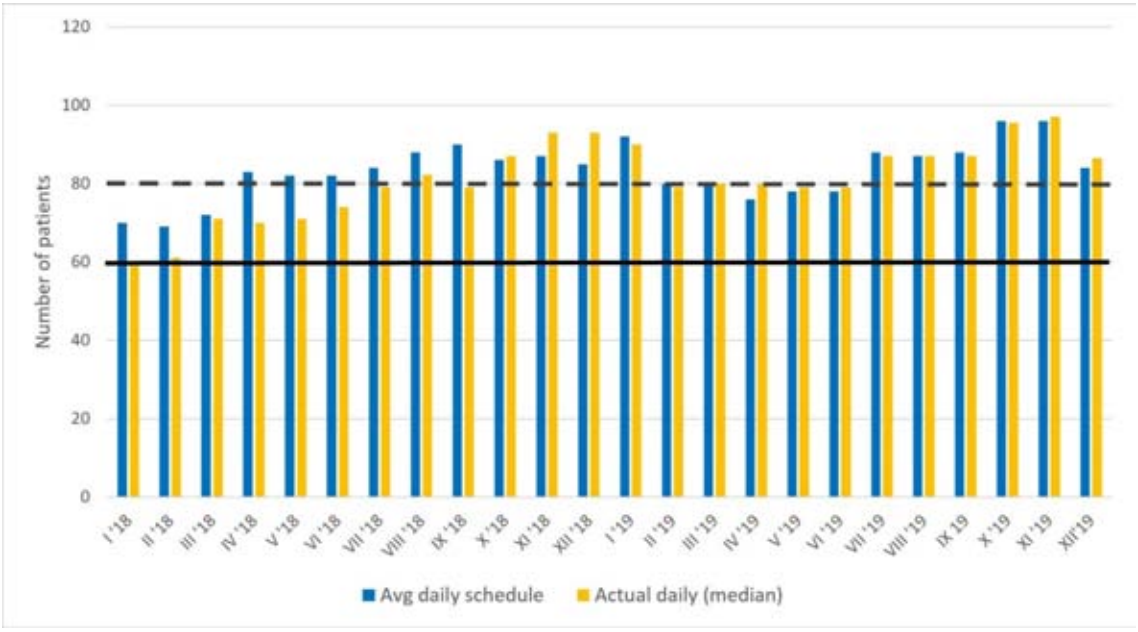

Figure 5. Actual vs. daily budget (median) 2018-2019. Solid line illustrates average daily execution before launching the project. Dashed line presents the required level as stated in the budget. Source: own elaboration.

The lower horizontal line illustrates the average number of patients per day, who actually participated in the sessions before March 2018. The target level is marked by the upper (dashed) horizontal line. Since April 2018, the daily target of 80 patients or more, if necessary, has become a standard, and actions were taken to ensure its execution, as described above. Since October 2018, monthly execution has reached the level equal to or higher than the monthly target. This made up for the shortfall, reduced the waiting time from a maximum of 24 weeks to 1-2 weeks, decreased the number of sessions, and made the working hours of the attendants predictable. The reduced waiting time for the first session in the therapeutic cycle contributed to a higher effectiveness of the treatment, and improved patients' comfort.

Table 2 presents a summary of the adverse effects identified before the project implementation, and the desirable effects achieved as a result of the implementation of Focusing Steps. It also demonstrates how the applied Focusing Steps are related to the global measures, as well as to the requirements resulting from the CQA triangle. The results achieved after the implementation of the project remained stable until 2020, with a slight tendency to increase. The flattening in February-May 2019 was mainly seasonal, and was the result of patients infections.

Table 2.
List of undertaken actions and their organisational consequences

Undesirable effects/risks before starting the project (April 2018)	Applied Focusing Steps	Desirable effects achieved after the implementation (October 2018 on)
Insufficient daily schedule execution: 1. Required no. of patients: 80 per day 2. Actual no. of patients: 60 per day	IDENTIFICATION of constraints, in order: 1. Procedural 2. External 3. Peak-time EXPLOITATION: Ensuring the use of the chamber at its full capacity EXPLOITATION/SUBORDINATION: 1. Elimination of the session exclusively for the hospitalised patients 2. Development and compliance with the procedures of co-operation with: a. Hospital wards (internal buffers) b. Outpatients (external buffers) availability and punctuality 3. Patient education	1. Daily schedule at the level of 80 patients. 2. Full chamber during sessions. Daily schedules met or exceeded. 3. Flexibility in reacting to patient deficits: improved scheduling and performance 4. No late arrivals of internal patients.
3. Long waiting queues – 20 to 24 weeks to start the therapy 4. Expenses associated with additional technical and personal costs	SUBORDINATION: 1. Buffer management ensures the chamber is used at 100% capacity during sessions 2. Reducing the number of sessions and chamber utilisation at full patient capacity reduces unnecessary costs	5. Waiting times reduced to 1 week 6. Cycle repetition ensured 7. Reduction of operating expenses (data not disclosed by the hospital)
5. Potential risk of temporary personnel deficits, reducing the number of sessions due to absences	SUBORDINATION: 3. Sustaining the controlled number of sessions prevents shifting of the bottleneck (market – hospital employees – market) 4. Training of new attendants	8. Session stability – predictable demand for attendants/day 9. No. of attendants sufficient to cover daily requirements.

Source: own elaboration.

4. Disscusion

Elimination of the previously applied approach demonstrated that the constraint was, in fact, of external nature: the current number of referrals to the chamber was lower than its working capacity. The presented case is, according to the authors' knowledge, the first one to describe the use of TOC to address a market constraint in healthcare. In for-profit enterprises, the typical solution involves intensifying of the marketing activities. In the case of publicly funded hospitals, this option is not available.

However, the presented example proves that it is possible to apply a solution other than marketing operations, which can effectively ensure full use of the public funds available to the hospital and prevent their waste. Obviously, the described approach can also be used by private healthcare providers that do not receive public funding.

Utilisation of DBR (Table 2, middle column) and the additional tools (Table 4) eliminated or significantly limited the abovementioned constraints. The targets for 2018 to 2020 were met. At the time of writing of this article (September 2021), the annual target despite the pandemic, is not threatened. The waiting time for the first session in the chamber was reduced from approximately six months to 1 week. In the case of an increased number of referrals, the hospital has the option and resources to provide additional sessions.

Table 3 presents the effect of the solutions applied on the global measures at the hospital, and on the Cost/Quality/Access Triangle. As a result of the project, all of the key measures improved.

The COVID-19 pandemic still poses a threat to the functioning of the hyperbaric chamber. From March 2020, it has seriously affected the number of sessions, which resulted both from the hospital's safety policy (only hospital patients), and the fear of potential outpatients who cancelled appointments due to the pandemic. At the beginning of 2021, when the situation has stabilised, regular sessions and the number of patients from before the pandemic were restored. The presented project still ensures the expected benefits (Figure 6).

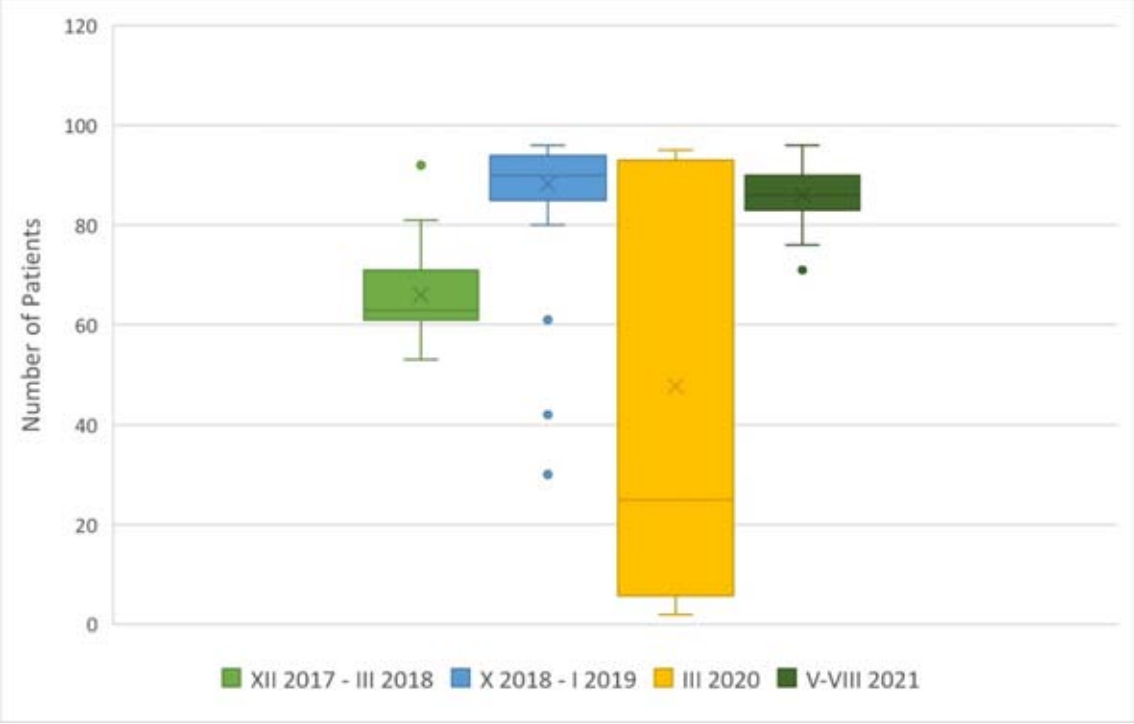

Figure 6. Distribution of patients per day in the hyperbaric chamber – comparison by periods. Source: own elaboration.

Table 3.

Applied Focusing Steps	Effect of the TOC global measures	Effect on the CQA Triangle
IDENTIFICATION of constraints: 1. Procedural 2. External 3. Peak-time EXPLOITATION: Ensuring the use of the chamber at its full patient capacity EXPLOITATION/SUBORDINATION: 4. Elimination of the sessions exclusively for the hospitalised patients 5. Development and compliance with the procedures of co-operation with: a. Hospital departments b. Outpatients availability and punctuality 6. Patient education	THROUGHPUT: Increased compared to the period prior to the project implementation: 1. by 17.5% in April – August 2018 2. by 24% in April – October 2018 3. by 43% since November 2018 (before COVID-19 pandemic outbreak) Decrease in performance in 2020 was only temporary. Current (May-August 2021) throughput remains 37% over the initial period despite continuous COVID threat RESPONSE TIME: Waiting time for the first session reduced from 20-24 weeks to 1 week DUE DATE PERFORMANCE: No effect	ACCESS: Increased access to HBO therapy for patients
SUBORDINATION: 7. Buffer management ensures the chamber is used at 100% during sessions 8. Reducing the number of sessions and chamber utilisation at full patient capacity reduces unnecessary costs 9. Sustaining the controlled number of sessions prevents shifting of the bottleneck (market – hospital employees – market) 10. Training of new attendants	THROUGHPUT: No effect OPERATING EXPENSES: Data not disclosed by the hospital DUE DATE PERFORMANCE: No effect QUALITY: Earlier treatment initiation provides better therapeutic effects	COSTS: Elimination of unnecessary personal and technical costs (data not disclosed) ACCESS/QUALITY: Reduced time to therapy; faster treatment initiation provides better therapeutic effects

Effect of the proposed solutions on the measures used at the hospital.

Source: own elaboration.

The third and fourth waves of the pandemic in Poland did not bring about as strong disruptions as the beginning of the pandemic in March 2020. The strict procedures against COVID-19 were followed at the hospital at all times. Approximately 10% of patients still cancelled their appointments, but the attendance remained at over 80 patients/day. Therefore, we may conclude that the developed management system for the hyperbaric chamber has proven also to be effective during the time of the pandemic. Importantly, the primary prerequisite was ensuring safety, e.g. through vaccination of the chamber personnel in contact with patients, and through close monitoring of the patients.

The risk due to COVID-19 still does exist, and it poses a threat to the functioning of the chamber, especially if a particularly virulent mutation, more dangerous than the previous ones, occurs. In such circumstances, the use the chamber may have to be limited; nonetheless, even then the solution in place should lead to the best possible outcomes.

5. Conclusions

The article presents an original approach to improvement of healthcare providers with the use of the Theory of Constraints and additionally, Lean Management tools. The usefulness of this approach has been verified through the project in HBOT laboratory of public hospital. Table 4 presents the tools used at individual steps of the project.

Table 4.
Effect of the proposed solutions on the measures used at the hospital

Phase	Description	Basic tools	Additional tools
I	Why change?	Analysis of the statistics of resource use Financial data analysis (based on the contract with the National Heath Fund	Hyperbaric chamber data statistics and analysis Gemba walk Direct process observation
II	What to change?	Current Reality Tree (CRT)	Gemba walk C&E Diagram
III	What to change to?	Future Reality Tree (FRT)	Brainstorming
IV	How to implement the change?	Exploit the constraint – DRUM	Schedule for the use of the chamber at its full patient capacity (kanban) Visual management Procedures for substituting empty places in the chamber (heijunka)
		Subordinate BUFFER – ROPE	Quantity buffer – outpatients Time buffer – outpatients (2 h) Quantity buffer – hospital patients Time buffer – hospital patients (10 minutes Procedures for substituting empty places in the chamber (heijunka) Visual management
		Elevate the constraint	Training for additional attendants
		Transition Tree TT	Team analysis with an aid of graphic tools
		Prerequisite Tree PT	Team analysis with an aid of graphic tools
V	How to measure an sustain the change?	Measures: • Throughput • Investment • Operating Expenses • Response Time • Quality • Due-date performance	Daily hyperbaric chamber data statistics analysis in comparison to schedule and previous periods Process observation Patient education Analysis of financial results Analysis of complaints

Source: own elaboration.

The authors analysed the causes of variations from the schedules and disturbances occurring in the HBOT laboratory with an aid of Logical Thinking Tools, and developed improvements in its operation. developed by the authors. The suggested solution is beneficial both for the patients (reduced waiting times thus faster therapeutic effects), and for the hospital (income ensured, better organisation of work and no risk of temporary personnel deficits).

The advantages of presented solution, apart from aforementioned ones, include simplicity and a stable routine in scheduling and the management of late arrivals, based on the developed tools and procedures. This approach allows the chamber to be used to its full patient capacity at all times, and prevents problems due to late arrivals of patients. Involvement of the middle-level and lower-level personnel in the decision-making process plays an important motivational role (ownership).

Theoretically, the weakness of this solution lies in the small number of hyperbaric chambers it could be applied to. However, the approach is universal enough that it may be used, with small adaptations, for any constraint found in hospitals. It also offers a general framework which can be used by non-hospital healthcare providers complaining of significant underperformance, e.g. primary healthcare service providers (Korneta, 2021).

Implementation of new projects in a hospital environment is often associated with strong resistance against the change, especially on the part of the medical personnel thus, forming the barriers for implementation (Lubitsch et al., 2005; de Souza, and Pidd, 2011; Leite et al., 2019). In 2016, the hospital's top management introduced a system which focused first on the engagement of the middle management – including medical personnel – and those directly responsible for given activities. Only afterwards was it followed by the doctors. The system lifts the burden from the higher medical personnel in the first, most demanding phase of change, and also provides convincing evidence for the effectiveness of the undertaken actions, leading to their acceptance. The solution allows not only the workload on the doctors to be reduced, but also plays an important motivational function for the staff directly involved in the process of change. It also minimises potential conflicts between doctors and management in the first phase of introducing modifications. This contributes to achieving favourable outcomes, and prevents resistance to change or prompt discouragement due to a lack of positive results.

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ORGANIZATION AND MANAGEMENT SERIES NO. 155

THE INFLUENCE OF PERSONAL COMPETENCIES ON ORGANIZATIONAL COMPETENCES OF EMERGENCY MEDICAL UNITS

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Purpose: The aim of the article is to present organizational competences of Emergency Medical Units (EMU) in the areas of marketing (recognizing the patient's needs), quality (the level of medical services) and logistics (a provision of medical services in the right place) during the time of the COVID 19 pandemic, influenced by managerial and professional competencies, and to identify those that have become particularly important in the period of the pandemic.
Design/methodology/approach: The proposed lists of managerial (five domains) and professional competencies (eight domains) were created and are based on the analysis of healthcare competencies models – the study of the literature – and the author of this paper's observations of the analyzed entities. There were 57 respondents weighing managerial competences and 135 respondents assessing professional competences**.**
Findings: As a result of the research, it is determined that the highest level among the professional competencies presented in the model (in all areas) is characterized by transportation competencies. The most undoubtedly framing organizational competences of EMU were managerial competencies: in marketing area Business Competencies and Professional and Social Competencies in quality and logistic areas.
Practical implications: Currently health systems are being faced with briskly growing necessity developed by the COVID-19 outbreak. A well-organized and adapted health system has the scope to manage decent access to fundamental service delivery throughout an emergency, restraining direct mortality and avoiding heightened indirect mortality.
Originality/value: An integration personal competencies (professional and managerial) with organizational competences of Emergency Medical Units especially relevant in pandemic time.

Keywords: Emergency Medical Units, organizational competences, professional competencies, managerial competencies.

Category of the paper: research paper**.**

1. Introduction

Medical entities function in a very unstable environment nowadays, and are molded by the determination of factors which refer to both distal and near surroundings (primarily because of underfunding, absence of liquidation, operating a social mission resulting from the nature of these units, etc.). These aspects add to a growth of the conditions for medical entities, along with emergency medical units. Among other things, they consist of, in particular: patient orientation and demands, high standards of medical services performed and the escalation of the performance of these organizations within the budget. The awareness and competences of the personnel engaged within these organizations are therefore becoming more and more essential because growing needs are characterized to help the change of research results to clinical and administration practice and the upgrading of policy and legal explications in this area, which should fundamentally alter to better achievements in the needs of patients, as well as expanding the competitiveness of these units (Krawczyk-Sołtys, 2018).

These days health systems are being exposed to a fast growth in demand caused by the COVID-19 outbreak. A coherent and arranged health system has the scope to provide fair access to basic service delivery throughout an emergency, reducing direct mortality and averting elevated indirect mortality. Thus, it is essential to assimilate professional competencies of medical personnel of Emergency Medical Units (EMU) with its management competences. During the COVID-19 pandemic, emergency medical system has adequately altered to crisis standards of care by boosting treatment in place, application of telemedicine and transporting patients to different destinations. Some of these alterations are definite to become a long lasting part of emergency medical system in the future.

The competences of healthcare organizations may be obtained from various types of knowledge. Some of them depend on “know-how” – pragmatic forms of knowledge gained through additional upgrading to medical services and processes, another – on “know-why” – theoretical schemes of understanding that grants the formation of new kinds of services and mechanisms. Various healthcare organizations competences derive from varied levels of activity: some are resulted predominantly from the proficiency of these entities to initiate and serve explicit types of medical services, another is entailed to derive from the qualifications to arrange and organize resources in new and authoritative powerful ways, others mainly depend on the potential of managers to create new approach for forming managerial value.

The aim of the article is to present organizational competences of Emergency Medical Units in the areas of marketing (recognizing the patient's needs), quality (the level of medical services) and logistics (a provision of medical services in the right place) during the time of the COVID 19 pandemic, influenced by managerial and professional competencies, and to identify those that have become particularly important in the period of the pandemic. The proposed lists of managerial and professional competencies were created and are based on the analysis of

healthcare competencies models – the study of the literature – and the author of this paper's observations of the analyzed entities.

The article speculates that competencies are a combination of skills dwelling of: knowledge, education, experience, other predilections and personality characteristics. These competencies are performed and broadened in the course of providing medical services in order to achieve goals logical with the strategic aims of emergency medical units (Krawczyk-Sołtys, 2018a, 2019).

2. Material and methods

Based on the theory of healthcare managerial competencies schemes in the literature (Stefl, 2003; Stefl, 2008; International Hospital Federation, 2015; National Center for Healthcare Leadership (NCHL), 2005; Sanghi, 2010; Krawczyk-Sołtys, 2017) and own author's experience (as a consultant) in such entities the portrait of managerial competencies in Emergency Medical Units was created (Krawczyk-Sołtys, 2018a). It consists of domains with 26 competencies. The domains seizure the ramification and potent aspect of the Emergency Medical Unit's manager's role and echo the changing realities in health leadership nowadays.

In the model of professional competencies of medical staff in Polish Emergency Medical Units was embraced the offer of Paramedic Association of Canada (Paramedic Association of Canada, 2011) with acceptance of ideas (Epstein, & Hundert, 2002; Kęsy, 2013). The scheduled model provided eight domains of professional competencies of medical staff employed in Polish Emergency Medical Units: Professional Responsibilities; Communication; Health and Safety; Assessment and Diagnostics; Therapeutics; Integration; Transportation; Health Promotion and Public Safety.

In order to determine the jolt of level of personal competencies on the progress of organizational competences of Emergency Medical Units, experimental studies were executed in the second and third quarter of 2018 in the following regions: Śląskie, Mazowieckie, Opolskie, Warmińsko-Mazurskie, Lubelskie and Dolnośląskie. There were 57 respondents weighing managerial competences and 135 respondents assessing professional competences.

The selection of the research sample was random. The research sample included respondents from two regions characterized by the largest number of emergency medical teams (Mazowieckie – 200 and Śląskie – 163) (Pomoc doraźna…, 2020).

According to the assumptions of healthcare marketing (Bober, Majchrzak-Lepczyk, 2015) in the sphere of marketing it is necessary to focus on the processes of providing medical services that determine the pro-quality needs of consumers and the implementation of tools and techniques shaping their repetitive quality. Among the key dimensions of the quality of services provided by emergency medical services, reference was made to substantive and psycho-

sociological dimensions (Lisiecka-Biełanowicz, 2016). In the sphere of logistics, reference was mainly made to shaping, controlling and controlling supply and service processes implemented as part of actions aimed at saving people's health and life (Bartczak, 2015).

Respondents assessed the current level of personal (managerial and professional) competencies and the degree to which they affect organizational competencies in the areas of marketing (recognition of patient needs), quality (level of medical services rendered) and logistics (provision of medical services in the right place at the right time) (Krawczyk -Sołtys, 2018b, 2019, 2021).

3. Managerial competencies enchancing organizational competences of Emergency Medical Units

The most graded managerial competencies were Business Competencies (4,17): financial management (effective application of accounting principles and financial management tools, budgeting, cost accounting, planning, organization and monitoring of the organization's resources to ensure the highest quality of medical services provided) – 4.46, rigorous obedience carrying out procedures, regulations and legal norms as well as the understanding to form internal arrangements on their basis (4.39), strategic management (setting a vision and/or mission, determining the direction in which the unit should be aim to, analyzing the environment in order to identify existing, future or likely future opportunities and threats, analyzing resources and organizational skills, to establish its strengths and weaknesses, creating conditions and resources to take action to exploit emerging opportunities to succeed making on these grounds the selection of the most favorable strategy as well as the proper way of implementing the strategy chosen for implementation) – 4.25, developing the condition of medical services (development and implementation of quality assurance programs, patient satisfaction and safety in accordance with applicable standards, development and monitoring of indicators for measuring the quality of medical services, patient satisfaction and safety, permanent improvement of the quality of medical services) – 4.16, information and awareness of management (skillful using of data to evaluate effectiveness and monitor indicators and trends, ensuring compliance with applicable privacy and security requirements, creating and improving information management systems, creating and improving knowledge management systems, implementing key knowledge management processes: locating knowledge, its acquisition and developing, supporting for knowledge sharing and dissemination, using of knowledge and its preservation, implementation of knowledge strategy) – 4.12, knowledge of basic business practices and the ability to manage projects (creating an effective management system and its permanent improvement, collecting data and information, analyzing them and making the right decisions) – 4.11, human resource management (analysis and planning,

recruitment, selection, adaptation, motivation, assessment, staff improvement, coaching and mentoring, talent management) – 4.07, risk management (effective risk assessment and analysis as well as its reduction) – 4.02, systems thinking (holistic understanding, not separate components, ability to perceive and analyze processes through the holistic view, noticing mutual relations and connections, and identifying the principles of the health care system – 3.98.

According to respondents the following are Leadership Competencies (4.15): leading change (promoting permanent learning and organizational improvement, responding to emerging needs of change and leading change processes) – 4.30, management skills (planning, organizing, motivating, controlling) – 4.23, leadership abilities and behaviours (clear communication of mission, goals and priorities of the organization; including concepts, methods and management techniques to manage the organization, detecting and analyzing organizational problems, encouraging creative solutions and giving support to employees to co-decision, adopting a leadership role) – 4.16, boosting employees to imagination, alteration and development (4.12), formation of an managerial culture depending on mutual understanding, transparency and concentrating on advancing the condition of provided medical services (encouraging teamwork, supporting diversity, encouraging a great involvement of employees, openness to views, opinions and ideas of others, care for subordinates development, tolerance, raising trust) – 3.96.

Then the respondents referred to the level of Professional and Social Competencies (4.12): professional development and lifelong learning (commitment to self-improvement, reflection and personal development – 4.26, professionalism (promotion and participation in health policy initiatives, protection of patients' and their relatives rights and responsibilities, care for the quality of medical services and safety and social commitment in providing them, support and mentor high-potential talent within both one’s organization and profession of healthcare management) – 4.25, consciousness of aims, ethics, strengths and weaknesses (both in self-assessment and on the basis of the opinions of others) – 4.11, ethical behaviour and social awareness (demonstrating ethical behavior, transparency and responsibility for actions, balancing personal and professional responsibility, recognizing the most important need of patients and society) – 4.07, and input to the evolution of management in health care (sharing knowledge and experience, developing others through mentoring, consulting, coaching and personal mastery, support and mentoring for potential talents) – 3.89.

Accordingly, Communication and Relationship Competencies have been indicated (4.05): communication skills (oral communication, written communication, listening, business communication – business reports, schedules, presentations, presenting analysis results in a reliable and understandable way for stakeholders, public relations) – 4.16, relationship management (showing correct interpersonal relations and the ability to maintain them in relations with all stakeholders, horizontal and vertical cooperation skills, openness, patient orientation) – 4.04, and facilitation and negotiation (conflict management through mediation,

negotiation and other methods of conflict solving, improving problem-solving skills, building interdisciplinary teams established to solve organizational problems and participate in them) – 3.95.

The bottom of the table – in respondents opinion – achieved Sectorial Competencies (3.96): understanding of the existing health care system and entities within this system (understanding the structure of the health care system, financing mechanisms and organization of medical services, balancing the interrelations between access to medical services, their cost, quality and allocation of resources, care for the health needs of society, perception of the managed organization and its effectiveness as a part of the health care system, using of monitoring systems to ensure the legality, ethicality, safety and highest quality of medical, administrative and business aspects of the managed organization, promoting and creating alliances and networks – both in the health sector and cross-sectorial, on national and global scale) – 4.03, public health competences (promoting disease prevention, promoting health and physical fitness through organized efforts for environmental hygiene, control of infectious diseases, spreading the principles of personal hygiene, organizing medical and care services for early identification, prevention and treatment, and developing such social mechanisms that will provide everyone with a standard of living enabling them to preserve and strengthen their health, the ability to use basic statistical data and basic health indicators to make decisions and analyze population health trends, risk management and risks during disasters and crises, evaluate key processes of the public health surveillance and control system, recognizing the local implications of global health events, understanding the interrelations of factors affecting the health situation of society) – 3.93, skill to advance employment in the organization (taking into account the health needs of the society, shortages of medical staff, the scope of specialization) – 3.81, and personalizing health care (recognizing and promoting the opinions of patients and their relatives about health care, respecting the comments and opinions of patients, their relatives and public opinion in making decisions related to health care, taking into account cultural differences and respecting individual expectations) – 3.79.

The most undoubtedly framing organizational competences of Emergency Medical Units were: in marketing area Business Competencies (4.30) and Professional and Social Competencies in quality (4.14) and logistic (4.16) areas.

Then, the data presents that:

- in marketing area respondents pointed: Leadership Competencies (4.04), Communication and Relationship Competencies and Professional and Social Competencies (4.02), and Sectorial Competencies (3.81);
- in quality area indicated: Communication and Relationship Competencies (4,11), Sectorial Competencies (4.08), Leadership Competencies (4.05), and Business Competencies (4.03);

- in logistics area respondents pointed out: Leadership Competencies (4.13), Business Competencies (4.03), Communication and Relationship Competencies (4.02), and Sectorial Competencies (3.86).

4. Professional competencies enhancing organizational competences of Emergency Medical Units

The study presented that the maximally rated professional competencies were Transportation Competencies (4.30). The following were: essentially, getting ready ambulance for service (4.49), after that, driving ambulance or emergency response vehicle (4.23), next, relocating patient to air ambulance (4.14) at the end, transporting patient in air ambulance (3.94).

The next researched area were Therapeutics Competencies (4.18). The results showed data in the following line of importance: getting ready oxygen delivery devices (4.54), delivering oxygen and carrying out manual ventilation (4.44), disposing ventilation equipment (4.23), impairing actual and suspected fractures (4.20), controlling patency of upper airway and trachea (4.10), administering treatment (4.07), dispensing basic care for soft tissue injuries (4.05), carrying out measures to control hemodynamic stability (3.77).

Then, as far as the study is concerned the respondents singled out the level of Professional Responsibilities Competencies (4.11). The figures present as follows: existing as a professional (4.13), engagement in sustaining education and professional development (3.77), seizing and comprehending the medicolegal aspects of the profession (4.19), recognizing and obeying applicable Polish legislation (4.01), operating adequately in a team environment (4.22), be in control of effective decisions (4.10), dealing with actual or potential forensic implications (4.34).

In sequence, Assessment and Diagnostics Competencies have been established (4.06). The results are shown as follows: carrying out triage in a multiple-patient incident (4.01), receiving patient history (4.08), carrying out detailed physical assessment exhibiting proper use of inspection (3.92), palpation and percussion (4.57), estimating vital signs, utilizing diagnostic tests (3.74).

Another observation finds that respondents indicated Communication Competencies (3.94). As following: training adequate oral (4.04) and written (3.91) communication skills: training adequate non-verbal communication skills (3.84) and training adequate interpersonal relations (3.98).

The study of respondents in question distinguished Communication Competencies (3.94): training adequate oral (4.04) and written (3.91) communication skills, training adequate non-verbal communication skills (3,84) and training adequate interpersonal relations (3,98).

This paragraph shows the effects of analysis of respondents who specified Integration Competencies (3.86): promoting differential diagnosis skills, decision-making skills and psychomotor skills in providing care to patients (3.85), giving care to encounter the needs of special patient groups (3.83), carrying out continuing assessments and provide care (3.89).

It is predominant to stress that in reference to the respondents opinion Health Promotion and Public Safety Competencies (3.72) are of the lowest level. Thus presenting the components show accordingly: consolidating professional practice into community care (3.43), adding to public safety through association with other emergency response agencies (4.09), taking part in the organization a chemical, biological, radiological, nuclear and explosive incident (3.66).

Next, the data presents that:

- in marketing area respondents acclaimed in the order of importance: Assessment and Diagnostics Competencies and Therapeutics Competencies (4.04), Professional Responsibilities Competencies (3.95), Communication Competencies (3.90), Integration Competencies (3.88), Health and Safety Competencies (3.78) and Health Promotion and Public Safety Competencies (3.75);
- in quality field respondents displayed the impact of the following: Professional Responsibilities Competencies (4.13), Communication Competencies (4.09), Health and Safety Competencies (3.98), Integration Competencies (3.94) and Health Promotion and Public Safety Competencies (3.80);
- in logistics field respondents referred to: Professional Responsibilities Competencies (3.93), Assessment and Diagnostics Competencies (3.92), Therapeutics Competencies (3.88), Health and Safety Competencies (3.77), Communication Competencies (3.76), and Health Promotion and Public Safety Competencies (3.62).

5. Conclusions and Further Research

The matter of competencies and their significance in the management of healthcare organizations, counting emergency medical units, is drawing a growing interest – especially in pandemic time. The distinctive comprehension of competencies in services, primarily professional services (in general public named human based) which emergency medical services are a part of, is recognized by S.G. Hein and C.D. Riegel (Hein, and Riegel, 2012).

In the time of a pandemic, personal competences became particularly important, which were not indicated by the respondents as key (core) in shaping organizational competences of Emergency Medical Units in the analyzed areas.

Staying healthy during a pandemic has become highly obvious though that the proper personal protective equipment (PPE) combination – N95 mask, gloves, eye protection and gowns – limit transmission of COVID-19 to healthcare staff. PPE use by paramedics requires

to be reinforced by employers ensuring proper supplies, a potent supply chain that is active to changing amount and geographic demands, and policy requiring PPE use.

To stop other patients from contracting sickness by defeating or diminishing chances for pathogen exposure one of core competences of Emergency Medical Units is following policies and standards for disinfecting the ambulance, patient cot and diagnostic equipment, such as cardiac monitors and stethoscopes, at intervals of every call.

What`s more, Emergency Medical Units have a growing batch of options for reducing pathogens with hydrogen peroxide and ultraviolet light. Disregarding the cleaning technology, it is essential to process, educating on how to correctly clean and supervision that not only lets time for disinfecting but also boosts following procedure that makes all the difference.

The results indicate that extra operational resources provide a significant role during a pandemic in reference to an initial estimation and pilot function. This is possible to aid to relieve not only the emergency services but also the medical facilities in charge of providing further care. The regulated dispatch query allows the connection with the applicable codes from the low-priority operational spectrum and support by a Tele-emergency physician lends extra professional competency to the emergency paramedics (Breuer et al., 2020; Dahmen et al., 2021; Gibson et al., 2020). The intension surmises proper competent competencies of the personnel employed in these units, managerial competencies regulating these institutions, as well as managerial competences.

Important work commenced by researchers and experts in this competency area shows the definite skills enforced by today's medical staff to be more conscious of patient`s needs (Halpern et al., 2001; Committee on Quality of Health Care in America, Institute of Medicine, 2001; Lewin et al., 2001; Mead and Bower, 2000; O'Neil, 1998; Stewart, 2001): divide power and duty with patients and caregivers; interact with patients in a shared and entirely open manner; allow for patients' individuality, emotional requirements, etics, and life issues; introduce approaches to relate to those who can look after themselves, impose approach which support the wider community, strengthen prevention and popularize health.

The importance of competencies issues and their significance in the organization of healthcare organizations, comprising of emergency medical units, is broadly highlighted in the literature on the subject (Liang et al., 2018; Leggat et al., 2011; Bartram et al., 2012; Clark, Armit, 2010; Richtie, Yen, 2013; Lewandowski, 2017). The significance of the impact of professional competencies on organizational competences in health care is also stressed pointed out (Lustri, Miura, Takahashi, 2007; Yang et al., 2006; Wickramasinghe, De Zoyza, 2011; Mazurek-Melnyk et al., 2016).

The achievements of such organizations (on top of the arrangements and actions that regulate them) come from the bodies who are connected to the process, the competence they undependably and together have to possess, and the attitude they have to implement (individually and interactively) to employ he process – their competencies (Krawczyk-Sołtys, 2019; Parker et al., 2020).

Amongst the most important characterizing the core line competences of Medical Emergency Units one can determine precursors competencies, for which the catalyst of the addition process is the following the new technologies and explanations carried out in the plan of emergency medical services and dominant competencies adjusted by recognizing the organization's needs.

Thus, it is essential to carry out empirical and literature analysis in this field, which will boost scientific knowledge, justify research methodology, as well as allow to define recommendations for practice. This is especially important in times of a pandemic.

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THE INTERPLAY OF RESOURCES, DYNAMIC CAPABILITIES AND TECHNOLOGICAL UNCERTAINTY ON DIGITAL MATURITY

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Purpose: Based on the resource-based view theory, environmental uncertainty perspective, and causal complexity in firms, this study aims to identify the causal pathways of organizational resources, dynamic capabilities and technological uncertainty leading to digital transformation from a holistic perspective.
Design/methodology/approach: Considering the gap in the existing literature on the configuration of internal and external factors affecting digital transformation, this study conducts a set-theoretic analysis using fuzzy-set qualitative comparative analysis (fs/QCA). The fs/QCA focuses on the effects of causal conditions that allow for more detailed discovery and understanding of the causal mechanisms of digital transformation. Thirty-three manufacturing SMEs were selected and fs/QCA was used to explore how companies can engage resources and dynamic capabilities to achieve digital transformation in the face of a highly uncertain external environment.
Findings: As the research shows, both high and low levels of digital maturity can be achieved through various pathways of causal conditions. There is synergy between technological uncertainty and relational and portfolio technological resources or between technological uncertainty and sensing and seizing capabilities that can jointly promote digital transformation.
Research limitations/implications: The analysis is based on a limited number of cases. In order to generalize the results, a larger sample from multiple industries can be collected and analyzed, thus refining the findings and increasing the level of universality. Future research should also be extended to different levels and theoretical perspectives to analyze the different factors influencing digital transformation.
Practical implications: According to the research, managers should avoid "one size fits all" strategies and follow a pathway based on their resources and capabilities, especially dynamic to promote digital transformation or analyze environmental changes, as the digital era is inextricably linked to a high degree of technological uncertainty.
Originality/value: This research enhances understanding of the interdependence of causal conditions (i.e. organizational resources, dynamic capabilities and technological uncertainty) in established relationships with the outcome – the level of digital maturity. It also provides implications for the digital transformation of manufacturing SMEs.

Keywords: digital maturity, resources, dynamic capabilities, technological uncertainty, fs/QCA.

Category of the paper: research paper.

1. Introduction

The fourth industrial revolution, or Industry 4.0 pushed, among others, by COVID-19 and the increase in customer expectations for technological development and digital transformation, promotes business innovation, increases customer experience as well as improves performance (e.g. Ferreira et al, 2019; Martínez-Caro et al., 2020). The adaptation of enterprises to these new circumstances is critical to their survival. However, the low success rate (< 30%) of organizational transformation (e.g. La Boutetière et al., 2019) shows that there is still uncertainty about how companies can seize the opportunities of the digital transformation. An important challenge is to overcome the existing processes, routines and patterns.

We are currently witnessing an increasing proliferation of digital practices, and the emerging literature centers around the definition of digital transformation and the factors that influence its level of maturity. Digital maturity has been recognized, by both academia and industry, as the standard for assessing digital transformation performance. It is worth noting that the area of research related to digital maturity is complex and requires systematic and comprehensive research regarding the understanding of the factors involved in this process. It seems that the efforts are carried out in a narrowly focused perspective that limits the comprehensive and true interpretation of the mechanisms influencing digital transformation. Digital transformation and maturity are therefore a complex problem of systems engineering (Chen et al., 2021), for which the causal conditions can be both internal and external to enterprises. Therefore, more research is required to deepen our understanding of how interactions between internal and external factors influence the degree of digital maturity of enterprises.

In addition to internal modernization through digital technologies, companies may require external applications to overcome the limitations of time and space. The issue of leveraging existing resources and capabilities especially dynamic capabilities becomes important in this regard. Dynamic capabilities rooted in organizational routines and actions of managers and employees are well suited to explain successful digital transformation (Warner, and Wäger, 2019; Rowe et al., 2017). Companies should strive to integrate internal and external resources by constantly analyzing the external environment, balancing technology and business practices and developing their digital capabilities. Only with this approach can they achieve a high level of digital maturity and successful transformation.

Both environmental aspects and possessed organizational resources and dynamic capabilities are critical to successful digital transformation. However, these factors have rarely been considered together from a holistic perspective. Researchers relying on conventional methods tend to focus on the net effects of single factors rather than the interactions of multiple factors. To overcome these limitations, this paper employs a qualitative comparative analysis (QCA) that is appropriate for studies involving complexity and causality (Ragin, 2008; Rihoux,

and Ragin, 2009; Kwiotkowska, 2018). The QCA method is focused on finding the common conditions implying the selected outcome and therefore allows discovering and understanding the causal mechanisms of digital transformation. More specifically, the method allows us to determine whether the resources and dynamic capabilities possessed, together with the technological uncertainties in the environment, are able to jointly or individually explain the results relating to the degree of digital maturity revealing the types and pathways of digital transformation.

The study was conducted among thirty-three manufacturing SMEs. QCA and more specifically fuzzy-set QCA (fs/QCA) was used to investigate how enterprises can engage resources and dynamic capabilities to achieve digital transformation in the face of a highly uncertain external environment. The following research question was posed: What are the possible combinations of factors that generate high and low levels of digital maturity? The research analyzed the combined impact of technological uncertainty, organizational resources and dynamic capabilities on the digital transformation of enterprises, and identified multiple pathways through which such effects are realized.

This study offers several contributions to the literature. First, the study proposes a framework for understanding the configurations of factors influencing different levels of digital maturity. The framework takes into account organizational resources, dynamic capabilities and environmental features – technological uncertainty, while analyzing the complex dynamics of these determinants. Second, the study reveals many equifinal pathways to high and low digital maturity, rather than the single best solution offered in most studies in the literature to date. The study provides a better understanding of the interdependence of causal conditions in established relationships with the studied outcome.

Following the aims of the research, the paper is structured as follows. Section 2 ("Literature review") presents and discusses the conceptual background of digital transformation, organizational resources, dynamic capabilities, environmental determinants and the interactions of these concepts. In Section 3 (“Data and method”) the research design is described, along with data and method. The main empirical results are displayed in Section 4 (“Results”). Section 5 ("Discussion and conclusions") discusses the research findings, their theoretical and practical implications, and conclusions, limitations, and tracing future research paths.

2. Literature review

Digital transformation is an interesting research area both from the perspective of theory and business practice. The literature offers a variety of definitions of digital transformation analyzing the phenomenon at the social (Kaplan, and Haenlein, 2019), meso (Gurbaxani, and Dunkle, 2019), and enterprise levels (Guinan et al., 2019). In the definition provided by

Vial (2019), digital transformation is described as a process that aims to improve an individual by inducing significant changes in its properties through a combination of information, computing, communication and connectivity technologies. Warner and Wäger (2019) indicate that digital transformation refers to the process of leveraging new digital technologies such as cloud technology, blockchain, mobile Internet, artificial intelligence and Internet of Things and is used to expand business opportunities, improve customer experience, streamline operational processes and develop innovative business models.

Importantly, research conducted in this area has contributed significantly to a better understanding of specific aspects of the digital transformation phenomenon. It has been found that technology itself is only part of the complex puzzle that needs to be solved for organizations to remain competitive in the digital world. Strategy (Bharadwaj et al., 2013) and changes in the organization including its structure (Selander, and Jarvenpaa, 2016), processes (Carlo et al., 2012) and culture (Karimi, and Walter, 2015) are required to ensure the ability to generate new value creation pathways (Svahn et al., 2017).

Research conducted at the organizational level mostly focuses on assessing the leading drivers of digital transformation and refers to digital culture (Martínez-Caro et al., 2020), digital skills (Kane et al., 2015), or the digital leadership model (Kwiotkowska et al., 2021; Jackson, and Dunn-Jensen, 2021), among others. It should also be noted that in addition to internal factors, external conditions are also very important for the adoption of digital transformation solutions. Changes in the external environment especially random events or technological uncertainty relating to the unpredictability of technological change have been identified as major drivers of digital transformation. In fact, internal change mechanism in the aspect of process reengineering based on the integration of resources and capabilities especially dynamic ones support digital transformation (Warner, Wäger, 2019; Amit, and Han, 2017). Thus, external – environmental factors and internal – organizational factors driving digital transformation are combined providing an important direction for further research.

According to Resource-Based View (RBV) theory, a firm's competitive advantage is attributed to the possessed valuable and scarce resources. Firms maintain their competitive advantage as long as the resources are inalienable or imitated by other firms (Barney, 1991; Chadwick et al., 2015). Moreover, a bundle of complementary resources and capabilities is needed to achieve competitive advantage (Kauppila, 2015). Following this line, RBV-based resource orchestration theory argues that the causal complexity of competitive advantage comes from the configuration of organizational resources, capabilities, and management decisions possessed that respond simultaneously to internal and external competitive environments (Kauppila, 2015). This theory also echoes many previous studies in the information systems field that information technology (IT) resources alone do not uniquely provide strategic advantage (e.g., Zammuto et al., 2007). Thus, the relationship between resources and firm performance is likely to be complex in terms of multi-directional interactions between

complementary organizational elements e.g., culture, resources, structure, capabilities, and environmental elements.

Digitalization requires firms to design and organize their resources and capabilities from a systemic and value creation perspective (Amit, and Han, 2017). This study examines two types of organizational resources, namely relational resources and portfolio technological resources, relevant to the research context, i.e. manufacturing firms. Manufacturing firms in emerging markets act as both exporters and suppliers, and their competitive advantage strongly depends on their relationships with global buyers (Fletcher-Chen et al., 2017). Building and maintaining long-term relationships with these global customers means having relational resources for manufacturing firms' markets and sales (Kingshott et al., 2018). Thus, relational resources are acquired by developing and maintaining positive relationships with business partners, while allowing firms and their partners to effectively leverage and synthesize capabilities to create competitive advantages (Wittmann et al., 2009). In turn, with the advent of Industry 4.0, developing a portfolio technological resources is a strategic roadmap for the future of manufacturing firms (Ghobakhloo, 2018). Mainly digital and smart technologies such as automation, cloud, 3D printing and Internet of Things (IoT) enable sustainable manufacturing and thus competitive advantage (Machado et al., 2020). Thus, based on previous studies (e.g. Zhang and Ozer, 2015), this study assumes that the portfolio technological resource will be defined as the portfolio of core technology assets owned by a manufacturing company that enable the company to digital transformation and maintain its competitive advantage.

Higher-order organizational capabilities that support firms in adapting their organizational structures, processes, and cultures are called dynamic capabilities (Teece, 2007). Dynamic capabilities are rooted in the routines of organizations and the actions of managers and employees and, unlike ordinary capabilities, represent the ability of organizations to transform (Winter, 2003) and positively influence performance (Jantunen et al., 2018). Dynamic capabilities are therefore seen as enablers of digital transformation (Warner, and Wäger, 2019). They can be categorized into three dimensions: sensing, seizing, and reconfiguring (Teece, 2007). Sensing capabilities help achieve superior performance in finding new and aligning from existing markets, correctly identifying customer needs, and recognizing innovation opportunities. Seizing capabilities enable new structures, policies, incentives, and value generation for organizations or service and product innovations. Reconfiguration capabilities refer to the alignment of organizational resources to meet new requirements in new circumstances.

It should also be emphasized that digital transformation is the result of the evolution of companies and the environment. The introduction and adaptation of new technologies certainly affects the change and specification of customers' needs, and thus intensifies uncertainty. Uncertainty in the environment may result from the lack of control over external resources but also the difficulty in understanding and obtaining external information. In the era of digital transformation, especially the focus is on technological uncertainty referring to the

unpredictability of technological change in terms of the complexity and novelty of technology (Zhu et al., 2020), but also how people discover and exploit opportunities (Liu et al., 2020). These changes create uncertainty, but they also create new opportunities. Advanced digital technologies such as cloud computing, big data, artificial intelligence, and the Internet of Things can promote the creation of digital capabilities, opportunities, resources, and other factors, and thus lead to digital transformation (Zhu et al., 2020) by supporting enterprises in this regard. Thus, the high level of technological uncertainty means that enterprises need to make and adjust their business operations early to cope with more complex and novel technologies (Jiang, and Ma, 2018). In this way, the development and application of digital technologies can facilitate digital transformation.

In summary, despite the fact that digital transformation is the result of the interaction of various factors, both internal and external, studies conducted in the literature so far have mostly focused on factors at the organizational level, neglecting the important role of factors flowing from the environment, especially those related to technological uncertainty. In order to fill this research gap, this paper analyzes the simultaneous impact of various mechanisms influencing digital transformation, both relating to internal, organizational and external environmental aspects from a holistic perspective (Figure 1). In turn, due to their complex combination, as convincingly argued by Fiss (2011) or Ragin (2008), multiple pathways are available through which companies can realize digital transformation that are difficult to explore by traditional methods.

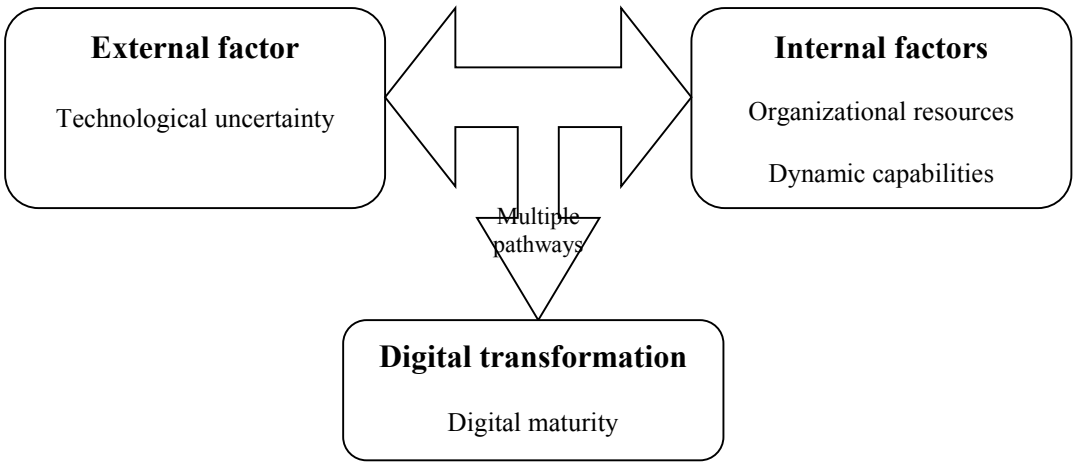

Figure 1. The research framework. Source: own study.

3. Data and method

The data was collected through a survey of high-level managers of Polish manufacturing SMEs. The sample was carefully selected to provide insights into the studied area of digital transformation based on the experience gained in manufacturing companies facing digital

transformation. Based on the available data, a list of 86 potential subjects was created. All entities received an email with a description of the project and an invitation to collaborate. Thirty-three companies expressed their willingness to participate. Survey participants were top executives, including chief digital officers and CEOs at manufacturing SMEs. The survey was conducted between February 2021 and May 2021, with respondents taking an online survey. After confirming that the respondent is a relevant company representative and indicating company-level variables (company age, company size, industry sector), the respondent answered questions on relevant variables shown in random order. Finally, some personal information (e.g. gender, age) was asked after ensuring the anonymity of the answers. A set of descriptive categories is provided in Table 1.

Table 1.
Sample description

Variable and Category		**Statistic**
Firm level	Firm age	Mean: 39.6 years
	Industry sector	• Manufacture of computers, electronic and optical products:27.3% • Manufacture of motor vehicles, trailers and semi-trailers:18.2% • Manufacture of electrical equipment: 30.3% • Furniture manufacturing:24.2%
	Firm size (employees)	• Fewer than 50: 36.4% • 50-250: 63.6%
Respondent level	Gender	• Female: 73.3% • Male: 26.7%
	Age	Mean: 46.3 years
	Position	• CEOs: (41%) • chief digital executives, CDOs: (23%) • manufacturing directors (29%) • others (7%)

Source: own study.

The aim of this research is to find causal pathways that explain the digital transformation of enterprises. As a result, traditional quantitative approaches (e.g. linear regression) are inadequate as they analyze the main effect of independent variables on at least one dependent variable, the so-called "net effects" (Woodside, 2013). Therefore, the qualitative comparative analysis (QCA) was used, i.e. a fuzzy-set (fs/QCA) based on set theory and fuzzy algebra (Ragin, 2008), which is applicable to the study of complex causality and multiple interactions (Fiss, 2011). Fs/QCA produces a relationship that is the total number of alternative pathways that maximize the test score. These pathways consist of three different possibilities in which a variable may influence the outcome: (a) presence – which is a key requirement; (b) absent, illustrating the absence of a requirement; and (c) irrelevance, being a "don't care" variable or dispensable variable for the desired outcome. Fuzzy sets allow for the inclusion of continuous variables, which are much more common in management science research, and allow for the definition of different levels of membership (e.g. 0 for no membership, 1 for membership, 0.5 for cross-over membership). Importantly, membership can be understood as the presence of a variable in the outcome under study, which is iterated over all possible combinations of

variables and outcomes to obtain a truth table. The Quine-McCluskey algorithm is then used to reduce the truth table to a subset of outcome-changing variables (presence or absence) and irrelevant variables ("don't care") via Boolean minimization. After minimization, each row of the reduced truth table consists of pathways that can be interpreted causally; that is, each variable alters the outcome either positively (presence) or negatively (absence), or is irrelevant (don't care). These pathways make up one or more solutions.

The outcome in this research is digital maturity recognized as a standard for assessing the results of digital transformation (e.g. Pramanik et al., 2019). In this study, the digital maturity assessment model by Gill and Vanboskirk (2016) was used, based on four dimensions: culture, organization, technology and insight. Each dimension contained five items (e.g. "We have the right leaders to execute on our digital strategy day-to-day" or "We have digital skills embedded throughout our organization").

Relational resources are measured reflectively by building relationships with external business partners (Wittmann et al., 2009). According to global commodity chain theory, external business partners are reliable and strong partnerships with global customers (Boyd et al., 2010) and reliable networks with suppliers (Shou et al., 2017). Portfolio technological resources are generated to cover the technologies required for digital transformation, i.e. manufacturing technology, digital marketing technology, design technology and IT. Based on existing literature (Wittmann et al., 2009; Boyd et al., 2010; Ghobakhloo, 2018; Castelo-Branco et al., 2019; Li et al., 2019), four items measuring relational resources (e.g. "We have successfully developed a strategic partnership relationship with our customers") and four items measuring the portfolio technological resources (e.g. "We have developed the required information technologies for Industry 4.0") were used.

For the three dimensions of dynamic capabilities, i.e., sensing, seizing, and reconfiguring, measures developed in the existing literature were used. The measurement items for the sensing dimension include activities related to acquiring knowledge and resources (Zahra and George, 2002) and identifying opportunities (Teece, 2007). This dimension contained five items (e.g. "We are looking for new opportunities in the operational environment"). Measurement items for the seizing dimension include patching (Teece, 2007), investing in research and development and competence building (Katkalo et al., 2010), and making changes (Eisenhardt and Martin, 2000). This dimension contained four items (e.g. "We actively develop new ways of doing business"). The reconfiguring aspect of dynamic capabilities represents activities related to knowledge, leadership, and human resource management (Jantunen et al., 2012), as well as the reallocation of resources and assets (Eisenhardt and Martin, 2000). This dimension included three items (e.g. "We use the existing know-how in new areas").

Technological uncertainty was measured using the popular scale developed by Jaworski and Kohli (1993) and assessed using two elements, such as, for example, "Core technology in the industry is changing rapidly". A five-point Likert scale was used for all scale items ranging from 1 (strongly disagree) to 5 (strongly agree). The individual reliability of each construct was

greater than the minimum acceptable Cronbach's α of 0.7, indicating high reliability (Nunally, Bernstein 1994).

4. Results

First, before conducting the appropriate pathways analysis, it was checked whether any single condition is necessary for digital transformation. If the consistency coefficient is higher than 0.9, the causal condition can be considered a necessary condition for the outcome (Ragin, 2008). Table 2 shows the results of this analysis. For high and low levels of digital maturity, the consistency coefficients of all conditions were below 0.9, indicating that no single condition is necessary for digital transformation (Ragin, 2008; Schneider, and Wagemann, 2012).

Table 2.
Necessity analysis of single, causal conditions

Condition	High level of digital maturity		Low level of digital maturity	
	Consistency	**Coverage**	**Consistency**	**Coverage**
Relational Resource	0.71	0.72	0.64	0.57
~Relational Resource	0.54	0.65	0.63	0.71
Portfolio Technological Resource	0.55	0.43	0.71	0.54
~Portfolio Technological Resource	0.72	0.71	0.64	0..73
Sensing	0.53	0.65	0.68	0.59
~Sensing	0.71	0.75	0.73	0.69
Seizing	0.63	0.43	0.56	0.62
~Seizing	0.68	0.59	0.71	0.68
Reconfiguring	0.75	0.67	0.69	0.57
~Reconfiguring	0.64	0.65	0.66	0.67
Technological Uncertainty	0.71	0.73	0.67	0.58
~Technological Uncertainty	0.52	0.65	0.77	0.72

Note. ~ logical negation – the absence of conditions. Source: own study.

The fs/QCA3.0 software was used in this analysis. Following the fs/QCA steps, a sufficiency analysis was performed using a minimum case frequency benchmark greater than or equal to 1 (e.g. Schneider, and Wagemann, 2012; De Crescenzo et al., 2020) and a raw consistency benchmark of greater than or equal to 0.8 (e.g. Fiss, 2011; Du, and Kim, 2021). Consistency and coverage are two metrics to measure the strength and importance of the relationship between condition(s) and the outcome (Ragin, 2008).

This study refers to the suggested principle of coverage, according to which selected configurations should capture at least 75-80% of cases (Ragin, 2008). The results are shown in Table 3. The study identifies three pathways that can lead to a high level of digital maturity. The overall solution consistency is 0.88, which explains the significance level of all configurations as a whole. The results show that the three pathways capture 75% of high-level

digital maturity. Next, two pathways were identified that may lead to low level of digital maturity. The overall consistency of the solution is 0.85, with coverage of 0.75.

Table 3.
Causal pathways leading to digital maturity

Causal condition	High level of digital maturity			Low level of digital maturity	
	1a	1b	2	3a	3b
Relational Resource(RR)	●		●	⊖	
Portfolio Technological Resource(PTR)	●		●	⊖	
Sensing (SEN)		●	●		⊖
Seizing (SIZ)		●	●		⊖
Reconfiguring (R)			●		⊖
Technological Uncertainty (TU)	●	●		⊖	⊖
Raw coverage	0.48	0.43	0.47	0.37	0.41
Unique coverage	0.07	0.02	0.10	0.07	0.05
Consistency	0.82	0.80	0.79	0.94	0.86
Overall solution coverage	0.75			0.75	
Overall solution consistency	0.88			0.85	

Note. ● – core causal conditions (present); ● - peripheral casual condition (present); ⊖ - core casual condition (absent); ⊖ - peripheral casual condition (absent); blank spaces indicate "do not care".

Source: own study.

As indicated by the first two pathways (1a and 1b), digital transformation is achieved under high technological uncertainty. This type of maturity therefore includes two pathways, configuration 1a and configuration 1b, and the sum of coverage is 0.09. The core condition for both of them is technological uncertainty. Thus, the technological uncertainty of the environment is an important extrinsic motivation to achieve a high level of digital maturity, which is also confirmed by previous studies (Zhu et al., 2020). As the first pathway indicates: RR * PTR * **TU**, enterprises use their relational and portfolio technological resources to cope with environmental changes, and thus achieve a high level of digital maturity. On the other hand, as indicated by pathway 1b: SEN*SIZ*__TU__, in an uncertain technological environment, firms use dynamic capabilities, more specifically sensing and seizing capabilities, to achieve high digital maturity. As the research shows, in an uncertain technological environment, firms can alternatively rely on their relational and portfolio technological resources or use sensing and seizing capabilities to achieve high digital maturity. In the two paths dominated by the technological uncertainty of environment, there is an effect of mutual substitution between resource (relational and portfolio technological resources) and dynamic capabilities (sensing and seizing capabilities).

Interestingly, configuration 2 also leads to high digital maturity, in which both analyzed resources (i.e. relational and portfolio technological resources), and dynamic capabilities (sensing, seizing and reconfiguring resources) are combined. In this configuration, dynamic capabilities are core causal conditions. The coverage is 0.1, which is much higher than the other two types, indicating good versatility of this solution. As indicated by pathway 2: RR*PTR*__SEN*SIZ*R__ dynamic capabilities are an important internal motivation for achieving a high level of digital maturity.

The core condition leading to low digital maturity, as indicated by the analyses conducted, is insufficient awareness of technical uncertainty in the environment. This type includes two pathways, configurations 3a and 3b, and the sum of the coverage is 0.12. Pathway 3a: ~RR*~PTR*~**TU** indicates that enterprises with low relational resource and portfolio technological resource, have difficulties in seizing the opportunities that arise to successfully implement the digital transformation. Pathway 3b: ~RR*~PTR*~**TU**, on the other hand, indicates that low dynamic capabilities that not support companies in adapting their organizational structures, processes, and cultures to transformation also lead to the fact that, companies cannot take advantage of technological breakthroughs and find it difficult to achieve high levels of digital maturity.

The robustness analysis of the fs/QCA results was then performed, which used standard methods including adjusting the calibration threshold, adding or removing cases, changing the frequency threshold, changing the consistency threshold, and adding other conditions (Zhang, and Du, 2019). Referring to this method, the consistency threshold was reduced from 0.8 to 0.75, which, however, did not affect the still five supported pathways. Overall consistency slightly decreased and overall coverage increased slightly. Three new cases were added consecutively, but the solutions remained similar, indicating the robustness of the research results obtained.

5. Discussion and contributions

As the research shows, neither external factors: technological uncertainty in the environment, nor internal factors: organizational resources, dynamic capabilities alone create the necessary conditions for digital maturity. The results show that both high and low levels of digital maturity can be achieved through different causal pathways. Based on the combination of resources, dynamic capabilities, and technological uncertainty, three high digital maturity level pathways were identified, technological uncertainty-oriented (pathways 1a and 1b) and dynamic capability-oriented (pathway 2). The study also identified two low digital maturity pathways (3a and 3b) based on insufficient awareness of environmental uncertainty, which have an asymmetric relationship with high levels of digital maturity.

The study observed that there is a substitution between resources and dynamic capabilities along two pathways dominated by environmental uncertainty leading to high levels of digital maturity. These alternative solutions indicate that under certain conditions, a high level of digital maturity can be achieved through different pathways that nevertheless lead simultaneously to the same outcome. Based on the resource-based view and the environmental uncertainty perspective, a theoretical model of digital transformation was proposed and an analysis was conducted revealing the mechanisms that influence the level of digital maturity.

Unlike most studies focused on organizational factors (e.g., such as skills (Kane et al., 2015) and digital culture (Martínez-Caro et al., 2020), this study considers internal and external factors together thus extending the research. As the analyses conducted show, digital maturity is determined by the interaction between external technological uncertainty and internal dynamic resources and capabilities, rather than by any single condition.

Importantly by focusing on dynamic capabilities in the digital age, it contributed to the theory of higher-order organizational capability. How dynamic capabilities affect innovation (Li et al., 2016), or firm performance (Jantunen et al., 2018) is a popular way for exploration. However, this research analyzes how the three dimensions of dynamic capabilities, namely sensing, seizing, and reconfiguring (Teece, 2007), affect digital transformation, and thus reveals an interactive mechanism between dynamic capabilities and digital maturity. This finding supports the thesis of Warner and Wäger (2019), who suggest extending the dynamic capabilities theory to the current digital context.

In addition, fs/QCA was used for the study which significantly broadens the choice of research methods conducted around the issues of digital maturity. This procedure furthermore allowed, on the one hand, overcoming the difficulties of classical research methods and, on the other hand, to reveal the causal pathways and conditional substitution relations of high and low levels of digital maturity from a causal asymmetry perspective. In summary, fs/QCA expands the choice of research methods and provides a new approach to study small and medium samples in the field of digital transformation.

This research also provides some practical recommendations. An organization's capability to proactively respond to technological uncertainty in the environment is an important indicator of a high level of digital maturity (see pathway 1a and pathway 1b). This indicates that business managers should especially analyze environmental changes because the digital era is inextricably linked to a high degree of technological complexity. Managers need to develop the relational and portfolio technology resource (see pathway 1a) and the sensing capabilities that help achieve superior performance as well as the seizing capabilities that enable new structures, policies, incentives, and value generation (see pathway 1b), thus quickly adapting their transformation strategy to environmental change. Alternatively, managers should develop dynamic capabilities with the support of the relational and portfolio technological resources (see pathway 2) to achieve high digital maturity. Managers should avoid a "one-size-fits-all" strategy and follow a pathway appropriate to their resources and dynamic capabilities (see pathway 2) and market factors (see pathways 1a and 1b) to promote digital transformation.

Certain limitations and concerns arising from this study indicate further research opportunities. The analysis is based on a limited number of cases, Polish manufacturing SMEs. In order to generalize the results, a larger sample from multiple industries can be collected and analyzed, thus refining the findings and increasing the level of universality. Also including entities from other countries in the sample could further enrich the findings. Furthermore, the research focused only on the impact of selected resources, dynamic capabilities and

technological uncertainty on digital transformation. Future research should therefore be extended to different levels and theoretical perspectives to analyze the different factors affecting digital transformation.

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E-LEADERSHIP AS A BOOSTER OF EMPLOYEES' DYNAMIC CAPABILITIES INFLUENCE ON JOB PERFORMANCE

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Purpose: The article concerns the influence of employees' dynamic capabilities on job performance and the role of e-leadership in strengthening such a relation.
Design/methodology/approach: The hypotheses were verified among 1200 organizations operating in Poland, Italy and USA during 2nd wave of COVID-19 pandemic. The statistical reasoning was based on linear regression model with moderator.
Findings: The results show that e-leadership is indeed strengthening the positive influence of employees' dynamic capabilities on job performance, and moreover – such effect is much stronger among organizations operating in crisis during circumstances of COVID-19 pandemic, striving to survive.
Research limitations/implications: The empirical research should be treated as a pilot study, as the systemic literature review is limited and has a character of an initial review aiming at the identification of future direction of research in this regard.
Practical implications: The obtained results show that organizations, which experience crisis caused by the COVID-19 pandemic are characterized by a much higher level of EDC influence on job performance than those, which do not experience crisis. It is clearly showing the important role of EDC in managing such organizations and transforming their way of doing business in order to survive the crisis.
Originality/value: The obtained results contribute new knowledge to the field of job performance management during crisis, confirming that dynamic capabilities are crucial among employees and this specific type of capabilities should be shaped and enhanced among those organizations struggling through crisis caused by COVID-19 pandemic.

Keywords: e-leadership, employees' dynamic capabilities, job performance, COVID-19.

Category of the paper: Research paper.

1. Introduction

In the past decades, the world has been through the accelerating path towards globalization when commercial activities have no longer clear national boundaries in all areas spanning from designing, developing, shipping, marketing, and sales. This is inevitably attributed to its nature of being less bond to physical proximity throughout the whole development process (Avolio et al., 2000). It prompts companies and organizations to coordinate tasks across time, location and more flexible competence composition in order to secure the business success. Virtual team is the product of attempt to fulfill such needs (Malhotra et al., 2007). Seeing with broader view, not only the development of virtual teams is driven by companies for industry globalization and cost efficiency consideration, the unprecedented COVID pandemic has also proved the emergent need that fuels the growth of this form as an invincible external force. Such force swiftly extends this form into all industries in the society as an obligation rather than choice (Velicia-Martin et al., 2021), which will revolutionize the workplace in terms of flexibility greatly and quickly. This calls researchers to dive into the understanding of virtual teams and provide suggestions to its leaders on navigating the dynamic business environment and bettering member's job performance thus sustaining the business success (Avolio, 2000; Kayworth and Leidner, 2002).

As highly relevant to the virtualization of work environment and emergence of virtual leadership, the concept of employee dynamic capabilities (EDC) is gaining interest in the practice of management (Bieńkowska & Tworek, 2020). EDC can be understood as a micro level of dynamic capabilities as proposed by Teece and colleagues (1997) applicable at employees' level, denoting the abilities to integrate, build and reconfigure own competencies to address a rapidly changing environment thus influences job performance. It entails adaptability and problem-solving capabilities as well as long-term improvement of work processes at the job position. It was argued by Bieńkowska and Tworek (2000) to be highly relevant to job performance. It is considered necessary to sustain the lasting competitive advantage in the virtualized business environment. Although there is rich body of study on e-leadership alone, few empirical researches exist that verifies the moderating effect of e-leadership on the critical business constructs employee dynamic capability and job performance. Moreover, as virtual mode is propelled to be applied widely across all industries under the crisis of pandemic, additional interest arises among the researcher in understanding e-leadership's role between EDC and job performance in light of such circumstances.

This article aims to fill the gaps mentioned above by first examining e-leadership and its impact on employee job performance, then explores the moderating effect of e-leadership upon the relation between employee dynamic capability and job performance. Moreover, it puts the moderating effect under conditions of crisis to test the strength of the influence. Such research intent is structured by first systematic literature review on the subjects of virtual teams,

e-leadership, employee dynamic capability, job performance and existing studies on any of their correlations. This lays the foundation for the development of a conceptual model. Further on, empirical research with data collected from 1200 organizations operating in Poland, Italy and USA during 2nd wave of COVID-19 pandemic was performed, using linear regression model with moderator as the basis for statistical reasoning. The data collection and analysis process are discussed in the methodology chapter. Lastly, we summarize and discuss the results and provide implications on how the results can benefit the field practices. This research contributes to the body of academic knowledge on managing virtual teams and offers insights for leaders interested in improving job performance of their virtual team members.

2. Theoretical background

2.1. Leadership in virtual teams: e-leadership

The increasing popularity of globalization, business model shifting from production to services and interorganizational alliances fuel the need for companies and organizations to set up teams across time and space which depend on computer-mediated systems to communicate and cooperate. Virtual team prevails driven by such needs. Driskell and Radtke (2003) defines virtual team as "a team or group whose members are mediated by time, distance, or technology." Attributes extended from this definition which mark a virtual team are (1) geographically distributed with no or very limited physical interactions; (2) Communicate through computer-mediated tools. A virtual team doesn't need to be cross-cultural, team members from the same country, city or even same building but with no or limited physically contact may choose to work in the virtual setup driven by various factors Virtual teams bring about significant challenges for companies and organizations. Many known challenges in traditional teams will be magnified in the virtual team context due to the organizational and process complexities. Leadership is one of them (Malhotra et al., 2007). Existing studies suggest that leadership with properly equipped skills in virtual setting is vital for business success. It necessitated a fresh inquiry into the role and nature of team leadership in virtual settings (Hoch, 2014). Existing arguments suggest the study of virtual team leadership is relevant and vital. Failure of it can cause team attrition, under-performing team members, lack of team spirit and crash of team goals (Malhotra et al., 2007).

One of the main challenges that leaders encounter in leading virtual teams is how to integrate business and information technology systems within their organizations to fully leverage the potential of virtual teams (Li et al., 2016). Though leadership in its essence is about the leader's capability to mobilize team members towards the team goal, the methods and styles applied by leaders vary depending on their voluntary or involuntary choices. One way to

generalize and categorize such differences is to divide leaders into three types: laissez-faire, transitional, and transformational (Avolio and Bass, 1991). Avolio and Bass (1991) coined it as Full Range Leadership model. Laissez-faire, also known as 'Let them do' denotes a management style that looks like complete anarchy. Leaders delegate all decisions to members and exercise the least of intervention. It's seen as the absence of leadership with negative connotation of avoiding responsibilities (Skogstad et al., 2007). Transactional leaders promote compliance through rewards and punishments. They tend to keep things the same through negotiations with team members (Waldman et al., 2001). Such negotiations require close monitoring and supervision of employees' daily work output so to apply the reward and punishment fairly. In contrast, transformational leaders promote long-term oriented and higher-ranking values to motivate members and aim to incrementally increase their commitment, confidence, and productivity so they can achieve bigger results (Podsakoff et al., 1996). Transformational leaders do not see their role as supervisor but rather coach or mentor who gives vision, answer questions, promotes group goals and set higher performance expectation (Dirk and Ferrin, 2002). Transitional leadership by its nature suits the most to managing virtual teams given the fast-changing environment and limited possibility of close task monitoring for traditional management transactions (Avolio et al., 2000; Bell& Kozlowski, 2002). Moreover, expanding industrial digitalization and the prevalence of information technology have been changing the requirements to leaders, prompting them to adapt to the fast-changing environment and co-evolve with companies and organizations (Li, 2016). On the other hand, leadership plays a pivotal role in helping companies and organizations apply culture paradigm shift so to keep up with new business opportunities and volatile environment (Waldman et al., 2001). IT is essential for virtual working environment. Leaders' vision, attitude, behaviors largely influence members' perception of IT adoption along with the changes it entails.

Based on the arguments provided before, we propose the use of term e-leadership to incorporate the emerging virtual context of leadership. We follow the definition proposed by Avolio and colleagues (2001) to understand e-leadership as a social influence process mediated by technology to produce a change in group attitudes, feelings, thinking, behaviors, and performance. Leaders who practice e-leadership aim to inspire members to develop self-management capacities from distance, who play a role as coach rather than supervisor (Kerfoot, 2010). Successful e-leadership practices require abilities to first generate and sustain trust through the use of computer-mediated communication technologies; secondly to ensure members' awareness and appreciation to the distributed diversity; lastly to manage and monitor life cycle of virtual work and transparently monitor members' progress (Malhotra et al., 2007). Empirical research made by Keyworth and Leidler (2002) revealed that e-leaders who exhibit high degree of empathy towards team members and act in a mentoring role outperform their peers in leading virtual teams. They tend to exercise their authority in a non-overbearing and flexible way. This leads us to believe that e-leadership involves the ability to motivate teams that operate primarily in a virtual mode.

Another dimension that makes e-leadership differ from traditional leadership is that it relies largely on computer-mediated communication between leaders and members as well as members themselves. The traditional leadership requires leaders to transmit the leadership via traits, behaviors, cognitions, and psychological influences (Hernandez et al., 2011). This becomes challenging in the virtual environment when social clues such as facial expression, body language, dressing code etc. are no longer at presence or blurred. In such context, e-leaders are obliged to act more proactively in creating structures that foster the communications over computer-mediated tools, optimally integrate human and information technology systems to leverage the leadership transmission (Avolio et al., 2000). In other words, e-leaders must be able to hold teams that work in a virtual mode accountable.

2.2. Employees' dynamic capabilities, e-leadership and job performance

Job performance has been studied extensively over the past decades, largely due to its importance to the success of organizations. Campbell (1990) defines job performance as the behaviors of an individual to perform a job which can be judged in the context of organizational goals. It has both behavioral and outcome aspects which concerns directly observable actions or intellectual products such as decisions. While behavioral aspect examines actions that are judged against organizational goals on its effectiveness and efficiency, outcome aspect focuses on the outcomes and consequences (Sonnentag & Frese, 2001). In terms of measurements, job performance is first considered as the combination of five aspects: task proficiency, task meticulousness, work discipline, work improvement, and readiness for innovation (Ali-Hassan et al., 2015; Kwahk & Park, 2018; Yuen et al., 2018). However, when putting job performance in virtual business environment while employees are facing a dynamic and rapidly changing environment and they are supposed to perform their tasks efficiently in such circumstances, dynamic capabilities of employees become critical (Bieńkowska& Tworek, 2020).

Employees 'dynamic capabilities (EDC) are defined as "abilities to integrate, build, and reconfigure employees' competencies to address rapidly changing environment, which is directly influencing the performance of tasks in the workplace" (Bieńkowska & Tworek, 2020) and refer not only to the current adaptability and ability to solve problems but also long-term learning and reshaping of business processes. The results available in the literature show that there is a clear relation between EDC and job performance. The two dimensions of EDC taken from adaptive performance, sensitivity to changes and adaptation to changes, are studied richly in relation with job performance (Shoss et al., 2012). Moreover, there are scientific attempts to unravel the relation of proactive personality and job performance (Fuller et al., 2010). Fuller and colleagues (2010) argue that the relation between proactivity and job performance is not as simple as previously assumed in the way that proactivity alone may not be as strong a trait as reported and other traits should coexist to significantly influence job performance. Therefore, it remains aligned with our claim that job performance can be understood as the effectiveness of the activities of employees that contribute to the realization of organizational

goals. This leads us to believe that include EDC in contemporary job performance models is necessary. Considering the above, we hypothesize that:

H1: Employee dynamic capability (EDC) and job performance is positively correlated.

In response to the fast-changing business environment, success of modern organizations depends largely on how fast it can integrate new knowledge and capabilities that can be deployed in ongoing activities for continuously deliver business values (Purvis et al., 2001). Global organizations which have their staff dispersed physically and time-wise face the challenge that knowledge and capabilities are not equally distributed among all employees or functional units. Instead, 'pockets' of specialized knowledge exist across spatial and temporal borders which are often dynamically and continuously generated through practice by individuals on different projects, products and processes at different locations at different times. Such dynamicity is a crucial constituent in EDC according to its definition as the ability to integrate, build and reconfigure employees' competence to address rapidly changing environment (Bieńkowska & Tworek, 2020). This necessitates the need of linking, combining and organizing such pockets of knowledge to form effective work teams throughout the whole organization (Kogut & Zander, 1996). E-leadership fulfills such need when leaders connect members through the effective communication media and hold them accountable of passing necessary information and knowledge among the team in order to form a cohesive team.

Beyond the above arguments which are given from the business necessity's point of view, we shall also look at the issue from team members' motivation point of view. The relation between motivation and job performance was already established in 1974 by Hackman and Oldham (Hackman & Oldham, 1974). Motivation is being constructed and measured from the aspects of skill variety, task's identity, task significance, autonomy and feedback, and can influence members' outcome and performance. Later studies on job performance re-confirmed the significance of motivating employees in order to engage them for improving the job performance which will result in organizational success (Campbell, 1990). When we define e-leadership, one important attribute that empowers e-leadership is the ability to motivate teams that operate primarily in a virtual mode. This reasonably leads us to believe that e-leadership plays a moderator role between EDC and job performance through leaders' capability to motivate. Based on these arguments, the following hypothesis may be formulated:

H2: E-leadership moderates the relationship between EDC and job performance.

When business environment becomes dynamic as we argued before, they're deeded normal as long as they do not endanger the functioning of the organization. But when the environment reaches the level as largely unpredictable and potentially hazardous that influences organizations' normal operations, we rate it as crisis condition. Such conditions can severely disturb the sustainability of the organization, threaten its survival by triggering escalation of negative phenomena in the organization (Bienkonwska & Tworek, 2020). The state of epidemic crisis that swapped the world in 2020 can doubtlessly fit into the extremely critical conditions in the range of crisis. Its extent and magnitude went far beyond the assumption of the models

of job performance existing in the literature. One unprecedented impact is that it forces many organizations across all industries to function in the virtual mode. Allowing employees to work remotely from home magnified the degree of virtuality even for IT companies which had been used to operation globally before the pandemic period. Ensuring employees understand principles of virtual mode and are able to utilize computer-mediated tools to sustain the same level of communication, as well as motivating them to stay connected become crucial to the continuity of business performance. (Hoch & Dulebohn, 2017) E-leaders under such circumstances are given much bigger challenges. We can legitimately argue that e-leaders who are better at motivating members to operate in virtual mode and holding member accountable of their work are more likely lead the team to outperform under such circumstances while e-leaders who do not acquire such abilities can make the team drift loose and decrease its momentum to perform. Thus, we posit:

H3: The moderation effect of e-leadership between EDC and job performance is more significant when organization is operating under crisis.

3. Research methodology and results

3.1. Research method

In order to verify the proposed hypotheses, an empirical research was conducted. The research was based on a survey, which took place in the last quarter of 2020. It was preceded by the pilot study aimed at determining the quality of the research tool and was conducted among 25 managers who played the role of competent judges. The main survey was performed among 1200 organizations operating in Poland, Italy and USA during 2nd wave of COVID-19 pandemic. The study was conducted using the CAWI (Computer-Assisted Web Interview) method. The sample was purposefully selected, limited by the geographical scope of the activity. Despite the fact that the selection of organizations for the sample was not representative, it seems possible to formulate conclusions due to the diversity of the organizations included in the study (see Table 1).

Table 1.
Research sample characteristic

Country	Not in crisis	In crisis	Total
Poland	83	343	426
USA	95	406	541
Italy	45	188	233
Total	130	109	1200

To allow verification of hypotheses the following variables were used: E-Leadership, Employees' Dynamic Capabilities, Job Performance (table 2).

Employee dynamic capabilities was measured based on 4 previously defined dimensions based on a 5 points' Likert scale with 6 items: sensitivity to changes in the environment, ability to adapt to changes in the environment, ability to solve problems in the workplace (including innovation in the workplace), as well as the ability of continuous personal development (Bienkonwska & Tworek, 2020).

E-leadership was measured based on 5 points' Likert scale concerning 9 items: based on E-communication, E-social, E-team, E-change, E-tech, E-trust.

Job Performance was measured based on 5 points' Likert scale with 7 items: based on the task proficiency, task meticulousness and work discipline.

To address the issue of crisis, to control variable was included, in which organizations were asked whether COVID-19 pandemic caused crisis within the organization, which needed to be addressed by changing the way of their operations (and introducing virtual mode of operations).

For each variable, the homogeneity and reliability of scales was verified using Factor Analysis and f Cronbach's α of the obtained research sample and is presented in Table 2. The results show high internal reliability of the scales and measurements.

Table 2.
Defined variables along with the results of the reliability analysis of scales

No.	Variable	No. of scales	Cronbach's α	Factor analysis
1	E-leadership	9	0,843	56,895
2	EDC	8	0,843	47,896
3	Job performance	4	0,753	57,759

3.2. Research results

The hypotheses verification was performed using linear regression analysis with moderator. Statistical tests were performed using Macro Process for IBM SPSS Software. The sample was divided into two groups: organizations declaring crisis occurring within due to COVID-19 pandemic and those declaring normal operations despite the COVID-19 pandemic, in order to verify whether the crisis is strengthening the role of E-leadership in moderating the influence of EDC on job performance. The moderated regression analysis procedure was performed among both groups of organizations. In every case, a moderator was introduced as a new variable in the relation. It was built as a product of two independent variables, which have been standardized. The first linear regression model was built as a base for comparison (and only EDC was added as predictor). The second linear regression model used both EDC and moderator as predictors. To confirm the moderation, the third linear regression model was based only on moderator as independent variable. The results of the analysis are presented in Table 3.

Table 3.
Regression models' statistics

Model description	R2	Delta R2	Moderator coeff.	Standard error	t Stat	P Value*
ORGANIZATIONS IN CRISIS						
EDC E-Leadership, Moderator dependent v.: job performance	0,38	0,023	0,697	0,112	5,704	0,005
ORGANIZATIONS NOT IN CRISIS						
EDC, E-Leadership, Moderator dependent v.: job performance	0,27	0,01	0,350	0,085	4,123	0,020

*Accepted level of significance 0,05.

The research results allowed for two main conclusions. However, it is worth mentioning at the beginning that those conclusions may be formed because R2 obtained for all models was sufficient and models were statistically significant. The model obtained for organizations operating in crisis is characterized by ($F(3,942) = 116,403$, $p < 0,05$), and the model obtained for organizations operating not in crisis is characterized by ($F(3,210) = 43,941$, $p < 0,05$). Both models were a basis for results, which clearly show that E-Leadership is a statistically significant moderator between EDC and job performance in both groups of organizations. However, the moderation effect of E-Leadership on the relation between EDC and Job performance is stronger among organization in crisis than those, which are not in crisis. Therefore, as shown in Table 3, obtained results allow to accept hypotheses H1, H2 and H3.

4. Discussion

The obtained results show that organizations, which experience crisis caused by the COVID-19 pandemic are characterized by a much higher level of EDC influence on job performance than those, which do not experience crisis. It is clearly showing the important role of EDC in managing such organizations and transforming their way of doing business in order to survive the crisis. It confirms the views of (Purvis et al., 2001, who stated that in response to the fast-changing business environment (which may cause a crisis in the organization), success is highly dependent on how fast it can integrate new knowledge and capabilities that can be deployed in ongoing activities for continuously deliver business values. However, the obtained results allow to contribute new knowledge to this field of study, confirming that dynamic capabilities are crucial among employees and this specific type of capabilities should be shaped and enhanced among those organizations struggling through crisis caused by COVID-19 pandemic.

Furthermore, the results confirmed the fact that e-leadership role in strengthening such relation. The role of e-leadership is significant among contemporary organizations, which are more and more relying on virtual mode during the every-day operations. Returning to the definition of e-leadership, which, among others, refers to the ability of leaders to motivate teams that operate primarily in a virtual mode it is not surprising that e-leadership was proven to be an important mechanism allowing organizations to boost the job performance of their employees. As it was assumed, the obtained results confirm that especially in circumstances connected to the COVID-19 pandemic (forcing virtual mode of operations and much heavier load of work relying on IT) boost the importance of e-leadership. The strengthening role of e-leadership is also higher among organizations operating under crisis. Hence, the mechanisms which enable organizations to obtain benefits form EDC are having much more significant role among organizations operating in such circumstances, which also confirms that there is a significant need for shaping and boosting specific dynamic capabilities among employees.

5. Conclusion

The paper was devoted to analyzing the role of e-leadership in shaping job performance by EDC. Moreover, such a role was analyzed among organizations operating during COVID-19 pandemic, which caused most organizations to change the way of operating and introducing virtual mode. The hypotheses were verified based on empirical research performed among organizations operating during 2nd wave of COVID-19 pandemic in Poland, Italy and USA and two groups were distinguished among them: those, in which the situation has not caused a crisis and those, in which the crisis occurred. The results clearly show that during such conditions both groups of organizations are experiencing benefits from e-leadership, which is strengthening the role of EDC in boosting job performance of employees. However, such a strengthening effect is much more visible among organizations operating in crisis, for whom high EDC and the ability to properly use such capabilities and translate them into job performance seems to be crucial for their survival.

Such results contribute to the theory of organizational management during crisis, showing not only the importance of dynamic capabilities among employees working under critical conditions of crisis in organization but also the need for shaping e-leadership as a method for boosting the job performance of employees (especially those operating in organizations experiencing crisis). The results contribute also to the practice of management (utilitarian conclusions) stating the mechanism, which can be use among organizations experiencing crisis during COVID-19 pandemic.

The empirical research should be treated as a pilot study, as the systemic literature review is limited and has a character of an initial review aiming at the identification of future direction of research in this regard. Even though such limitations exist, the extensive empirical research, which is a basis for forming conclusions (sample is large and diverse, covering multiple countries) allows to form solid conclusions and clearly show such future directions.

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THE ROLE OF ENTREPRENEURIAL DISCOVERY PROCESS IN TECHNOLOGICAL DEVELOPMENT OF SILESIAN VOIVODESHIP

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Purpose: the main purpose of this paper is to define the scope in which the entrepreneurial discovery process for smart specialization affects the technological development of the region.
Design/methodology/approach: Based on theoretical analysis of the concept of smart specialization and entrepreneurial discovery process (EDP), set of research tools and methods has been proposed, including broad participation and interaction between EDP participants. The research tool – questionnaire for studying the needs of entrepreneurs in the direction of technological development of the Silesian Voivodeship consisted of four thematic blocks, including such aspects, as: innovative activity, financial aspects and the effectiveness of obtaining funds, cooperation and development strategy. A representative group of 300 companies was selected to participate in the survey. The responses obtained were processed and generalized using statistical methods – with use of MS Excel and Statistica software. The results of the research, conducted in 2017-2019, were used as a tool to identify areas of technological and cooperation advantage in the Silesian Voivodeship and recommendations for the update of Regional Technological Program for the 2030 perspective.
Findings: The role of different groups of actors is varies substantially in terms of their involvement and impact, with the stakeholders from business and research are the main group to be targeted in the entrepreneurial discovery process.
Research limitations/implications: The results provide a basis to improve the effectiveness of regional development planning, especially solutions for SME involvement and cooperation. The results confirm, that a detailed study of entrepreneurs' needs should be included as the main instrument for the implementation and for gaining reliable information on the effectiveness of implemented solutions in the field of innovation support.
Limitations of the study include the subjectivity of respondents' opinions and the relatively small research sample, which may limit the generalization of the results.
Practical implications: The results of the survey indicate the existence in Silesian region of the distance between entrepreneurs and scientists (thinkers and doers), which may result in lessening of effectiveness and willingness of cooperation, without preventive measures on a regional scale. The results also confirmed, the existence of financial barriers for innovativeness activities, especially impeded access to external capital, translating into lost benefits.

Originality/value: The contribution of the research to the development of innovation management process in the region, which is based on a broad process of collaboration with different stakeholder groups. The results provide a contribution to the operationalization of the entrepreneurial discovery process.

Keywords: entrepreneurial discovery process, smart specialization strategy, technological development.

Category of the paper: research paper**.**

1. Introduction

Dynamic changes in the economy caused by the ongoing transformation of the region, blurring of boundaries between industry sectors as a result of diffusion and transfer of innovations, setting new directions of development in the European and global economy and changes in the socio-economic environment enforce openness to the ongoing technological changes (PRT, 2019). Finding niches of competitive activity based on innovation and eco-innovation is the key to increasing the competitiveness of enterprises in a given region and, by extension, improving the competitiveness and development of regions. Relationships and cooperation between different stakeholder groups, especially between entrepreneurs, researchers and consumers, are one of the key features of entrepreneurship, innovation activities and technological development of the region. The need to involve a large number of diverse stakeholders to collaborate on important policy decisions is one of the key aspects of innovation policy (Martin, 2010).

According to OECD (2003), diverse stakeholder involvement in setting up the development priorities is an important trend in most countries. New approaches to decision-making processes include extensive consultation with scientists, political, business and community representatives, undertaken in the interest of increasing transparency and better responding to societal needs. At the level of the region's economic and technological policy-making, there is a particularly important need for strategic collaboration between the regional government and the private sector to overcome development obstacles and take advantage of existing opportunities. This strategic cooperation should form the basis of the entrepreneurial discovery process (Rodrik, 2004; Mieszkowski, Kardas, 2015).

The primary aim of the paper is to operationalize the concept of entrepreneurial discovery in in the development of technological development for the Silesia region. A complementary objective is to obtain a set of recommendations on the role of entrepreneurs in the process of updating the region's technology development agenda, which will enable policy makers to identify and support initiatives and processes of this kind. The theoretical and practical aspects of the entrepreneurial discovery process are presented by recalling a series of definitions and characteristic elements. The Technology Development Program as one of the key policies for

supporting the implementation of the regional innovation strategy is also presented, together with a description of the process of its updating, using the entrepreneurial discovery process.

The paper presents the assumptions and results of the study of entrepreneurial needs conducted in 2017 - 2019 as a tool of identification the areas of advantage relevant for the formulation of innovation development policy in the Silesian region. The results presented in the article refer to one of the technological areas of the Silesian Voivodship, namely technologies for environmental protection. For this area, the logic and scope of entrepreneurial discovery process is presented. The analysis of the results allows translating the concept into the reality of the territory in question. The last part summarizes a number of conclusions that should be considered in the context of the possibility of further implementation of the entrepreneurial discovery process in the region, and also presents the limitations that arise in the research process.

2. Theoretical background

The concept of *entrepreneurial discovery* related to business and entrepreneurship emerged widely in the literature in the 1990s, and comes from Austrian school of economics. Israel M. Kirzner (1997) described entrepreneurship as a process of "systematic exploration of technological, political and regulatory, social and demographic changes to discover opportunities to produce new goods and services", and Ludwig von Mises stated that the person becomes an entrepreneur when he captures an opportunity and fills a perceived gap (Huerta de Soto, 2010; Janik, 2014).

Despite the modification of the basic assumptions through many years of critical discussion, the theory of *entrepreneurial alertness and discovery* has contributed to a better understanding of the phenomenon of economic development (Yu, 2001).

The definition of *entrepreneurial discovery process* (EDP) has been coined. According to Dominique Foray it's a "learning process by which a region gradually discovers which should be their priorities in R&D and innovation linked these to the ability to transform the current economic structure orientated to maintaining a path of growth and employment" (Foray, 2013; del Castillo-Hermosa et al., 2015). At the same time, Foray – one of the founders of the concept of smart specialization, draws attention to the role of the EDP for the implementation of RIS3 strategies (Foray et al., 2012), for which it's the "conceptual pillar" (Capello, 2014). This inclusive and interactive bottom-up process (Foray, 2015) is crucial to understanding the main feature that distinguishes the S3 approach from the innovation strategies of the past. The EDP reconciles the idea that policy takes matters into its own hands, shaping the regional system through priority setting, with the idea that market processes are key in creating information about the best areas for future priorities. Indeed, EDP is an ongoing process in

which participants from different backgrounds (political, business, academic, etc.) discover and produce information about potential new activities, identifying potential opportunities that arise through this interaction, while policy makers evaluate the outcomes and ways to facilitate the realization of this potential (Hausmann, Rodrik, 2003; Markkula, Kune, 2015). What's important, entrepreneurial discovery processes occur in any type of economic sector and thus can be found in any region (del Castillo-Hermosa et al., 2015).

Therefore, the benefits of the process, which include the removal of barriers to cooperation between the private and public sectors, come not only from the end results of the EDP, but also from the process itself (Figure 1).

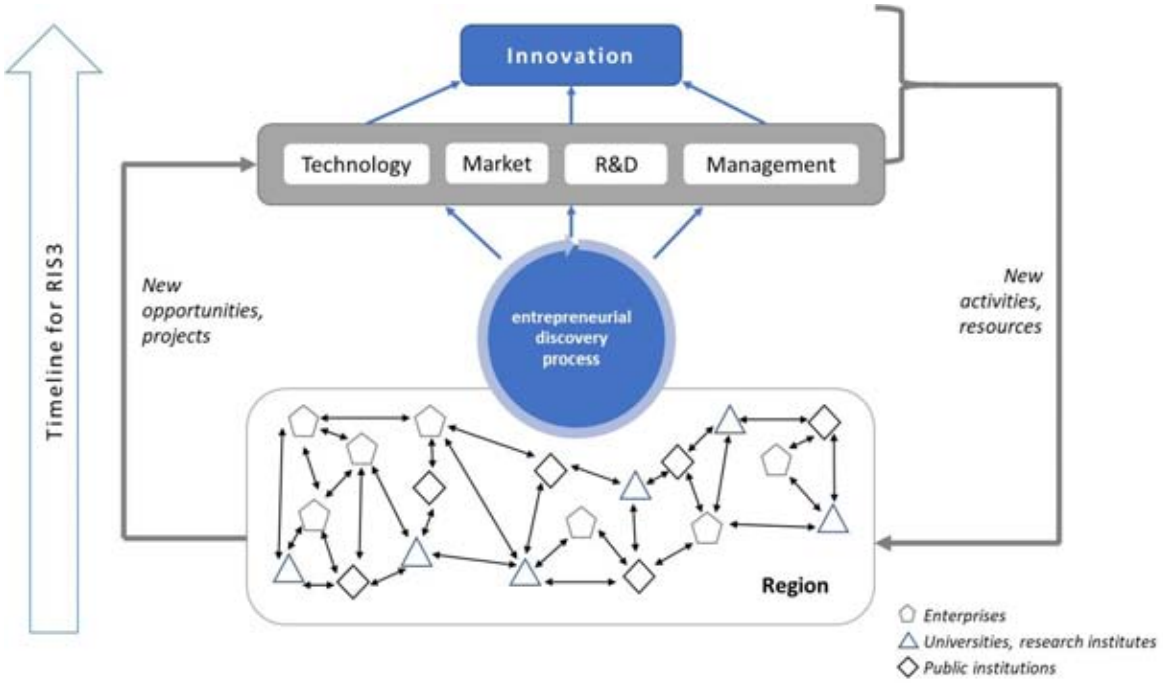

Figure 1. EDP role within region innovativeness. Source: adapted from "In Search of Domains in Smart Specialisation: Case Study of Three Nordic Regions" by A. Mäenpää and J. Teräs, J. (2018).

Therefore, the basis of the EDP must be trust and credibility (European Commission, 2018). In general, many authors highlights the vital importance of the presence of effective institutions and trust and continuous strategic cooperation between public and private actors for the effectiveness of all development processes (Amin, and Thrift, 1995; Rodríguez-Pose, and Storper, 2006; Rodríguez-Pose, 2013; Rodríguez-Pose, and Di Cataldo, 2015). It is important to note that problems related to the institutional side of the process, including excessive bureaucracy, conflicting institutional patterns, lack of stakeholder mobilization, or shortcomings in establishing a shared vision, can hinder or even prevent the entire entrepreneurial discovery process (Sotarauta, and Beer, 2017; Benner, 2019).

In this process, the public administration should, based on the identified needs of entrepreneurs, adjust the instruments of support for the implementation of innovation in such a way that it affects the growth to the development potential of companies, and consequently regions (Foray, 2013). The EDP aims to identify the most promising areas for future

development of the region by stakeholders belonging to different sectors. It is also supposed to demonstrate what the region does best in the field of research, development and innovation. This process directly translates into the creation and implementation of the Regional Innovation Strategy for smart specialization. Effective conduct of the entrepreneurial discovery process requires the integration of the evidence base represented by a set of statistical data and the knowledge of stakeholders – entrepreneurs, scientific and research units, business environment units and representatives of local government in order to effectively identify priorities for national and regional programs to support innovative development activities undertaken by individual entrepreneurs (Czaplicka-Kolarz et al., 2020). The implementation of the entrepreneurial discovery process requires the use of adequate research methods, techniques and tools to identify, monitor and evaluate growth areas with the highest development potential (Charles et al., 2012), which should receive high priority in public support (Foray, and Goenaga, 2013).

The need for extensive dialogue with members of the innovation ecosystem not only stems from the foresight methodology (Gavigan, and Scapolo, 1999; Havas et al., 2010), but also from the fact that individual actors may have relatively limited information about the world outside their immediate environment, and the information and needs they possess are often highly individualized (Schein, 2010). Using a bottom-up approach enables the support system to target real needs (activities and initiatives) leading to smart and sustainable development of the region, where the main rationale is the development of endogenous regional resources and the effective involvement of the private sector in research and innovation. The key to a successful entrepreneurial dialogue is to base the agreement on the selection of priorities on shared assumptions regarding the research and innovation ecosystem (Gheorgiu et al., 2016). At the same time, as highlighted by some authors, the exploratory nature of the entrepreneurial discovery process and the latter's priority-setting objective are potentially fraught with issues of legitimacy (Gheorghiu et al, 2016). Thus, the EDP needs to go beyond the prioritization phase and permeate policy making at different stages (s3platform, 2018), because if the entrepreneurial discovery process is not supported by strategy, policy and implementation tools and does not have a real impact on the distribution of public funds, there is a significant risk that it will remain a "paper" process (Gheorghiu et al., 2016).

The entrepreneurial discovery process has already been described quite extensively in theory, not only in the *Research and Innovation Strategy Guide for Smart Specialization* (RIS3) itself (Foray et al., 2012) and other EU documents (Foray, & Goenaga, 2013; Martinez, & Palazuelos-Martinez, 2014; Detterbeck, 2018), but also in many academic publications (Fiet, 1996; Kirzner, 1997; Charles et al., 2012; Foray, 2013; del Castillo Hermosa et al., 2015; Virkkala, and Mariussen, 2018). However – despite the rich literature on stakeholder engagement in development processes and the growing number of publications on the use of the entrepreneurial discovery process for updating smart specialization and regional development (Toward..., 2015; Mieszkowski, and Kardas, 2015; Dziedzic et al., 2016; Kruczek,

and Deska, 2018, Blažek, and Morgan, 2018), this topic still needs additional research, especially in the context of the specific experience of individual regions.

The *Technology Development Program of the Silesian Voivodeship* (known as PRT) adopted in 2011 is an operational and complementary document to the *Regional Innovation Strategy of the Silesian Voivodeship*. The first edition of the document is a strategic plan of technological development of the region which defines directions of technological development of the region in the horizon of 2020 as well as methods and tools for their evaluation and monitoring. Due to the ongoing transformation of the region, it has become necessary in recent years to review and update the existing *Technology Development Program* so that it responds to new challenges and becomes a basis for programming the region's development in the perspective of 2020+. The technological areas identified in the PRT 2010-2020 document are still represented in the Silesian Voivodeship, but structural changes caused by global trends and national and regional conditions as well as endogenous factors have made it necessary to revise their scope and to try to identify new development niches.

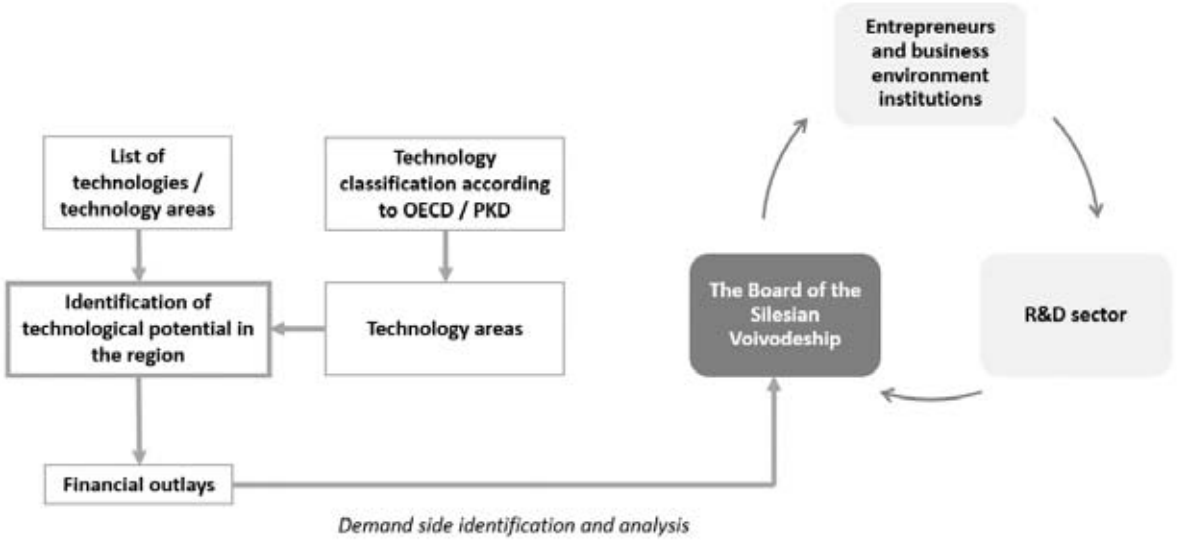

Figure 2. Aspects of assessment of region's protechnological development. Source: adapted from PRT 2011.

The entrepreneurial discovery process carried out in Silesian Voivodeship for the purposes of the PRT update was connected to the methodological approach described in the *Technology Development Program for the years 2010-2020*, which made it possible to assess and update the list of priority technologies and technology groups as well as to indicate new technological areas.

3. Methods

The PRT update has been on based entrepreneurial discovery process, with involvement of the *Network of Regional Specialized Observatories*[1], the Marshal's Office of the Silesian Voivodeship and the leading R&D institutions and business companies, with the use of extensive dialogue activities with stakeholders and actors of the innovation ecosystem from the business sector (Figure 3).

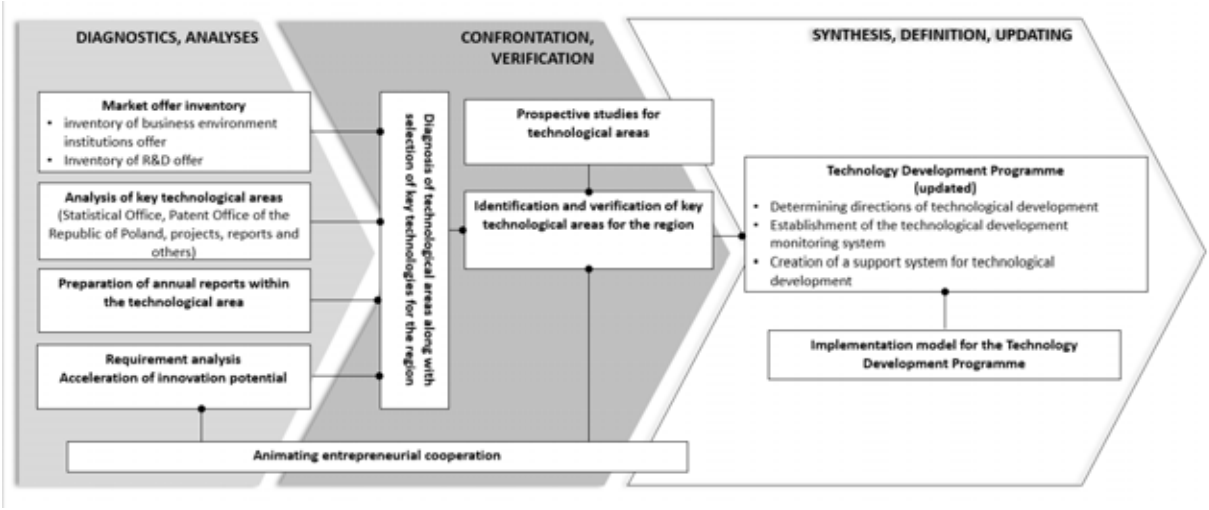

Figure 3. Model of EDP use in the update of Technology Development Program. Source: adapted from PRT 2019.

As a result, *the Technology Development Program of the Silesian Voivodeship for 2019-2030* was developed, with the main objective of identifying the region's potential to strengthen its technological advantage.

The PRT update was carried out in two parallel paths. One of them involved analytical work and research conducted by existing Specialized Observatories in selected technological areas and concerned trends in technology development and the assessment of regional potential and possible gaps. In the same time, experts carried out similar work for technological areas where Specialized Observatories had not yet been established i.e. the technology area of transport and transport infrastructure, and the machinery, automotive and mining industries. Activities involved a broad group of institutions and stakeholders. The Network implemented a number of activities aimed at intensifying the dialogue with stakeholders (i.e., research on the needs of

[1] The Network of Regional Specialized Observatories responds to the specific needs of the stakeholders in the innovation ecosystem of the Silesian Voivodeship in terms of creating a modern mechanism for monitoring the effects of innovative development of the region in particular technological areas. The network brings together research, business and business environment institutions that cooperate to support and improve the management of regional development in the field of regional scientific and technological potential, positioning of key technological areas and evaluation of the effectiveness of activities aimed at creating a regional policy of technological development of the Silesian Voivodeship and strengthening regional specialization, strengthening the adaptive potential of the region, regional market of research services and regional human resources and co-creating a regional network of knowledge and competence exchange.

entrepreneurs and research units) and making an inventory of the market offer of BEIs and the R&D sphere in the region.

One of the technological areas indicated in the PRT are technologies for environmental protection. An entrepreneurs' needs survey was conducted targeting entrepreneurs in this area. In order to create a database of enterprises, the content of web pages, search engines of national economy entities and data obtained from the Marshal's Office of the Silesian Voivodeship and the Statistics Poland, databases of business support institutions, distinctions and awards in contests for innovative companies were analyzed. Purposeful sampling was implemented – with following criteria for selecting companies for the survey were: place of business (Silesian Voivodeship), conducting business in the technological area of environmental technologies and conducting R&D or innovative activities. A representative group of 300 entities from the Silesian Voivodeship was selected and invited to participate in an interview by e-mail. Approximately 11% of companies expressed their willingness to participate in a face-to-face interview – 33 completed interviews were achieved.

The research tool was in the form of a questionnaire developed on the basis of the experience of the World Bank (Toward..., 2015), in accordance with international good practices of research on entrepreneurship and innovation and after an in-depth study of industry literature, adapted to the realities of the region. Questionnaire for studying the needs of entrepreneurs in the direction of technological development of the Silesian Voivodeship consisted of four thematic blocks and introductory part. Each interview began with an outline of the essence and objectives of the process of entrepreneurial discovery in the context of the innovative development of the Silesian Voivodeship by 2030, also the sectors of advantage in the Silesian Voivodeship selected on the basis of quantitative data analysis were indicated. Apart from the questions included in the questionnaire, the expert team asked auxiliary questions which made it possible to specify the information obtained with particular reference to the represented technological area. The respondent's statements were systematically entered into the questionnaire in the appropriate boxes. The duration of the interview was approximately 1-1.5 hours.

The research was preceded by a pilot study, the purpose of which was to verify the correctness of the assumed research procedure and appropriate refinement of the questionnaire content. As a result of the pilot study, changes/additions were made in the scope and type of questions asked in the interview questionnaire according to the conclusions and experiences from the pilot study. This was important to ensure the optimal form of the questionnaire so that it was maximally adjusted to the specifics of the Silesia region and provided as much relevant feedback as possible while being understandable and respondent-friendly.

The responses obtained were processed and generalized using statistical methods – with use of MS Excel and Statistica software. Analyses of descriptive statistics were used and graphical presentations of the collected data were made. The answers to open questions of a qualitative nature made it possible to complement in a synthetic way the results of quantitative studies in

identifying factors conducive to the development of innovation, barriers to its development, and directions of expected public support in this area in the Silesian Voivodeship.

4. Results and discussion

A key element of the study was the issues of innovative activity and innovation management. There is a variety of ways in which innovation has been addressed in the literature (Schumpeter, 1971; Drucker, 1992; Kotler, 1994; Gopalakrishnan, and Damanpour, 1997). Therefore, for the needs of this paper, innovative activity is understood as a set of scientific, technical, organizational, financial and commercial activities, including investments in new knowledge, aiming at the implementation of innovations – new or improved products/processes or their combinations that differs significantly from the unit's previous products or processes (Oslo Manual, 2018). According to the results obtained, R&D activity is an important element of Silesian companies' activity, however, more than 60% of the surveyed companies do not have a formalized R&D department. At the same time, respondents have often indicated that it often functions as a non-formalized working group established when an innovation initiative is launched. In such situations an interdisciplinary team (several to a dozen or so employees) is set up on purpose to perform specific tasks. In the remaining surveyed companies (41%) a formalized R&D department functions. As respondents indicated – mostly these departments have been established relatively recently – in last few years and with few employees.

Innovation activity is a complex process consisting of many elements. The most common element of the innovation process in the surveyed companies is the identification of market needs (over 95%), as well as the identification of innovative ideas (about 90%).

When asked about the most important sources of information on innovation, most often (nearly 90% of respondents) indicated internal resources of the company with particular emphasis on intellectual capital, which consists of specific knowledge, experience in technology/solution creation, professional skills. This is in line with the concept of a knowledge-based economy, which states that the capital of people and the knowledge they bring is the dominant element of a company's resources. Among the surveyed enterprises, 39% (mainly medium-sized enterprises) indicated the functioning of a knowledge management system, which is in line with many literature sources (Perechuda, 1998; Kubik, 2011; Pichlak, 2012; Stroińska, 2016)

An important source of innovation can be the employees' ideas (Stroińska, 2016). In this context, the functioning of a system for evaluating innovative ideas seems to be important. However, 66% of the surveyed enterprises do not use procedures for evaluating innovative ideas. The existence of a system for evaluating innovative ideas of employees and a system of incentives for innovative activities significantly affects the effectiveness of the

innovation implementation process, as shown among other Slovenian regional studies on example of eco-innovations (Hojnik, and Ruzzier, 2016).

Entrepreneurs implementing innovations have to overcome many barriers related to it. Market and financial barriers were indicated as the most significant (50%), which is conditioned by capital intensity of innovative investments at a very high risk level and complicated and unclear legal regulations. About 35% of respondents pointed out that institutional and legal barriers resulting from state policy are equally important. During face-to-face interviews entrepreneurs repeatedly pointed out to threats that occur in innovation processes, identifying them with risk. The risk related to innovations is an underestimated issue in the literature. This is caused by the specificity of innovations, which are most often treated as obvious phenomena or processes occurring in the enterprise (Piśniak, 2017). In the conducted survey, respondents emphasized primarily technological risks (47%), related to competition and customers (44%), intellectual property protection (31%). At the opposite pole, risks related to distributor acceptance (9%) and project organization and management (16%) were indicated (Figure 4). This indicates a high level of entrepreneurs' awareness of the impact of external factors related to technological trends and competitors' activities on the management of innovation processes in the company (Deptuła and Knosala, 2017; Etges et al., 2019). It also indicates developed processes in supply chain management and project execution, which is mainly due to the greater influence that the enterprise may have on these elements.

Figure 4. Sources of risk in innovation processes. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

Another element of the survey were the financial aspects and the effectiveness of obtaining funds by enterprises in the context of their innovative activities. From the perspective of the financial aspects, the research covered enterprises whose revenue in the last reporting period in the majority (77%) exceeded 5 million PLN, and only 7% concerned enterprises with revenue below 250 thousand PLN. Additionally, more than half of the respondents (64%) declared that

total revenue also included revenue from innovative activities, including both implementation of new products and services.

Due to the high risk of realization and implementation of innovative activities and the fact that their implementation is directly related to high capital expenditures, and the return on investment and potential profits often occur after many years (Kokot-Stępień, 2016), companies, in order to reduce the risk, often decide to acquire external sources for financing such initiatives. Innovative activities can be financed both by market instruments including credits, loans, bonds, stock exchange instruments as well as public sources, which include primarily operational programs, allowing for co-financing of projects in the cohesion policy (Zembura, 2016).

As the most attractive external sources of financing for innovative activities, respondents indicated EU subsidies (31%) and EU projects (26%), while bank loans are used significantly less often for this purpose (14%). Also noteworthy is the emphasis on the attractiveness of financing innovative investments with own capital (28%). It is particularly important in the case of activities focused on implementation and commercialization, when entrepreneurs want to quickly enter the market with a new product or service. Such activities are often undertaken when the level of maturity of the innovative solution is sufficiently advanced to be able to carry out the investment without undertaking lengthy procedures of attempting to finance the undertaking from national or EU programmes and dedicated competitions.

At the same time, despite declaring a high level of attractiveness of external sources of investment financing, as many as 50% of respondents have not used public support within the period of three years. This is partly due to the fact that entrepreneurs perceive the process of obtaining co-financing as complicated and time-consuming (41% of respondents did not participate in any competitions in the last 3 years prior to the survey, while 47% of companies applied for external support less than 3 times - not always successfully). According to the respondents, access to external sources of financing is definitely difficult (31%) or rather difficult (28%). Thus, the research has confirmed that one of the barriers to innovative activity is an impeded access to external capital (Ratajczak, and Mądra, 2008). Despite being dedicated to the development of enterprises in carrying out research and innovation activities, it often causes entrepreneurs many administrative and formal problems, often translating into lost benefits.

An extremely important aspect investigated was the approach and experience of companies in terms of cooperation for innovation. The issue of approach to technological cooperation is important for understanding both practical issues in the strategic management of the company itself (Hagedoorn, 1993) and theoretical knowledge about the interaction of actors in the innovation ecosystem in the region (Radicic et al., 2018). Cooperation between entrepreneurs and between entrepreneurs and R&D units is the basis for the development of the economy of many countries and regions. The benefits of cooperation between universities and scientists and business entities are multiple, both on one side and on the other. The literature diagnoses many

advantages of cooperation of different entities for their further, especially innovative development. Among the benefits identified are reduction of costs by exploiting economies of scale and scope (Hagedoorn, 1993; Teirlinck, Spithoven, 2012); sharing of risks and uncertainties associated with innovation (Hagedoorn, 1993; Rese, Baier, 2011); and, particularly important when a firm collaborates with an R&D unit, access to the latest knowledge and technology (Zontek, 2015); the ability to choose buying over manufacturing when transaction costs are low (Williamson, 1985), which accelerates the process of implementing modern innovative solutions and bringing them to market to earn a return on innovation and overcome permissibility problems (Leiponen, Byma, 2009; Rese and Baier 2011), resulting in increased firm competitiveness (Zontek, 2015). At the same time, W.H. Hoffmann and R. Schlosser (2001) state that SMEs underestimate to a large extent some of the factors determining the success of cooperation, such as partnership management and professional management, and often lack the managerial skills and experience necessary to develop and maintain successful cooperative ties. Therefore, improving cooperation between universities and entrepreneurs has become a key policy priority for the European Commission within the idea of the Knowledge Economy: "dialogue and cooperation between business and universities should remain a priority, as should dialogue and cooperation with all sectors of society, so that all partners can benefit from the cultural, scientific and technological knowledge acquired and disseminated in universities" (University Business dialogue..., 2010).

As such cooperation is still less popular in Poland than in Western European regional countries (Zontek, 2015), the analysis of the cooperation approach of Silesian Voivodeship entities is an important element for regional development planning.

The results of the survey showed a very diversified approach of entrepreneurs to cooperation issues. A vast majority of respondents have experience in co-operation, often repeated, with R&D units. At the same time, more than 9% of respondents from the enterprise sector have not cooperated with any R&D unit before, and more than 1/3 of this group does not plan to establish such cooperation in the future. The obtained answers indicate a significant predominance of research institutes (indicated by over 89% of respondents) and public universities (over 79% of respondents) as R&D units, with which the entrepreneurs co-operate most frequently. Respondents also relatively often collaborate with technology parks (nearly 29%), industrial research institutes (25%) and other companies conducting R&D (over 21%).

In addition to the existence of the fact of collaboration, its areas, scope and effectiveness are extremely important (Figure 5).

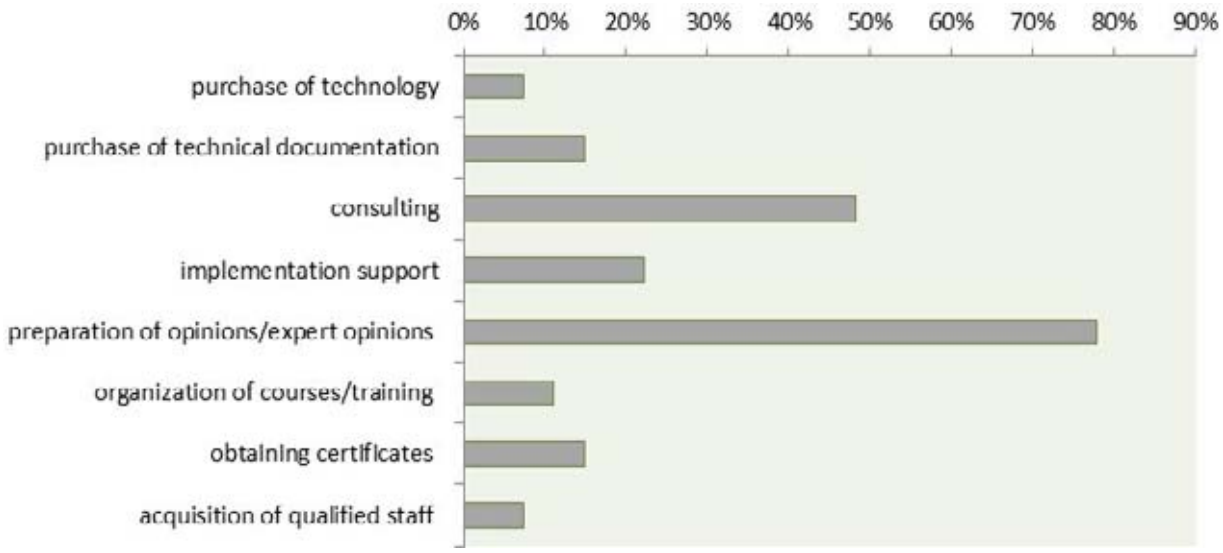

Figure 5. The most frequent areas and scope of cooperation between enterprises and R&D units. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

The most common area of cooperation, indicated by 78% of respondents, is the implementation of research services by R&D units on behalf of companies in the form of expert opinions, analyses and opinions on specific topics. It is worth noting that this form of cooperation based on commissioning expert opinions is most often a short-term form of cooperation, which on one hand allows the companies to cooperate with different units in different subject areas, but on the other hand it is not necessarily related to long-term, permanent forms of cooperation. A popular scope of cooperation is also consulting conducted by R&D units for entrepreneurs. The respondents have indicated both holistic and long-term strategic consulting for building innovative development strategy, as well as short-term consulting for solving current problems or implementing tasks. These conclusions are very important from the point of view of the region's development, because cooperation of the scientific environment and entrepreneurs, whose main objective should be the transfer of innovations, is a key issue for the development of enterprises, consequently for the technological development of the whole region (Wach, 2005).

Awareness of existing or potential difficulties and barriers is extremely important for the development of co-operation between the enterprise sector. Administrative and legal barriers, including particularly difficult and time-consuming procedures (48% of respondents), are the most frequently indicated by entrepreneurs of the Silesian Voivodeship as barriers for undertaking and then conducting effective cooperation with R&D units (Figure 6). The opinion of Silesian entrepreneurs in this respect coincides with the assessments of experts, who indicate excessive bureaucracy in universities and a protracted decision-making process as a significant limitation in Polish conditions, discouraging companies from cooperation with universities and other units of the science sector (Szot, 2019).

Financial barriers were also indicated as significant by 29% of the respondents, although it is worth noting here that the significance of this barrier depends not only directly on the size and financial condition of the enterprise, but also on the level of knowledge regarding possibilities to obtain external funds for cooperative activities for innovative development and the type of implemented innovation.

It is worth noting that both inadequate or outdated knowledge of representatives of R&D units on real problems faced by entrepreneurs (19%) and low level of advancement of technologies that could be offered to entrepreneurs (10%) were indicated as significant barriers, which often translates – according to entrepreneurs (29%) – into the lack of an adequate offer from scientific units (see Figure 6).

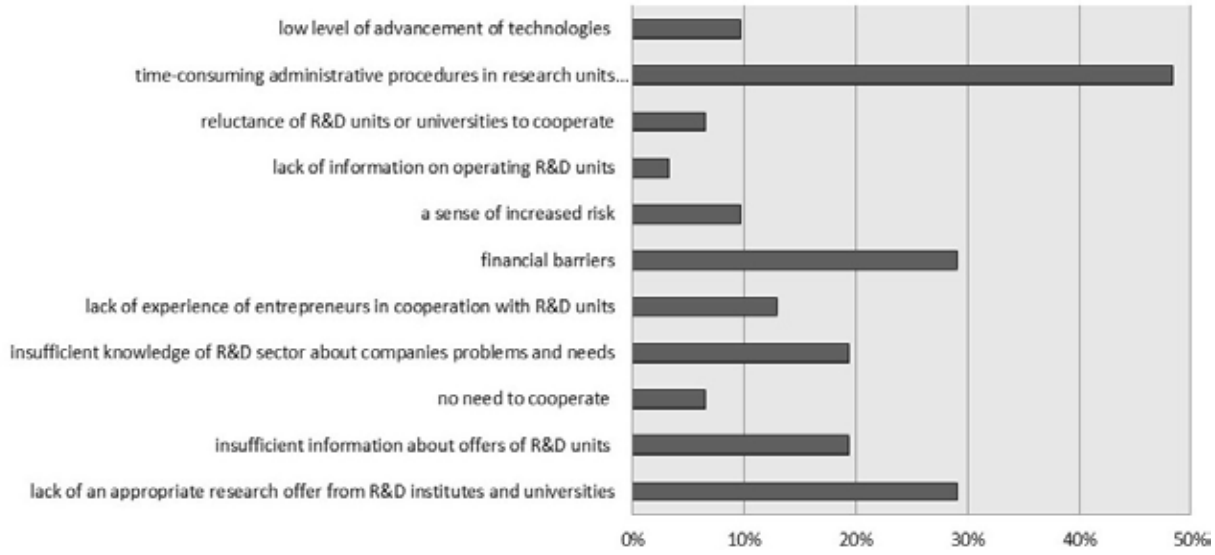

Figure 6. Factors that constitute a barrier to cooperation with R&D units. Own elaboration based on the results of the conducted survey of entrepreneurs' needs. Due to the possibility of multiple choice, the number of answers does not sum up to 100%.

These results confirm the existence also in the Silesian region of problems and distance between entrepreneurs and scientists - similar as in other regions. As a main issues may be indicated: the lack of a "common language" (Whitley, 1988), poor channels of information, and thus the diversity of what is "read" by theorists and practitioners (Van Aken, 2004; Santini et al., 2016). Among the indicated reasons for the reluctance to cooperate or the lack of effectiveness in cooperation attempts on the part of entrepreneurs, we can also note the lack of experience of entrepreneurs (13%), a sense of high risk (10%), or lack of awareness of the benefits for the development of the company resulting from conducting activities in cooperation with R&D units (6%).

Most of the surveyed entrepreneurs have experience in undertaking cooperation in order to create innovations with various partners, including those located in different parts of the value chain. Most often joint activities are undertaken with customers (clients) – as indicated by 68% of respondents – and suppliers – 64%. Much less frequently entrepreneurs decide to cooperate

with competitive entities. At the same time it is worth noticing, that more than 30% of the respondents have never taken actions for the creation, or implementation of innovative activities in cooperation with other entities, be it suppliers or customers.

The survey shows that only slightly more than 57% of the respondents have experience in technological cooperation on an international level. At the same time, a significant differentiation in the scope of experience can be noticed: from experience limited only to consultation with foreign companies on single production processes or products, conducting preliminary activities for future cooperation, or single export activities to foreign markets, through the implementation of joint projects co-financed from EU funds, to long-term cooperation on a semi-technical scale with laboratories located in different countries, joint projects on innovative products with companies from Europe and from the world, or long-term cooperation with foreign R&D units.

To sum up, interviews with entrepreneurs are an integral part of the EDP, creating an opportunity for direct contact with the actors of the innovation ecosystem – entrepreneurs and research units, allowing access to information that is often not available in other ways. A face-to-face interview conducted by an experienced expert with company representatives provides invaluable quantitative and qualitative information - information that is crucial for an effective EDP. The use of audits in monitoring protechnology development is an important part of building evidence-based policy. The effective use of the tool for research and evaluation of innovation and technology potential – i.e. direct interviews/audits – by Specialized Observatories has made it possible to obtain expert support targeted primarily at enterprises and the R&D sphere. The result of these activities is an opportunity, indispensable in the case of business, to search for directions of development, to establish cooperation with scientific and research units and to develop competencies. In turn, in the case of the R&D sector, it facilitates the acceleration of responses to the changing market conditions and better adjustment of the research offer to the actual demand from industry.

5. Summary

A detailed study of entrepreneurs' needs is the main instrument for the implementation of the process of entrepreneurial discovery and for gaining reliable information on the effectiveness of implemented solutions in the field of innovation support.

The use of an entrepreneurial needs survey as one of the elements of the conducted entrepreneurial discovery process was necessary due to the noticeable differences in knowledge, understanding and approach to the development of the regions between administrative authorities/policy makers and actors of the innovation ecosystem, as well as between the scientific community and entrepreneurs (Cavicchi et al., 2014, Santini et al., 2016).

Different authors highlight different reasons for the distance between theory and practice (often referred to as differences between "thinkers" and "doers"), such as, among others, the lack of communication between researchers and practitioners (Thomas, 2007; Van Aken, 2004; Whitley, 1988), which can translate into a lack of understanding of the real needs of doers/entrepreneurs (Santini et al., 2016).

Without preventive measures on a regional scale, including in particular the increase of activities aimed at creating a forum for continuous exchange of opinions and experiences between representatives of both sectors, it may translate into a decrease in effective cooperation in the future. Only up-to-date information from companies will allow the representatives of the R&D sector to respond more dynamically to the changing market conditions and better adjust the research offer to the actual demand from the industry. And it is the expansion of the scope of scientific research conducted in order to adapt it to the capabilities and implementation needs of enterprises, related to the development of research skills of academic staff, that broadens the scale and increases the standards of research conducted by scientists (Nellickappilly, and Maya, 2009).

Therefore, the development of the needs survey process and its dissemination supported by the improvement of competence of the *observatories*' staff and the promotion would allow to obtain information at regular intervals. This information is very important in the decision-making process for the cyclic assessment and evaluation of PRT and RIS. The needs analysis service would also enable development of dedicated support services, increasing commercial effectiveness of cooperation between units.

The main objective of the entrepreneurial discovery process is to identify priorities for national and regional innovation support programs. However, the process itself is also valuable as it helps to convince the public and private sectors towards a single vision of development focused on selected smart specializations and related business and technological opportunities. In this way entrepreneurial discovery process helps to direct limited resources and achieve a critical mass of investment. The entrepreneurial discovery process also contributes to establishing and strengthening contacts and generating knowledge and added value that would probably not have been obtained without such close cooperation between private and public sectors. The process of entrepreneurial discovery in the Silesian Voivodeship means the broad promotion of entrepreneurship. This study presents an approach to the implementation of the entrepreneurial discovery process in the Silesian Voivodeship. It presents a fragment of a broad research related to the field of environmental technologies. A similar process is being realized in other technological areas of the region, and the conclusions are reflected in the decisions made at the regional level in the scope of supporting key areas for the voivodeship – smart specializations. While successful enterprises will constitute a new specialization of the region, the role of policy is to create a flexible strategy focusing on measurable milestones, identifying obstacles and market failures and providing feedback for updating *the Technology Development Program* and *the Regional Innovation Strategy.*

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INNOVATION AS A DETERMINANT OF CURRENT ECOLOGY

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Purpose: authors based on trends, goals, theses and examples of good practices presented in the article focus – both in theoretical and practical dimensions – on striving to identify need to develop eco-innovation as an element strengthening environmental policy in global, regional and national dimension.
Design/methodology/approach: theses presented in the article have been verified using the following methods: literature review, critical literature analysis, document and comparative analysis, and examples of good practice.
Findings: innovations in the field of ecology focus in particular on human activities in two areas. The first is use of existing living and inanimate natural resources resulting from need to maintain life expectancy. In the second area, focus on its protection and care for its duration. Therefore, it should be emphasized that associating innovations with them is extremely important in modern ecology. Striving to create new eco-friendly solutions of an eco-innovative nature both in the sphere of its social acceptance and in utilitarian dimension.
Originality/value: the article enriches, and at the same time develops, knowledge and discussion in the field of defining eco-innovations – and their impact on the lives of communities and individuals. Thanks to knowledge presented in the article, the need to look for solutions that can strengthen the impact of eco-innovation on the natural environment is clearly justified.

Keywords: innovation, eco-innovation, current ecology.

Category of the paper: Conceptual paper, Case study.

1. Introduction

The modern world determined in its development by globalization and, developing its social and economic structure, Industrial Revolution 4.0 notes existential threats in area of natural environment with increasing intensity. It relates in particular to right to life – which,

as Krajewski writes – is realized in environment and through environment. The indicated dependence is conditioned essentially by human – as far as a human being from necessity of his life explores and uses them (Krajewski, 2015, pp. 9-24). This state implies need to increase knowledge about state of environment and possibilities of using its resources. These goals include eco-innovations, which are implemented within framework of global ecological policy, as a particle of innovation corresponding to area of natural environment surrounding man. The importance and relevance of eco-innovation are emphasized by numerous strategies and documents with a global, regional and national dimension – indicating the need for radical protection of the natural environment. The indicated goal is particularly emphasized by the United Nations in the report "A healthy planet, healthy people" (Global forecasts..., 2019). In the report, its authors believe that environmental degradation caused by human activity is progressing so quickly that it may soon threaten foundations of our existence. They emphasize role of decision makers at all levels who must urgently take global action to avoid a catastrophe, or at least, to mitigate its effects. First of all – as authors of the report note – one should strive to reduce CO_2 emissions as well as reduce air and water pollution. The report identifies global threats – a counteraction that is necessary. They include:

- air pollution, which can cause between 6 and 7 million premature deaths by 2050,
- species extinction. It is currently threatened with extinction 42% of terrestrial, 34% of freshwater and 25% of marine invertebrates,
- climate change,
- soil degradation,
- pressure on terrestrial and marine ecosystems,
- urbanization,
- waste of food and natural resources,
- presence of contaminants in freshwater systems,
- increasing population growth.

In one of its many conclusions, UN experts state that ensuring a dignified life and well-being for nearly 10 billion people by 2050 without compromising our planet's ecological limits, it will be one of the most serious challenges and responsibilities humanity has ever faced.

In the European Union, on the other hand, document that best reflects need for environmental protection is "The Seventh General EU Environmental Action Program until 2020 – good quality of life, taking into account the limitations of our planet". The authors of the document set nine key priorities and actions for the EU in the 2020 perspective, which are (https://ec.europa..., 2019):

- protection, preservation and improvement of the Union's natural capital,
- transforming Union into a resource-efficient, green and competitive low-carbon economy,

- protecting Union citizens against environmental problems and threats to their health and well-being,
- maximizing benefits of Union environmental legislation by better implementing it,
- improving knowledge and evidence base of EU environmental policy,
- securing investments for environmental and climate policy and taking into account ecological costs of all social activities,
- greater consideration of environmental issues and greater policy coherence,
- supporting sustainable nature of urban development in Union,
- increasing Union's effectiveness in addressing international challenges in environment and climate.

Assuming that the above priorities will be achieved, EU vision in 2050 is as follows. Citizens enjoy a good quality of life, taking into account ecological limitations of the planet. Prosperity and healthy environment result from an innovative, circular economy where nothing is wasted, natural resources are managed in a sustainable way, and biodiversity is protected, valued and restored in a way that increases society's resilience. Low-carbon economic growth affects consumption of resources, setting the direction for the development of a secure and sustainable global society.

In Poland, environmental policy is fully applicable in Resolution No. 67 of the Council of Ministers of July 16, 2019 on the adoption of the "State Environmental Policy 2030 – Development Strategy in the Area of Environment and Water Management" (Government Monitor..., 2019). The resolution stated, among others, that building an innovative economy while maintaining the principles of sustainable development is a requirement of modern state policy. Sustainable development means stable economic growth associated with rational management of environmental resources and respect for human rights. It is man who is supreme value in State Energy Policy until 2030 by focusing on thematic quality of life, health and well-being of Poles, while ensuring environmental protection, maintaining biodiversity and other forms of animate and inanimate matter. The role of ecological policy is therefore to ensure ecological security of state. Eco-innovations play a particularly important role in stimulating the transition to a circular economy, preventing climate change, protecting air quality, loss of biodiversity or sustainable use of water resources and ensuring their good quality. At the same time, its contribute to increasing competitiveness and economic development as well as strengthening economy's resistance to environmental pressures, improving efficiency of natural resources use and reducing negative impact of human activities on environment. Changing production and consumption modes for more energy-efficient adaptation to climate change and transforming waste into high value-added products will require new technologies, processes and services.

Based on the above provisions, trends, goals and theses in this article, authors, both in theoretical and practical dimension, strive to identify need to develop eco-innovation as an element strengthening global environmental policy, regional and national. In this context, it is worth recalling that ecology, in basic meaning, is study of relationship of organisms with environment in which they live, and relationship between the organisms themselves[1].

2. Innovations – theoretical aspect

The term innovation comes from the Latin word innovatis, which means creating something new. It appeared around 400 A.D. in Latin church as innovatio, meaning renewal – change (Dictionary of Foreign Words, 1980, p. 307). In the 13th century this concept was used in Italian by Machiavelli (innovatore). The starting point for considering the importance of innovation in modern economy is definition proposed by J.A. Schumpeter. He defined innovation through prism of specific situations, among which he distinguished (Schumpeter, 1960): introduction of a new product that consumers have not yet dealt with, or adding new features to product; introduction of a new production method not yet tried out in a given industry; opening a new market, i.e. one in which a given type of domestic industry did not previously operate, regardless of whether market existed before or not; acquiring a new source of raw materials or semi-finished products, regardless of whether this source already existed or had to be created; introducing a new organization structure for some industry, e.g. creating a monopoly or breaking it. Innovations are also defined in theory of economics. In this approach, four types of innovation are distinguished (Stawasz, 1999):

- product innovations – they consist in improving product already manufactured in enterprise,
- process (technological) innovations – changing production methods (or providing services). It can be based on changes in equipment or organizational production sphere,
- organizational innovations – understood as introduction of a new organization method in the field of business practices or external relations of company,
- marketing innovations usually associated with a change in marketing strategy include changes in pricing policy, appearance, packaging, promotion or positioning of product and is based on the perception of the product (service) as new, even if from technological point of view it has not changed significantly.

[1] The word "ecology" is a combination of two Greek words: *oikos* (farm, home, residence) and logos (word, science). It was first used in 1873 by Ernest Haeckel to denote part of biology that deals with relationships between organisms and environment. See Dictionary of Contemporary Terms, edited by A. Bullock et al., Katowice 1999, p. 130.

Innovations are also defined in terms of its impact area, and are divided into: global innovations, regional innovations, local innovations, innovations at industry level, and innovations at enterprise level. In turn, due to the importance of new products, we can distinguish the following two types of innovations: jumping (inventing the light bulb) and linear (subsequent generations of televisions). From the point of view of changes caused by the following innovations are known (Bryx, 2014, pp. 35-36):

- radical (new: products, technologies or business management method),
- recombination (using existing technological, production and organizational solutions to create new products, technologies or management systems),
- modification (they consist of minor changes in existing products, technologies and management systems to improve them).

Anticipating Schumpeter's thoughts, it should be noted that innovation means introducing a new solution to practice. The subject of his considerations are primarily technical innovations and its impact on the economy. Any dissemination of innovation is a separate type of change, known as imitation (Bryx, 2014).

According to K. Kozioł-Nadolna, according to the latest theories, innovations are the result of numerous complex interactions between individuals, organizations and environment, in which these units and organizations operate. The development of theory of innovation and innovation processes indicates a further evolution of these phenomena together with progressing processes in modern economy, which will result in the creation of more complex and reality-matching models of innovation process. One of them is open approach (open innovation, open invention), which is based on various concepts and theories (Kozioł-Nadolna, 2012, pp. 295-303), which was described and developed by H.W. Chesbrough (Chesbrough, 2003). His approach says that in a world of widely disseminated knowledge, companies cannot rely solely on their own research, but should purchase patents or licenses for inventions and other innovative solutions from other companies. In addition, companies should share their inventions, which they do not use, to other entities on basis of selling licenses, creating consortia or more and more popular spin-off companies in Poland. The message of open model is based on the following view – since it is impossible to stop changes on market, you need to learn to profit from it (Sieniawska, 2010).

In turn, in the context of a closed approach to innovation, it is worth noting that it has been characterized according to several of the following principles (Sieniawska, 2010):

- company employs the best employees, the most intelligent people in sector, employees themselves come up with and develop ideas for new products or services,
- enterprise inventing innovations by itself will achieve effect of priority on market, company that first introduces product to market, usually wins,

- company will allocate the most investment funds for research and development (further referred to as R&D – Research and Development) in sector, which will result in the largest number of best ideas, which in turn will lead to position of market leader,
- organization must have control over intellectual property so that competitors do not profit from their ideas.

In the field of economics, another proposal for definition of innovation was proposed by Philip Kotler, who stated that innovation is all seen as new (Kotler, 1994, p. 322). The concept of his authorship was extended by Peter F. Drucker, noting that innovation is a conscious and beneficial change resulting from the needs or systematic observation of environment (Drucker, 1992, pp. 40-45). In this light, innovation can be determined by human activity, which must lead to something new. On the basis of this principle, it can be assumed that one of the most common is the definition according to which "innovation is the process of transforming existing possibilities into new ideas and introducing them into practical application" (Okoń-Horodyńska, 2013, p. 9). In Poland, the word innovation means "the introduction of something new, a newly introduced thing, novelty, reform" (Dictionary of foreign words, 1980, p. 307). Thus, innovative activity consists of all scientific, technical, organizational, financial and commercial activities that actually lead or are to lead to implementation of new words (Dictionary of foreign words, 1980, p. 307; Report on..., 2000).

3. Eco-innovations – an attempt to define

Eco-innovation is a manifestation of economy based on determined knowledge in its development Industrial Revolution 4.0. It notices, among others Dolińska, writing that changes taking place on a global economy scale point to its evolution towards a knowledge-based economy in which knowledge is constantly developed and its practical use in innovations (knowledge products) implemented in the organization's activities and in markets (Dolińska, 2009, pp. 53-54). In this light, when looking for an explanation of term eco-innovations, it is worth emphasizing that one of its first definitions was given by M. Carley and P. Spapens, who defined the eco-innovations as "intended conduct characterized by entrepreneurship, covering product design stage and integrated management during its life cycle, which contributes to pro-ecological modernization of industrial age societies by taking into account ecological problems in development of products and related processes" (Carley et al., 2000, p. 159). In their perception, eco-innovations determine integrated solutions that reduce resources and energy expenditure, while increasing the quality of products or services.

In other terms, ecological innovation is creation of new and affordable competitive goods, processes, systems, services and procedures that meet human needs and increase quality of life – while minimizing exploitation of natural resources over their life cycle (materials, including

energy and surface area) per product unit and minimum emission of toxic substances (Stępniak-Kucharska, 2012, pp. 293-319). In turn, reaching for definition developed by the Central Statistical Office, eco-innovations are considered to be a new or significantly improved product (product or service), process, marketing or organizational method that brings benefits to environment compared to alternative solutions (Oslo Manual, 2005). The Organization for Economic Cooperation and Development, on the other hand, emphasizes that the term innovation fully fits into the concept of eco-innovation, but only if it is extended by two areas of influence. The first is an innovation that reflects concept of a clear focus on reducing environmental impact when such an effect may or may not occur. In the second approach, it includes innovations in social and institutional structures (Michalski, pp. 1-22).

Eco-innovations also have their own and unique typology. In the literature, term eco-innovations is classified according to the following types (Eco-innovation, 2019):

- resource stream innovations,
- eco-innovation products and processes,
- organizational eco-innovations,
- marketing eco-innovations,
- eco-innovations with a social dimension.

Each type of eco-innovation is different and has distinctive features. Ecological innovation of resource stream mainly focuses on material and energy flows that take place in the product life cycle, and their goal is to reduce material, water and energy consumption of processes related to product design, services, development, implementation and development of products related to him. At the same time, reduction of absorbency towards resources should simultaneously stimulate improvement of life quality. The indirect goal of this type of innovation is to determine changes at mental and behavioral level, consisting in transition of society from model of excessive consumption, which generates too much burden on environment by, among others, excessive waste towards closed circulation of matter, elimination of waste and reduction of overall material consumption (Prystrom, 2013, pp. 81-90). In turn, eco-innovation products are associated with launch of products or services on market that were determined at design stage by the direction of impact, which is maximum reduction of the negative impact of product/service on environment (e.g. passive residential buildings). However, the characteristic features of eco-innovation processes are the lowest risk and the largest savings in financial terms. This type of eco-innovation is characterized by a process of reducing material, water and energy consumption in production process and at distribution stage. It is worth noting that eco-innovation processes in different sources are defined differently, e.g. cleaner technology, zero emissions, material efficiency, zero waste. The indicated terminology is shaped by strategic goals of an innovation-oriented enterprise, elimination of ecological threats, increasing productivity of used resources, acquiring new sources of raw materials and its effective use, creating modern technologies with high efficiency and developing new materials with high quality features such as strength, flexibility, reliability

(Karlikowska, 2013, pp. 87-90). Organizational eco-innovations are another type. They consist in introducing new management methods, systemic solutions such as certified management systems according to ISO 14000 or EMAS standards, or systemic tools such as LCA – life cycle analysis, as well as introducing solutions on a wider, sectoral scale, e.g. business networks, clusters, cooperation platforms. This type of eco-innovation is characterized by a socio-economic dimension due to its links with organizational learning processes. In this light, it is worth noting that implementation of system environmental management has essential importance for creating a value chain in enterprise, because it integrates aspects of environmental protection in every decision-making process, starting from product design, through marketing action plan, delivery concept and logistics to sales system (Chrzanowski, 2015, pp. 68-92). The briefest definition has marketing eco-innovations that focus on areas related to product packaging, product placement, promotion, price policy. The last of the described types of eco-innovations focuses on social issues. Is defined as new solutions to social problems, more effective, efficient and more durable than previously used, whose values benefit entire community, not just an individual. In this context, two main features of social innovation are noted in the literature. The first feature is their goal, which is to create social change and added value for society, not commercial innovation and profit. In turn, the twitching feature is participants of eco-innovation process, which are not only enterprises but also public institutions and non-governmental organizations (Nowakowska, 2011).

In view of the above theses, definitions and goals related to eco-innovation, it is worth emphasizing that they are a special area of interest of European Union recognized as the "key" to its competitiveness and innovation. In this context, eco-innovation is any innovation that leads to achievement of sustainable development by reducing negative impact of production activities on environment, increasing the nature's resistance to load or ensuring greater efficiency and responsibility in natural resources use. In other terms, eco-innovation is defined by its application. This definition is dominated by eco-innovation conducive to development of new processes, technologies and services, thanks to which enterprises become more environmentally friendly, facilitating the optimization of the potential for economic growth, while at the same time enabling to take on challenges such as climate change, scarcity of natural resources and biodiversity loss. When the development opportunities factor is taken into account, eco-innovations are the main development determinant of enterprises. Their use implies reducing costs of doing business, allows to take advantage of new development opportunities and positively shapes company's image. The above theses and directions of perception of eco-innovation in EU determine need to accelerate process of practical implementation of good ideas in the field of eco-innovation as well as industrial development, eliminating economic and legal barriers, as well as promoting investment and stimulating demand and disseminating knowledge in this field (Eco-innovations..., 2019).

Contrary to the theoretical utilitarian approach, term eco-innovations refers to all forms of innovation – technical and non-technical – which create opportunities for enterprises and bring benefits by preventing or reducing negative impacts on environment, or by optimizing use of resources. Eco-innovations are closely linked to way we use natural resources and how we produce and consume, as well as concepts of eco-efficiency and eco-industry. They favor transition of production enterprises from "end of pipe" technology to "closed circulation" solutions that minimize flow of materials and energy by changing products and production methods, bringing a competitive advantage to many enterprises and sectors (Eco-innovations..., 2019).

Due to reference of eco-innovative characteristics to other types of innovations, it is worth noting that they are equally complex and multidimensional. Considering this type of approach to eco-innovation shows that they are more than just an instrument for implementing sustainable development.

4. Information as the basic factor shaping eco-innovation functionality

In modern managed enterprises, information is considered as fourth factor of production next to land, labour and capital. In a different approach, information is treated as third, next to energy and matter, fundamental quantity with a decisive impact on society, on forms of its cohabitation and cooperation (Ansoff, 1985, p. 28). Referring indicated regularities to eco-innovation issues, it seems that a properly shaped system of obtaining and transmitting information about eco-innovation and its surroundings will create a kind of mechanism of coexistence and relations between these areas. It seems that looking at the processes caused by eco-innovations in surroundings only from position of obtaining and transmitting information is far from sufficient. This position mainly determines environment in which changes are taking place today which are important for organizations functioning, especially economic ones. Their impact is not due to fact that they occur quickly and are hardly predictable or unpredictable. These include (Ansoff, 1985, p. 28):

- globalization processes and, consequently, need for enterprises to operate on international market,
- intensification of competition (also in an international context), leading to a focus on customer needs and relationship: results – outlays,
- disappearance of many existing markets and creation of new ones,
- emergence of new organizational forms, which are a consequence of, among others functioning of enterprises as a network, numerous mergers and alliances, which results in organizing work in form of multi-task teams, bringing together people with

interdisciplinary knowledge and skills, independent and creative people, and also leads to decentralization and flattening of organizational structures,

- fast pace of development and implementation of new technologies and operating techniques, which results in increasingly shorter product implementation cycles and short life cycles,
- activity of individual stakeholders groups of striving to meet their needs.

The changes take place in all aspects of eco-related activities, occurring in civilizational, cultural and socio-economic area. The increase in its novelty and speed, as well as the increase in intensity and complexity of environment means that it is referred to as turbulent (Ansoff, 1985, p. 28). It is also becoming more extensive, diverse, unstable and comprehensive (Bolesta-Kukułka, 1993, p. 174). Assuming that decision-making processes are shaped by dynamic – even "turbulent" – environment, coexistence mechanism should fit into dimensions indicated and make relations between eco-innovation and its environment dependent on these dimensions.

In this context, question arises as to what information should be essential content shaping the indicated mechanism? It seems that factors determining the ability of eco-innovation to shape the indicated mechanisms - characteristic of creative thinking about indicated relationship – will be:

- an appropriate level of information aggregation in line with existing relationships between eco-innovation and its environment,
- an appropriate level of information aggregation in line with expectations of environment,
- ensuring by information increased knowledge in eco-innovation,
- ensuring through information that eco-innovation can effectively respond to challenges it faces.

In the light of theoretical considerations on meaning of information, ensuring its expected quality is only part of a broader process shaping mechanism under discussion. The information obtained should have a deeper meaning in the decision-making process, especially in the context of accuracy of the described (diagnosed) phenomena and processes related to eco-innovation. It is equally important to give acquired information importance of effective use in achieving utilitarian goals. Acquired, collected, ordered and aggregated information should guarantee its practical application. Allow identification and analysis of trends, forces, events and phenomena that may be fundamental importance for building and functioning of coexistence mechanism and occurring between eco-innovation and its environment (Majerska, 2015, pp. 26-38). This function seems to be considered a key challenge.

In the light of the above theses, it is worth noting that, as shown by numerous scientific studies – as well as practical experience – it is now recognized that key capital of an organization is knowledge and its skills, primarily ability to respond to changes in surroundings. Bartlett and Ghoshal even state that in today's highly a competitive, driven by

new technologies, world unique potential, which is a key barrier to development and achievement of strategic goals of companies and organizations is the lack of specialized knowledge and experience that responds to changing surroundings and potential in area of organization and management, which creates basis for their use in implementation company goals and mission (Barlett et al., 1989). In turn, Naisbitt claims that while in traditional understanding of strategic resource capital was material in terms of material, i.e. traditional production factors, current formula of this resource exposes three elements, which are information, knowledge and creativity (Naisbitt et al., 1985). On the other hand, the Strategy for Responsible Development, which documents the directions of Poland's development until 2020 with a perspective by 2030, notes that responsible and sustainable development shapes national economy strength and guarantees innovation growth. The sustainable development of national economy supported by innovations forms foundation for capital that young people will be able to multiply. Huge significance in these processes is attributed to human innovation, which will determine national economy strength, which will result from situation on the labour market shaping purchasing power of Polish zloty, thereby shaping Poland's position in competitive global markets (Strategy..., 2017). Still differently perceives these phenomena Nonaki, who believes that key source of competitive advantage in both labour market and enterprise is knowledge. In his opinion, changing economic situation shaping situation on the markets, dynamically changing and emerging innovative technologies, and developing competition result in disappearance of products within one day. In such conditions, successes are achieved by enterprises and organizations operating on the basis of updating and developing their knowledge, including it in all processes occurring in enterprises and organizations and based on them strive to create new technologies and products. Such activities are defined as markets, including knowledge-based enterprises whose sole purpose is systematic innovation (Nonaka, 1991).

By creatively anticipating concept of coexistence and relationships between eco-innovation and its environment, it seems that key need is to consider its maximally wide spectrum of impact – taking into account previously indicated goals focusing on areas of society, economy, environment and infrastructure. Given the above relationships, it seems that developing a model for gathering information on relationship between eco-innovation and its environment will require an alternative to existing interdisciplinary approaches.

5. Eco-innovations - good practices

The general characteristics of information indicated in the article – in relation to eco-innovation - should create premises guaranteeing desire to stimulate and maintain harmony and balance between goals of eco-innovation and its environment – in social, economic,

environmental and infrastructural dimensions. In this context, it is worth pointing out good examples of seeking – aforementioned – harmony and balance between eco-innovation and environment (Eco-Innovation..., 2018).

One such example is a project implemented in Czech Republic relies on regeneration of acetone as a new input material. The project is implemented by LINDE Witkowice[2]. In accordance with requirements of quality and safety in area of environmental protection set out in its own policy, LINDE Vitkovice has developed an innovative recycling method thanks to which acetone is effectively and ecologically reused as a raw material and material. Every year, LINDE Vitkovice restores 106 tones of contaminated acetone to its reuse – eliminateing huge amounts of hazardous waste from market. Thus, due to waste management and environmental protection, recycled waste is not transported, mixed with other waste or stored. In the light of example described, it is worth noting – on the basis of European policies – that many companies from Small and Medium Enterprise sector still do not realize that eco-innovativeness is associated with numerous economic benefits. Due to the perception of eco-innovation in terms of economic benefits, definition of activities for protection of natural environment in terms of costs is significantly reduced – in extreme scenario, ignoring need to take such actions.

Another example are German practices related to deposit system for the multiple use of coffee cups. The system operates in 23 cities and 850 cafeteria objects and is based on deposits of coffee drinkers in amount of 1 Euro. As a result of deposit payment, customers receive a discount buying coffee, they can return coffee cup to wash and resell at any time a partner cafe. The effect of using system is replacing with one deposit cup nearly 500 single-use cups. It is estimated that 2.8 billion ready-made disposable cups are consumed annually in Germany, resulting in paper consumption of 43,000 trees, 110,000 tones CO_2 emissions, 40,000 tones of waste and 1.5 billion liters of water. In contrast, reusable deposit cups do not contain harmful substances and can be reused up to 500 times.

An interesting example of good practice is Italian start-up focusing on production of textiles from citrus waste. Based on developed solutions, the process of extracting cellulose from "pastazzo" (citrus fruit residue) and method of yarn production have been patented in Italy. The final product of this process is a biodegradable material, imitating silk – created in 100% in form of soft, light and delicate to touch citrus fabric. This is an extremely important measure that significantly reduces costs of Italian entrepreneurs related to utilization and illegal removal of citrus waste. The scale of the problem is production in Italy of 700,000 tones of citrus waste in a one-year cycle.

[2] LINDE Witkowice is a plant in Usti nad Labem. Mainly supplies complete acetylene cylinders and cylinder bundles. It performs periodic tests and refurbishment of technical gas cylinders as well as full ecological utilization of rejected acetylene cylinders.

British eco-innovation in the form of re-recovery of residues from used paints is a very original solution. It is estimated that on average one can of households in United Kingdom uses 17 cans of paint, which in country corresponds to 50 million liters of paint used per year. Recovered paint residues are distributed at affordable prices to diverse social recipients (such as sports clubs, amateur theater groups, art groups, etc.), construction companies, social housing associations, tenants and low-income people. Resource Futures, an environmental consultancy, owned by employees, operating on a non-profit basis and sponsored by global paint manufacturer Dulux, recovers unused paint. As a result of actions taken – based on its own system developed – company intends to recover and redistribute more than 1.5 million liters of paint in 2020.

The examples of good practices described above indicate that important development determinants in field of eco-innovation are, among others:

- international cooperation,
- local authorities and communities cooperation with eco-innovators,
- public-private partnership,
- cooperation of enterprises with research units (R&D),
- cooperation between world of business and science,
- modernizing existing solutions,
- readiness to take economic risk,
- combining new technologies with sustainable development,
- creating products that strengthen impact of enterprises on society and environment in dimension of clean technologies,
- investments in experimental laboratory work,
- creativity and persistence of eco-innovators in pursuit of adopted goal,
- proper recognition of the demand for eco-innovations due to socio-cultural conditions of their recipients,
- proper promotion of eco-innovation, e.g. through instrumental campaigns.

In the context of good practices described above, it is worth noting the report Implementation of Sustainable Development Goals in Poland adopted by the Government of Republic of Poland in 2018. In the report, it is emphasized that in environmental dimension Poland is seeking to improve the state of environment and sustainable resource management. The goal of the state is to increase available water resources and achieve high water quality, rational management of natural and geological resources, as well as effective waste management. Improving air quality in Polish cities remains a priority. We focus on cooperation, partnership and shared responsibility of public entities, business and citizens for development processes. The expression of this is leaving from administration system in favor of co-management and sharing responsibility for success of transformational changes. The key is to build social dialogue around the most important projects as well as broad social support and trust between public entities and their partners to achieve development goals (Implementation of Balanced Objectives..., 2018, pp. 10-11).

6. Eco-innovations – good practices examples from Silesia Voivodeship

In accordance with Śląskie 2020+ Silesia Voivodeship Development Strategy, development and innovation activities in voivodeship should be aimed at "maintaining voivodeship on a path of lasting and balanced development and increasing region's competitiveness" (Strategia ŚLĄSKIE 2020+, 2013). Among innovative activities, activities aimed at ensuring ecological security for voivodship inhabitants of through development of services, transfer and application of environmental protection technologies are extremely important (Lorek, 2011).

Examples of organizational eco-innovations in institutional nature in Silesia Voivodeship are cooperation platforms, informal groups and networks established to deal with pro-environmental activities, such as, for example, ecological clusters. The strong region economy, as well as quite high business activity in R&D sphere, create very favorable conditions for development of clusters in region (EOCIC, 2019). At the same time, intensive development of cluster initiatives in recent years, often based on cluster development support programs, does not always translate into further activity of these cooperation networks in later years, after project implementation has been completed.

In voivodeship, technological clusters dominate (e.g. Euro-Centrum Cluster of Energy Saving Technologies, supporting energy-saving and passive construction, or Polish Wood Cluster, focused on wood industry and biomass production and use), although there are also clusters of knowledge (e.g. Cluster "3x20", aimed at implementing EU energy and climate package "3x20") or typically business, such as Silesian Water Cluster, aimed at sustainable water and sewage management (Dubiel, 2016). Clusters existing in voivodeship are characterized by various legal forms (some operate as corporate agreements, others in form of associations). Most ecological clusters are young structures in initial phase of innovative development (e.g. Silesian Water Cluster, Polish Wood Cluster) or in growth phase (e.g. "3x20" Cluster).

According to specialist reports for technological area of "Technology for Environmental Protection" implemented as part of the "Regional Specialist Observatories Network", Silesia Voivodeship, due to number of innovative enterprises and research and development activity, has significant potential in developing eco-innovation, in particular technological, and moreover, number of scientific and research units focused on implementation activities as part of cooperation between science and industry is increasing. (Raport Specjalistyczny, 2018).

An example of an eco-innovative solution is BioCargo, which is a device for analyzing activated sludge physiological state and sewage toxicity, as well as transporting environmental biological samples. This device was developed by scientists from Central Mining Institute with a view to maintaining high quality wastewater treated by biological wastewater treatment plants and determining its proper functioning by analyzing activated sludge physiological state and assessing sewage toxicity, as well as initial diagnostics during commissioning, service and

repairs in these facilities, which is a response to difficulties of many wastewater treatment plants related to maintaining a constant quality of treated wastewater and assessment of proper treatment plant functioning (https://biocargo.eu/, 2018).

Another interesting example of technological eco-innovation is comprehensive technology of renovating wells and sewage chambers, combining use of thin-walled GRP panels from Aquaren Panel System (APS) and renovation of connections and ducts using sleeve hardened by BlueLight LED system. This technology was developed jointly by Aquaren Sp. z o.o. and Kraso-Tech GmbH (Wilińska, 2017). As in existing technologies, sleeves for renovation of network were hardened chemically or by introducing water at 800^{o}C, use of this technology reduces consumption of both water and energy to heat it, which translates into reduced impact on environment.

An interesting example of developed eco-innovation process is separating components forming laminate layers, i.e. polyamide (PA) and polyethylene (PE) from post-production waste of food packaging foil, developed by scientists from Silesian University of Technology. By using a selective solvent for separation that only dissolves polyethylene layer, polyamide is separated by hot centrifugation, and polyethylene is recovered by precipitation from solvent by cooling followed by centrifugation. This technology allows recovery of raw materials from waste of PE-PA and PE-PET laminates used in packaging industry (cuttings, etc.), which allows reducing waste stream. The developed technology is at technological readiness level TRL 4 (Piotrowski et al., 2018).

The above examples indicate that market of environmental technologies in Silesia Voivodeship is developing rapidly, and developed solutions are largely implemented, which proves the high demand for this type of technology in voivodeship. Due to region specificity, many of eco-innovations developed and implemented in voivodship are mainly focused on a more sustainable use of environmental resources.

7. Conclusions

The overall content presented above focuses in particular on human activities in two areas. The first is use of existing living and inanimate natural resources resulting from need to maintain life expectancy. In the second area, focus on its protection and care for its duration. In these two activities – it seems – that two determinants shaping its development are of particular importance. The first is to follow key principles for environmental policy in these activities, which include:

- sustainable development principle,
- integrating environmental policy with sectoral policies principle,
- equal access to natural environment principle,

- regionalization principle,
- socializing environmental policy principle,
- "polluter pays" principle,
- prevention principle,
- precautionary principle,
- using the best available, economically justified techniques and technologies principle,
- subsidiary principle.

Eco-innovation is another determinant. It is particularly evident in undertaken actions of a forward-looking nature that respond to changes in environment surrounding changes in good practices. In the light of this thesis, eco-innovations are the basis for transformation of circular economy. They include innovation in way products are designed, manufactured, used and reused recycled. From a design perspective, they focus on aspects such as modularity, multifunctionality, ability to reproduce, and longevity. On the other hand, in business terms they refer to models integrating service offers, including: product handling systems, dematerialized services, joint consumption and resource management (Eco-Innovation..., 2018).

However, it should be noted that there is no universal solution for all products and services and circular economy. Therefore, in the final conclusion it is worth emphasizing that optimal matching of environmental policy with innovations is extremely important in achieving set goals. Striving to create ecologically new eco-innovative solutions both in sphere of its social acceptance and in utilitarian dimension.

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DEMOGRAPHIC CHANGE AND AUTOMATION AND THEIR IMPACT ON THE LABUOR MARKET. NATIONAL RESEARCH RESULTS

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Purpose: the main aim of the article is to determine whether demographic changes and automation threaten the development of the labor market.
Design/methodology/approach: theses and research questions presented in the article were verified by means of qualitative research conducted among representatives of national trade union organizations.
Findings: the conducted research and analyses show that breaking the mental barriers to demographic changes and automation in order to strengthen their acceptance may play a decisive role in creating the development of the labour market.
Originality/value: As evidenced by numerous sources cited in the text, the pursuit of development – in the phase of demographic change and the dynamic growth of automation – directly leads to economic growth in the dimension of both the state and local communities – favoring the social dimension of the individual and strengthening the human feeling of fullness of life.

Keywords: demographic change, automation, labour market.

Category of the paper: research paper.

1. Introduction

When analyzing the impact of demographic changes and automation on the labour market and education, it is worth noting that according to demographic projections, by 2030 the number of people of working age in the European Union will drop by almost 21 million. 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 and Poland in the area of the labour market and education. The demographic change indicated above determines important processes on the demand and supply sides of the labour market. As forecasts indicate, the result of the indicated change may

be a systematic decline in labour supply and, above all, an increase in the demographic burden ratio. According to forecasts, by 2060 the demographic load will increase significantly (compared to the base year, i.e. 2014 it may be even more than twofold). In turn, over three times – as forecasts indicate – may increase the burden of older people in the country (Kiełkowska, 2013, p. 6). The indicated process will have a huge impact on the quantitative and qualitative dimension of the labour market and education at every level of education.

In turn, in the context of automation, taking into account the future, it is worth emphasizing that scientists involved in research on artificial intelligence from the Universities of Oxford and Yale forecast that in 45 years machines will outrun people in all aspects of intelligence, and in 120 years all work will be automated, which will be done by man. In this light, it is worth asking the question whether automation will solve all existential problems in the future, and man will devote himself exclusively to consumption and pleasure. Will it lead to a global catastrophe in which machines take over the world, becoming ubiquitous, having the ability to learn, which will ultimately lead them to turn against man. Today, in view of the indicated megatrend – in globalized and automated economies determined in their development, among others demographic change – knowledge, which is exemplified by the knowledge society, creating competitive and innovative solutions, has become a key capital. It seems that the automation process, which is inevitably associated with the deepening phenomenon of demographic depression in the context of increasing competitiveness of economies, will determine the need to permanently raise the level of education, competences and create and master new knowledge.

Based on the above theses, an analysis of the survey results in the area of demographic change and automation was undertaken.

2. Discussion of the results

In the context of assessing the impact of demographic change and automation on the labour market, respondents were asked a total of ten questions. These were questions aimed at diagnosing the impact of demographic change and automation on the current and future situation of the domestic labour market; along with an attempt to determine the direction of their development. Surveys carried out using the CAWI technique – i.e. an online expert interview questionnaire (Batorski, 2006, pp. 99-131). As it has already been noted, the questionnaire contained 10 source questions and 4 metric questions, including questions with the indicated cafeteria of answers, whose construction was based on the Likert scale (Babie, 2005, pp. 281-182).

Research focused on the following cognitive areas:

- family changes from the "bourgeois" model to the "task–oriented" one,
- assessment of activities in the area of contemporary active social policy and the labour market and their importance for minimizing the effects of demographic changes,
- assessing the level of significance of factors determining demographic change,
- assessing the chances of reversing trends in demographic change – in particular, declining young people and aging populations,
- assessment of cultural and social processes that can most dynamically shape the future structure of the population living in Poland,
- the impact of automation in various areas of the economy on the domestic labour market in terms of opportunity or development barrier,
- assessment of the effects of the automation of industrial processes in the context of rising unemployment and the creation of new and better–paid jobs,
- job loss as a result of automation processes,
- the impact of automation on the disappearance of employment in some industries and professions, and on the allocation of employees to new jobs and tasks,
- the impact of automation on the creation of integration, openness and visionary solutions or reality in which man becomes a lonely, passive, immersed and lost being in the virtual world.

A targeted sample was used in the research, which was created by representatives of social dialogue institutions, employees and trade union activists derived from the "KADRA" Trade Union Agreement and the Trade Union Forum, including:

- Social Dialogue Councils,
- Provincial Councils of Social Dialogue,
- Labour Market Council,
- Voivodship Labour Market Councils,
- Poviat Labour Market Councils,
- Monitoring Committees,
- tripartite commissions,
- employees and trade union representatives who can stay in the future, active participants in social dialogue.

The key criterion for selecting a targeted sample was the following characteristics of the respondent: higher education, extensive life and professional experience, recognition in their socio–professional environment through their profession and social roles and, directly or indirectly, creation of labour market policy through the institutions of social dialogue.

The research tool was piloted on a sample of five randomly selected respondents. As part of the pilot, the following elements of the questionnaire were verified:

1. technical correctness: analysis in terms of transition rules, logic and order of questions asked, instructions for interviewers, etc. (technical notes),
2. linguistic correctness: analysis in terms of complexity and logic of sentences, intelligibility of the vocabulary used and abbreviations (linguistic and editorial comments),
3. substantive correctness: analysis of selection (relevance, legitimacy, completeness) of questions (e.g. control ones) and indicators (cafeteria) for closed questions (substantive remarks).

Based on the remarks and opinions obtained in the pilot, the structure of the questionnaire, questions and cafeteria was clarified and the questions in terms of language were standardized and standardized response categories were used. As a result, a research tool was obtained that was technically, linguistically and substantively correct. This tool was used for actual research as a source of research material for analysis.

The respondents expressed their opinions, choosing "Yes" or "No" or "Other" and based on an extensive rating scale, by level of importance: very large, large, moderate, small, does not matter. In order to achieve proper categorization, the research used an approach in which the answers with the indication of very large and large significance and the answers with the indication of medium, low and not significant were added together.

A total of 272 respondents were invited to participate in the study, of which 211 accepted them. This was the final group of respondents. Due to gender, women in the studies accounted for 26.1%, men 73.9%.

At the outset, in the light of the regularities and forecasts indicated in the introduction to the article, the first question in surveys in the area of demographic change focused on the assessment of the following thesis. In the country there is a radical reevaluation of the family. Instead of investing in the future of their children, parents focused on self–realization. This changes the family model from "bourgeois" to "individualized". A total of 211 study participants answered this question. The distribution of answers according to the following percentages: the answer "Yes" 46%, "No" 52% and "Other" 2% does not determine the acceptance or negation of the thesis presented in the question.

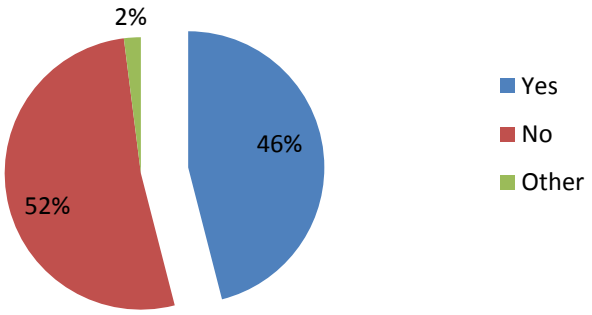


Figure 1. Is there a radical reevaluation of the family in the country? Instead of investing in the future of their children, parents focused on self–realization. This changes the family model from "bourgeois" to "individualized".

Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. In the case of women, the answer "Yes" was at the level of 58%, the remaining 42% focused on the answer "No". Among men, the distribution was 57.9% "No" and 42.1% "Yes".

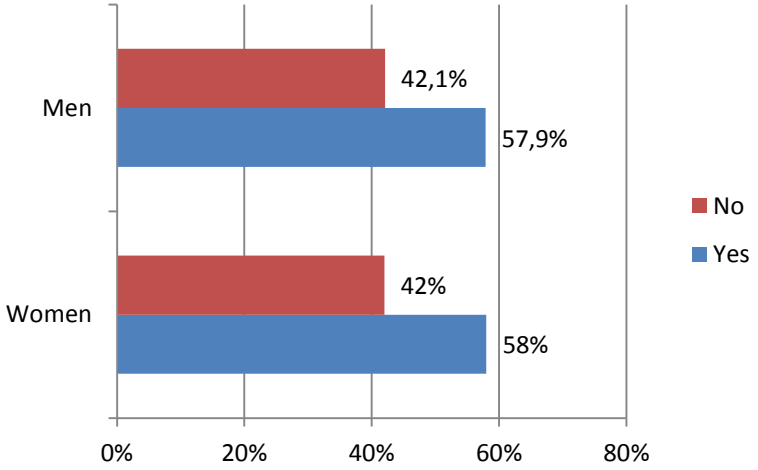


Figure 2. Is there a radical reevaluation of the family in the country? Instead of investing in the future of their children, parents focused on self–realization. This changes the family model from "bourgeois" to "individualized". Answers by gender.

In the next question, the respondents were asked to evaluate the nine activities in the area of contemporary social policy and the labour market and their importance for minimizing the effects of demographic changes. The obtained results of the assessments are presented in Table 1. In order to organize the obtained results, the following activities have been carried out. The first is to order the factors by summing up the answers by meaning: high and very high. In the second phase, the assessed factors were categorized due to the level of their importance for minimizing the effects of demographic change. To this end, the factors have been ordered from the highest to the lowest level of significance. The final analytical activity consisted in dividing the results obtained into four subsets, i.e. forms of activities with a level of significance above 90% – these are very important forms, from 85% to 90% of high importance, from 80% to 85% of moderate importance and below 80% – of low importance.

Table 1.
Activities in the area of contemporary national social policy and labour market by level of importance for minimizing the effects of demographic change [N = 210]

Lp.	Very important	Importnat	Moderate important	Small important	Does not matter	Level of importance
1	45,5%	41,1%	10%	2.9%	0,5%	86,6%
3	44,9%	41%	12,5	15%	0,5%	85,9%
2	43,4%	39%	14,6%	2,9%	0%	82,4%
4	49,8%	32,5%	13,3%	3,9%	0,5%	82,3%
7	43,3%	38,9%	14,3%	3,4%	0%	82,2%
5	45,3%	35,5%	15,8%	3,4%	0%	80,8%
6	35,5%	37,4%	25,1%	1,5%	0,5%	72,9%
8	32,7%	36,7%	24,6%	5%	1%	69,4%

Legend: 1. Incorporating aging into all policy (government) programs to adapt society and the economy to demographic change and to build a society accessible to all ages. 2. Supporting sustainable economic growth, the positive effects of which would be felt by all social groups. 3. Adaptation of the labour market, services and social infrastructure to changes and demographic forecasts. 4. Adaptation of the social security system to the ongoing and expected demographic changes (building a system of services and care in the place of residence, insurance for old age, etc.). 5. Striving to ensure a good quality of life and independence for people of all ages. 6. Striving for further development of lifelong education so that the education system reflects changing economic, social and demographic conditions. 7. Ensure full integration and participation of older people in society, with particular emphasis on the role and needs of older women. 8. Supporting older people in the family, promoting intergenerational solidarity.

Source. own study.

The obtained results entitle to formulate the following conclusions. To the activities in the area of contemporary social policy and the labour market, which are very important for minimizing the effects of demographic changes, research participants included two forms, which in the opinion of research participants are the inclusion of aging in all policy (government) programs in order to adapt society and the economy to changes demographics and to build a society accessible to all age groups and to adapt the labour market, services and social infrastructure to changes and forecasts demographic. In the area of high significance, however, five forms were found in the respondents' assessment, respectively with numbers in the table legend 1, 2, 4, 7, 5. Due to the percentage of responses, the above–mentioned forms of activities should be considered as dominant in the total set of assessed.

In the light of the third question regarding the assessment of the significance level of the next 10 factors determining demographic changes, it is clearly noted that the dominant source is the reduction in the average number of children in the family (80.2%, very important). At a significantly lower level of assessment, according to the percentage of answers given, two more sources were located, which are the disappearance of many children and the commonness of single–parent families (64% and 60.8% – very important). Other sources, whose level of assessment ranged from 28% to 58.7%, should be considered moderate and insignificant due to their level (Table 2).

Table 2.
Sources determining demographic change in the country by significance level [N = 209]

Lp.	Very important	Importnat	Moderate important	Small important	Does not matter	Level of importance
1	42,6%	37,6%	12,9%	4,5%	2,5%	80,2%
2	29%	35%	21%	8%	7%	64%
3	23,6%	37,2%	25,1%	8%	6%	60,8%
4	19,2%	39,5%	23%	13%	5,5%	58,7%
5	19%	39,5%	23%	13%	5,5%	58,5%
6	22,8%	34,7%	21,8%	13,9%	6,9%	57,5%
7	18%	23,5%	25%	18,5%	15%	41,5%
8	14,9%	22,8%	32.2%	18,3%	11,9%	37,7%
9	15,1%	20%	31,7%	19,5%	13,7&	35,1%
10	9%	19%	37,5%	15%	19,5%	28%

Legend: 1. Promoting premarital sex. 2. Delaying the marriage age. 3. Dissemination of alternative forms of partnerships. 4. Increased divorce severity. 5. Universality of single–parent families. 6. Reducing the average number of children in the family. 7. Disappearance of many children. 8. Increase of voluntary childlessness. 9. Popularization of contraceptives. 10. Delay of procreation age.

Source. own study.

The next question referred to the assessment of cultural and social processes that can most dynamically shape the future structure of the population living in Poland. The selection of four processes was made on the basis of the latest literature in the area of demographic change (Marszowski, 2019, pp. 32-45). Table 3 presents the assessment of their significance level.

Table 3.
Cultural and social processes that can most dynamically shape the future structure of the population living in Poland according to the level of importance [N = 209]

Lp.	Very important	Importnat	Moderate important	Small important	Does not matter	Level of importance
1	24,8%	32%	25,7%	13,1%	4,4%	56,8%
2	20,7%	29,6%	30,5%	13,8%	5,4%	50,3%
3	14,3%	34%	32%	12,3%	7,4%	48,3%
4	16,5%	25.5%	36%	16,5%	5,5%	42%

Legend: 1. Decreasing the importance of marriage as a form of human cohabitation for cohabitation. 2. Transition from family model: child with parents to model child with partners. 3. Transition from preventive contraception to conscious procreation. 4. Transition from homogeneous types of families and households to various forms.

Source. own study.

The obtained results clearly indicate that cultural and social processes which, in the opinion of the study participants, can most dynamically shape the future structure of the population living in Poland include the decrease in the importance of marriage as a form of cohabitation for cohabitation and the transition from preventive contraception to conscious procreation. According to the respondents' opinions, the smallest significance is related to the process related to the transition from homogeneous types of families and households to various forms.

The issue of changing (reversing) demographic trends in the country is another problem aspect on which the assessments of research participants focused. When asked about whether in 2030 Poland will have the chance to reverse the trends regarding demographic changes –

in particular, the declining population of young people and the aging population, 44% of respondents answered "Yes" and 56% "No".

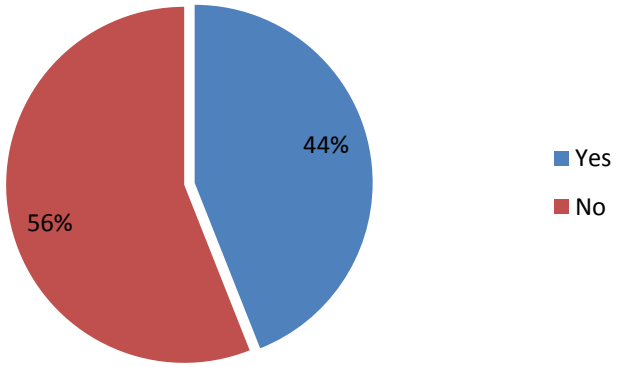


Figure 3. In the perspective of 2030, is Poland likely to reverse the trends regarding demographic change – in particular, the decline in the population of young people and the aging of the population?

Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. For women, the answer "Yes" is the percentage of answers 45.3%, the remaining 54.7% focused on the answer "No". Among men, the distribution was 51.3% "No" and 48.7% "Yes".

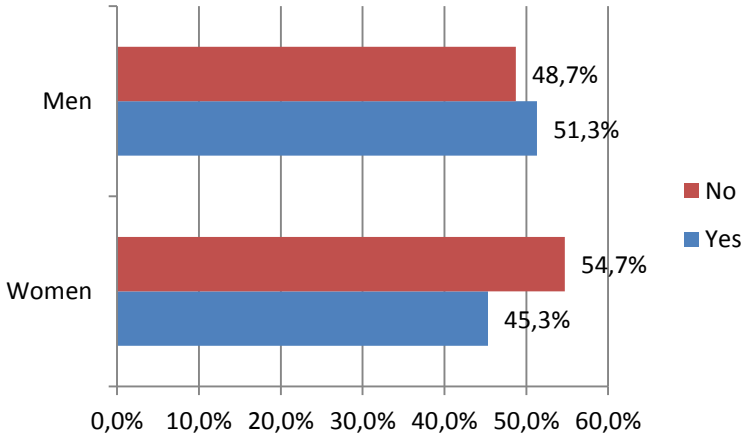


Figure 4. Does Poland have a chance to reverse the trends regarding demographic changes in 2030 – in particular the decrease in the population of young people and the aging of the society? Answers by gender.

In turn, the first question in the area of automation focused on assessing its impact on the domestic labour market in terms of opportunities or development barriers. A total of 211 study participants answered this question. The distribution of responses was shaped according to the following percentages: "64% chance", 30% "barrier" and 6% "I don't know". Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents.

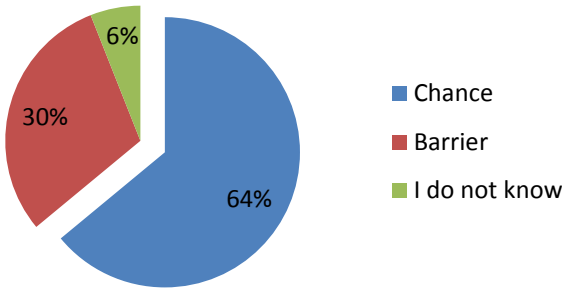


Figure 5. Impact assessment of the automation of production and other industry areas in various areas of the economy on the domestic labour market in terms of opportunity or development barrier.

For women, the "Chance" response was 86.3%, the other 9.8% focused on "Barrier" and 3.9% "I don't know." Among men it was the following distribution of 77.6% "Chance", 16% "Barrier" and 6.4% "I don't know".

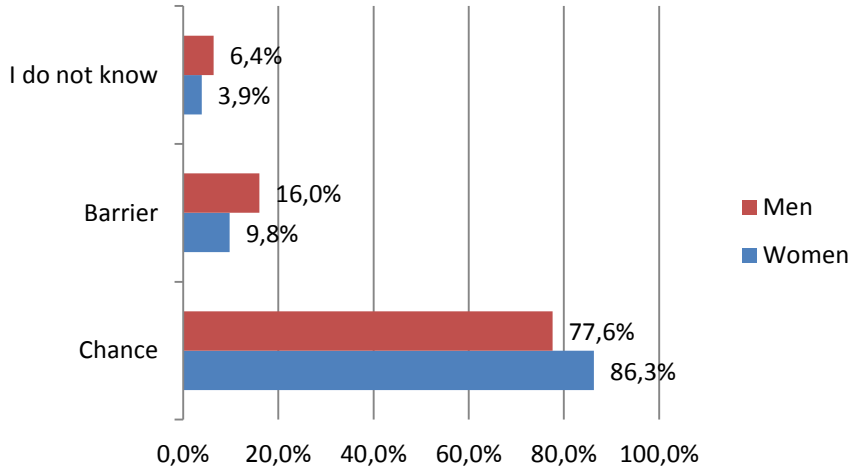
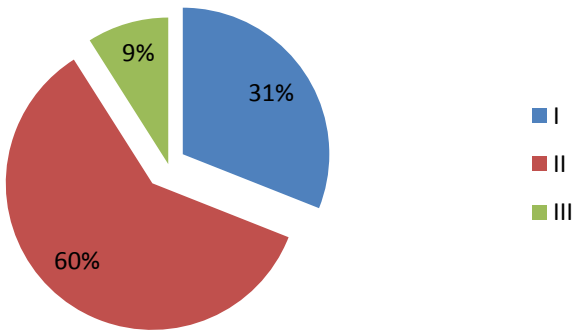


Figure 6. Impact assessment of production and other industry areas automation in various fields of the economy on the domestic labour market, in terms of opportunity or development barrier by sex.

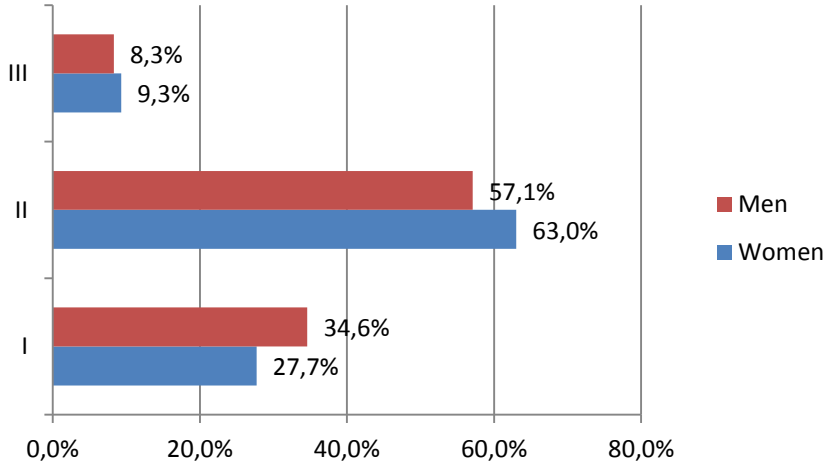
In the next question, respondents (209) were asked to assess the effects of the automation of industrial processes in the context of rising unemployment and the creation of new and better–paid jobs. For this question, the answers were based on the following percentages: "Increase in unemployment" 31%, "New and better–paid jobs" 60% and "I don't know" 9%.



Legend: I – Increase in unemployment, II – Creation of new and better–paid jobs, III – Other.

Figure 7. Evaluation of the effects of industrial process automation in the context of rising unemployment and the creation of new and better–paid jobs.

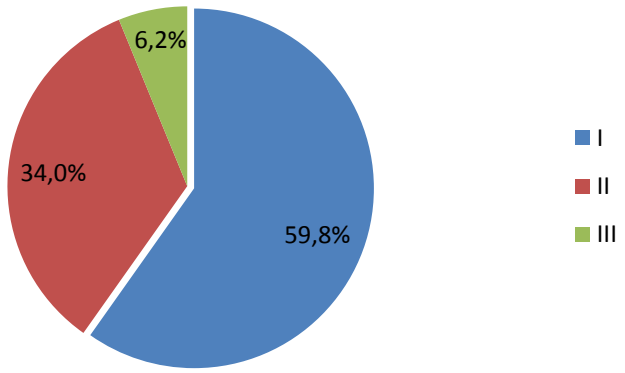
The above percentage distribution of responses entitles to the statement that in the opinion of the dominant percentage of study participants, automation will determine the process of positive changes in the labor market focusing on the creation of new and better–paid jobs. Out of ten such assessment was formulated by six respondents. Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. In the case of women, the answer "Creating new and better–paid jobs" was at the level of 63%, the remaining 27.7% focused on the answers "Increase in unemployment" and 9.3% "I don't know". Among men, the distribution was 57.1%, 34.6% and 8.3%.



Legend: I – Increase in unemployment, II – Creation of new and better–paid jobs, III – Other.

Figure 8. Assessment of the effects of the automation of industrial processes in the context of rising unemployment and the creation of new and better–paid jobs by sex.

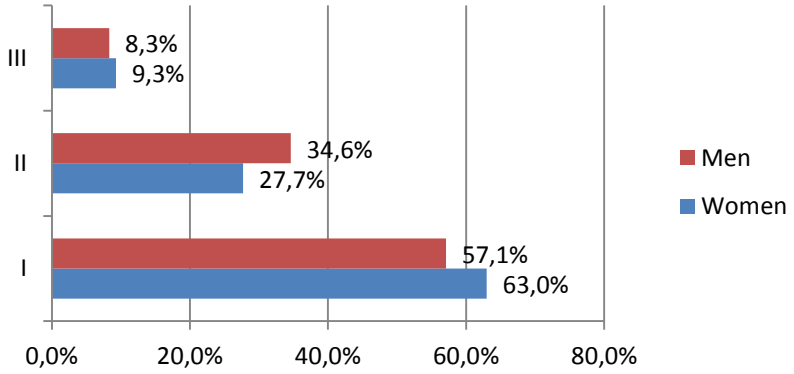
The issue of job loss as a result of automation-related processes is another cognitive area that focused the assessments of study participants (210 responses). When asked if production automation threatens the loss of work only by low–skilled employees whose professional duties are uncomplicated, repetitive and can easily be replaced by intelligent machines, or also by highly–qualified employees, the respondents will provide the following answers. If you answer that the problem will focus on employees low qualified, the percentage of respondents agreeing with this statement was 59.8%. The opinion that automation threatens the loss of job also by highly–qualified employees expressed 34% and the answer "I don't know" 6.2%.



Legend: I. Automation threatens the loss of work only by low-skilled employees, whose professional duties are uncomplicated, repetitive and can easily be replaced by intelligent machines, II. Automation also threatens the loss of jobs by highly-qualified employees. III. do not know.

Figure 9. Does production automation threaten the loss of work only by low–skilled employees whose professional duties are uncomplicated, repetitive and can easily be replaced by intelligent machines, or also by highly-qualified employees?

Also in the case of this question it is not difficult to decide its result. The distribution of the percentage of answers gives the right to state that the profession and qualification group that may be most severely affected by the problem of losing a job through the automation process can be people with the lowest qualifications, whose professional duties are uncomplicated and repetitive. Almost twice the percentage of research participants associates this phenomenon with employees with high and highest qualifications. Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. In the case of women, the answers were at the following levels: 63%, 27.7% and 9.3%. Among men, the distribution was 57.1%, 34.6% and 8.3%.



Legend: I. Automation threatens the loss of work only by low–skilled employees, whose professional duties are uncomplicated, repetitive and can easily be replaced by intelligent machines, II. Automation also threatens the loss of jobs by highly–qualified employees. III. do not know.

Figure 10. Does production automation threaten the loss of work only by low–skilled employees whose professional duties are uncomplicated, repetitive and can easily be replaced by intelligent machines, or also by highly-qualified employees. Answers by gender?

In the next question, respondents were asked to answer the question about whether automation will affect the disappearance of employment in some industries and professions, or rather the occurrence of employee allocation to new jobs and tasks (210 answers). In the case of this question, the answers were based on the following percentages: "Closure of employment" 31%, "Occurrence of the allocation process" 62% and "I don't know" 14%.

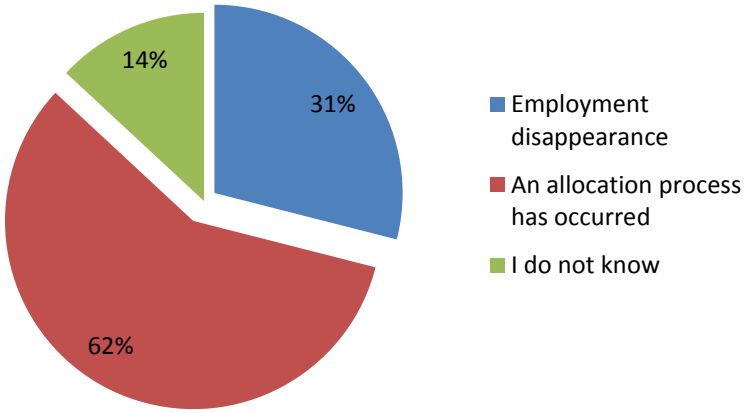


Figure 11. Will automation affect the disappearance of employment in some industries and professions, or rather the occurrence of employee allocation to new jobs and tasks?

Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. For women, the answer was 29.4%, 62.8% and 7.8%. Among men, the distribution was 31.9%, 61.5% and 6.6%.

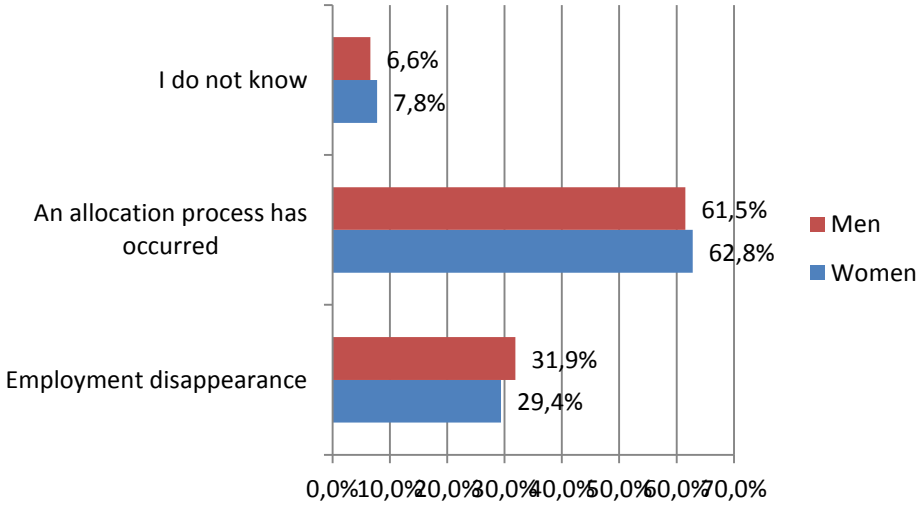
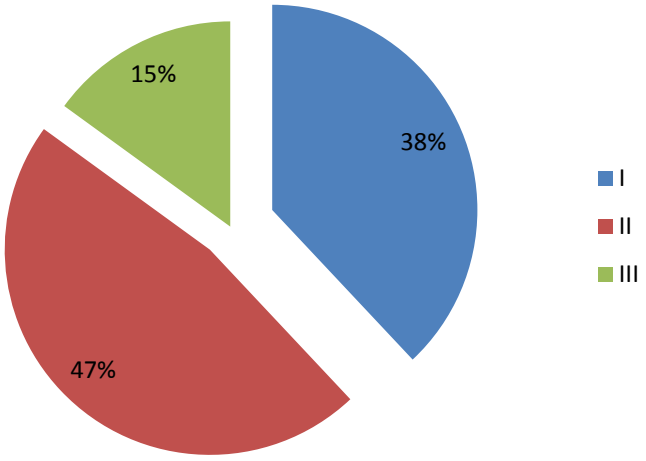


Figure 12. Will automation affect the disappearance of employment in some industries and professions, or rather the occurrence of employee allocation to new jobs and tasks? Answers by gender

The final question poses the problem of the impact of automation in the context of creating integration, openness and visionary solutions or reality in which man becomes a lonely, passive, deepened and lost being in the virtual world (210 answers). Analysis of the results obtained indicated the following distribution of the percentage of answers given. People who felt that automation could create integration, openness and visionary solutions accounted for 38% of the

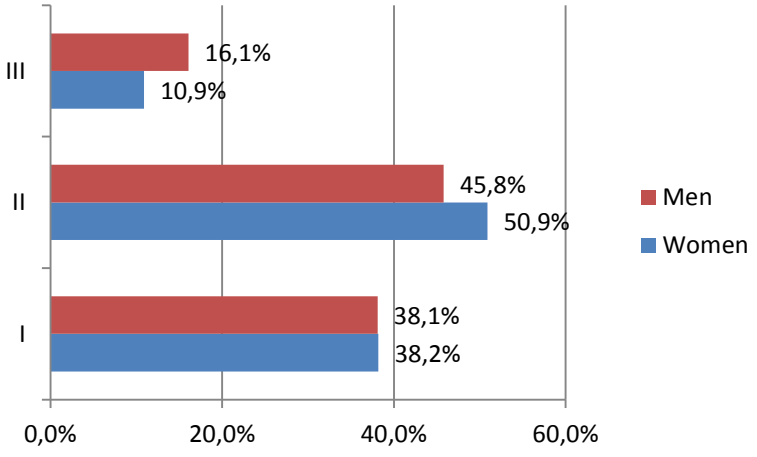
total. On the other hand, people who are inclined to accept thesis that automation will create a reality in which a person becomes a lonely, passive, immersed and lost being in the virtual world accounted for 47%. People who could not answer this question constituted the remaining 15% of respondents.



Legend: I. Automation creates integration, openness and visionary solutions. II. Automation creates a reality in which man becomes a lonely, passive, deepened and lost being in the virtual world. III. do not know.

Figure 13. Does automation create integration, openness and visionary solutions or a reality in which a person becomes a lonely, passive, deepened and lost being in the virtual world?

Analyzing the results of the research according to the criterion of sex, the obtained scores were divided according to the following percentage of respondents. In the case of women, the answer was 38.2%, 50.9% and 10.9%. Among men, the distribution was 38.1%, 45.8% and 16.1%.



Legend: I. Automation creates integration, openness and visionary solutions. II. Automation creates a reality in which man becomes a lonely, passive, immersed and lost being in the virtual world. III. do not know.

Figure 14. Does automation create integration, openness and visionary solutions or a reality in which man becomes a lonely, passive, deepened and lost being in the virtual world? Answers by gender.

Qualitative results indicate that the very small – the magnitude of statistical error – respondents did not refer to the content of the questions posed in the study. On this basis, it can be assumed that the problem areas undertaken in the research are widely noticeable and known to participants. In the light of the question about the family model, the issue of its transformation has not been resolved by the research participants. The obtained result indicates that respondents perceive the family still in the "bourgeois" formula, i.e. one in which children and their future are in the foreground – and parents are the creators of their development. Analysis of the results by sex confirms that on an identical level, the family model is perceived by women as men. However, observing the ongoing processes of transformation of the family model – in particular – in the most developed countries of the world and Europe, it can be assumed that as a result of the dynamic economic development of Poland and the associated increase in the quality of life, the process of transformation of the family model from "bourgeois" to "individualized" can develop significantly over time (Strzelecki, 2013, pp. 1-21). In this context, looking for actions in the area of contemporary social policy and the labour market that can minimize the effects of demographic changes based on the results obtained, one can point to the need to include the issue of aging in the all policy (government) programs to adapt society and the economy to demographic change and to build a society accessible to all age groups and to adapt the labour market, services and social infrastructure to demographic changes and forecasts. In the opinion of respondents, indicated actions should be considered as priority. It is worth noting the relevance of the indicated activities in the context of those already implemented in the European Union and the country. You can find them, among others in the following documents: "Active aging indicator and its extension to the regional level" (Karpiński, 2015) and "Strategies for action in an aging society" (Action strategies…, 2012). In turn, the respondents' answers to the question about the factors that most significantly determine demographic changes in the country made it possible to point to the following: reduction in the average number of children in the family, disappearance of many children and the universality of single–parent families (Janiszewska, 2016, pp. 34-51). It is worth noting that the indicated sources are similar in their source and focused on family issues. Maybe it is worth expanding this area to include the aspect of the progressing process of transformation of forms of married and family life, which is noted in numerous studies and which is the subject of numerous studies. The above proposal is justified by the results of the analysis indicated by the participants of the study of cultural and social processes that can most dynamically shape the future structure of the population living in Poland. They included as the most significant reduction in the importance of marriage as a form of human coexistence for cohabitation and the transition from preventive contraception to conscious procreation. The final cognitive issue undertaken in part of the research in the area of demographic change was the assessment of chances of reversing demographic trends in the country. In particular, the declining population of young people and the aging of the population. Research participants perceive such opportunities in a small percentage (in the overall answers the advantage of the supporters of

the answer 'Yes' over 'No' was only 2%). On the other hand, strong pessimists regarding the reversal of trends are women, among whom the answers to "No" prevailed over the answers to "Yes" in a percentage of over 19%; in the case of men it was 2.6%.

In conclusion, demographic change is a significant challenge for many areas of public policy, such as family, labour market, social security and education. The identified challenges and areas of their impact are part of a broader spectrum of reflection that should focus on a holistic approach to the public policy system, which is the key determinant shaping human capital, in which, according to forecasts, by 2050 people over the age of sixty–five can constitute 20% (Population structure…, 2019) of the total population of all Europe in Poland over 36% (Population forecast…, 2014).

As in the case of research in the area of demographic change, also in the analyzed case focusing on the phenomenon of automation a small percentage of respondents did not answer the questions asked. This result entitles the formulation of the first conclusion, which states that the problem areas undertaken in the research are widely noticeable and known to the participants. It is worth emphasizing, however, that the more the content of the question moves away from the problems of the labour market and education, the lower the percentage of answers enabling a clear resolution of the problem raised in the question. In the light of the question about the assessment of the impact of the automation of production and other industries in various areas of the economy on the domestic labour market, based on the results obtained, it should be stated that this is a development opportunity. Only every third of the study participants expressed a different opinion. Particularly positively – in the context of development opportunities for processes taking place in labour markets – the impact of automation is noticed by women. Nearly nine out of 10 research participants expressed this view. The indicated correctness is underlined in numerous publications and communications. Marianne Thyssen, Commissioner for Employment, Social Affairs, Skills and Mobility of Workers, said in 2018 that employment in the EU has reached the highest level in the history of 236 million jobs. Unemployment is steadily decreasing. We should take full advantage of this positive impetus in the economy and give citizens new and more effective rights that we have previously established under the European Pillar of Social Rights: fair working conditions, equal access to the labour market and fair social protection (Commission report…, 2018). This opportunity must be seized to ensure that all citizens and employees can benefit from these positive changes in the labour market. The regularity described above is confirmed in the analysis of the results of the impact of automation on the increase in unemployment and the creation of new and better–paid jobs. In this cognitive area, it can also be assumed that automation as a process will create the creation of new and better-paid jobs. Unemployment will not be determined by this process, but by a phenomenon that participates in changes social and economic. Also in this case, women (63%, males 57.1%) predominated in assessments focusing on the answers to the creation of new and better–paid jobs. In this light, it is worth pointing to the 2016 study of the American Pew Research Center, which showed that 65% of

Americans are convinced that in 50 years robots will do most of the work that people currently do, but 80% believe that their own profession in five decades will not change at all (Pew Research, 2016). On the other hand, as a result of the analysis of the respondents' answers to the question whether production automation threatens the loss of work only by low–skilled employees, or also by highly–qualified employees, it is not difficult to decide who will be affected by the indicated job loss. The distribution of the percentage of answers gives the right to state that the profession and qualification group that may be most severely affected by the problem of losing a job through the automation process can be people with the lowest qualifications, whose professional duties are uncomplicated and repetitive. Almost twice the percentage of research participants associates this phenomenon with employees with high and highest qualifications. Due to the sex of study participants, identical responses by percentage were similar (women 63%, men 57.5). The indicated correctness is confirmed, among others in the Gumtree.pl study developed by DELab University of Warsaw, in which 54% of surveyed Poles said that in the future they would have to work in several professions to support themselves. Unskilled workers (70%) fear the least, entrepreneurs least (43%) (Active +…, 2017). The assessment of the impact of automation on the disappearance of employment in some industries and professions or the occurrence of employee allocation to new jobs and tasks also clearly indicates the dominance of the allocation process. Over twice the percentage of respondents pointed to this process. When analyzing the answer to this question, there is no significant differentiation in the percentage of respondents (women 62.8%, men 61.5%) by gender. In the light of the above assessments, it is worth noting that in the next decades the so–called employment polarization, i.e. a relative increase in the demand for work of people with high qualifications and those with low qualifications and performing simple work, with a relative decline in the demand for work of people with an average level of qualifications. This process, the most advanced in the United States and visible in Western Europe, in Poland is not yet clear, but it will probably accelerate. Because it is based on technological progress that displaces work that is subject to computerization and automation, one should not be under the illusion that it can be effectively opposed, especially in an open, globalized economy. In these conditions, the challenge for the policy is to create conditions conducive to the creation of highly productive jobs while ensuring adequate support for those groups of employees who lose polarization processes (Lewandowski…, 2014, p. 196). In the final question in the area of automation, the issue of the impact of the process on creating integration, openness and visionary solutions or a reality in which a human being becomes a lonely, passive, immersed and lost being in the virtual world was raised. This question was the most difficult for research participants in resolving the problem. The analysis of the obtained results does not entitle to explicitly define the area that can be determined to a greater extent by automation. The percentage of responses obtained in the study makes it possible to state that the phenomenon of loneliness, passivity, depression and loss of a person in the virtual world as a result of the phenomenon of automation is closer to a higher percentage of respondents (11%).

The percentage of responses by gender was exactly the same (women 10.9%, men 7.7%). The indicated regularity corresponds to the results of research on artificial intelligence of scientists from Universities at Oxford and Yale, who assume that in 45 years machines will outrun people in all aspects of intelligence, and in 120 years all work will be automated, which will be done by man. In this light, it is worth asking the question whether automation will solve all existential problems in the future, and man will devote himself exclusively to consumption and pleasure (The robots will take over…, 2019). Will it lead to a global catastrophe in which machines take over the world, becoming ubiquitous, having the ability to learn, which will ultimately lead them to turn against man. It seems that both the first and the second scenario are connected with the present, in which modern institutions and their global reach create incomparably greater chances for people to experience a safe and satisfying life than any of the pre–modern systems. Modernity, however, also has a dark side, which has become clearly visible in the current century. This dark side of modernity is the loss of the individual between the global aspirations of modernity and the local dimension of human existence, the breakdown of space-time relationships, the reorganization of social relations within the network society, or the constant struggle with the processes of marginalization, differentiation and exclusion (Giddens, 2008, p. 5).

3. Conclusions

The research results described above – it seems – clearly determine the issues of the importance of scientifically shaped demographic assessments and analyzes. On their basis, it can be concluded that the effect of the regressive nature of demographic change is the growing process of demographic aging, which will affect the situation on the labour market. Vocational deactivation of numerous (high-growth) years of retirement age with a weak supply of labour from a small number of (low-volume) years entering the productive age can lead to quite different difficulties on the labour market – difficulties in obtaining labour, both in terms of quantity, as well as qualitative.

In the light of the observed and anticipated changes, it is important to emphasize the importance of influencing the population structure of Poland and the Silesia Voivodship, waving highs and demographic lows, extending the lowland phase at the end of the 1980s for subsequent years (transformation period), and the impact economic and political transformation and Poland's accession to the EU into the spatial, demographic, social, economic and infrastructural sphere, which highlighted numerous development problems. Among them, currently – as indicated by numerous studies – one of these challenges is the preparation of properly educated, modern, intelligent and sensitive to demographic changes personnel that will efficiently and effectively use their potential to achieve the assumed economic goals and

implement the mission of national enterprises (Marszowski, 2018, pp. 213-240). The dominant in these activities is – as has already been noted before – a modern, innovative and responding to contemporary and future challenges education system at every level of education. A system that is part of the short and medium term economic goals and megatrends – in phase II demographic transition and globalization – determines the successful development of the two most important human and social capital in the modern world and the resulting human attitudes, the universality of ideas, the ability to create them and gathering around them the most creative individuals, norms of behavior and, above all, creating a climate for fulfillment and achieving success through an individual in the modern and changing world with a hitherto unknown dynamics (Marszowski, 2018, pp. 5-26).

On the canvas of all the content contained in this article, the image of the future clearly emerges, in which man, industry and the surrounding reality will be shaped by the automation process developing with hitherto unknown dynamics. It will lead to the disappearance of the world dominated by the industrial age and the transition to a new era determined by technologies dominated by data flow and their analysis. The changes will focus on selected economic and social areas (Regional, 2012). In this light, it seems that the future of labour markets will be determined by two trends. In the first of these, labour markets will be on the margins of overlapping. On the basis of their development potential, they will successfully join the indicated processes of demographic change and automation – and will enjoy equal benefits with respect to other participants.

In this light, it seems that the decisive role in creating the development of the labour market can play overcoming mental barriers to demographic change and automation to strengthen their acceptance. As evidenced by numerous sources cited in the text, the pursuit of development – in the phase of demographic changes and the dynamic growth of automation – leads directly to economic boom in the dimension of both the state and local communities – favoring the social dimension of the individual and strengthening the human feeling of fullness of life (Wronka-Pośpiech, 2015, p. 133).

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DEVELOPMENT CONDITIONS OF THE HEALTH RESORTS IN THE LOWER SILESIAN VOIVODESHIP. SELECTED SOCIO-DEMOGRAPHIC ASPECTS

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Purpose: the main objective of the article is to support building sustainable development of spa towns by protecting their unique resources.
Design/methodology: the theses presented in the article were verified using: critical analysis of literature, document analysis, descriptive statistical analysis.
Findings: on the basis of the article it can be concluded that demographic change is an important challenge for numerous areas of public policy, such as family, health care, labour market, social security, education and active leisure. The identified challenges and areas of their impact are part of a broader spectrum of reflection that should focus on a holistic approach to active policies, which are a key determinant of human capital – in which, as forecasts indicate, by 2050 people over sixty-five years of age may constitute 20% of the total population of Europe.
Originality: the article enriches knowledge and develops discussion on demographic changes and the resulting great contemporary challenge for environment, institutions and people creating the future of the studied areas, which may turn out to be maintaining the professional activity of the ageing population while building modern active social and labour market policies – corresponding to the economic structure of the studied areas.

Keywords: health resorts, demographic change, social policy, labour market policy.

Category of the paper: conceptual paper.

1. Introduction

The article is the result of research tasks determined by the scope of the project carried out in the Central Mining Institute 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". The project Healing Placesis implemented under the

Interreg Central Europe programme by the international consortium of local and regional government units, development agencies and scientific units from Poland, Austria, Croatia, the Czech Republic, Slovenia, Hungary and Italy and aims to build sustainable development of SPA areas – by protecting their unique resources. Within the project, the current status of registered SPAs in partner countries & their socio-economic potential was investigated in partner countries, which has been the background for more detailed regional and local investigation. Based on this, the environmental as well as socio-economic impact on natural resources composing SPAs value is analyzed in partner regions. An important part of the project work is social and economic analysis, which enables the identification of development conditions in the examined administrative areas of the project partners' countries. In case of Poland the main area of interest are health resorts in Lower Silesian Voivodeship. The scope of analysis presented in this paper have been based on project common approach agreed by project partnership and in the case of Poland in particular led by the Institute for Regional Development (IRT) from Wroclaw.

The article aims to undertake a discussion on the development forecast of the spa functionin the context of the impact of key demographic changes in Poland and in particular demographic changes occurring in communes (gminas) in which health resorts are located.

In this light, it is worth noting that as a result of the ongoing changes and long-term forecasts, according to the experts' assessment, demographic changes will have a significant impact on the future shape of health and health prevention and care, as well as health tourism. The dynamically growing population of seniors constitutes the least active social group in Poland. The prevalence of negative consequences of the ageing process makes it necessary to search for effective ways of mitigating them. Taking into account the growing potential of this group of consumers and the increase in their number, it seems reasonable: to build specific areas of social policy in a way that would foster their activity; to create differentiated products taking into account heterogeneous preferences; to organise activity on the basis of global trends and changes in the process of demographic modernisation towards individualisation, self-realisation and human independence; to properly prepare personnel that would make it possible to break down barriers to the participation of seniors in social and economic life (Januszewska, 2017, p. 257-264).

In the coming decades, demographic trends will determine the shape of the economic model of the world and individual economies. Ageing populations, the still significant (though decreasing) number of 'young' societies and countries; migration and spontaneous urbanisation are forcing appropriate adjustments to economic policies. Countries with ageing societies – in the perspective of the next few decades – are determined to make efforts to maintain the living standards of their citizens, development of new types of services, as well as ensuring the continuity of social security systems and the sustainability of public finances. A limited supply of economically active people and changes in the demand for workers (skilled and unskilled) may result in increased global migration. Urbanisation, which creates incentives for economic

development, will at the same time increase pressure on food and water resources, and uncontrolled urbanisation may cause excessive economic and social costs (Strategy for Responsible..., 2017, p. 20).

At the same time, competences related to the concept of the so-called *silver economy*, understood as a social and economic system, which, on the one hand, is aimed at using the potential of older people in the labour market – on the other hand, takes into account their needs as consumers (Analysis of qualifications…, 2014, p. 37), are gaining importance. Along with the process of the growing importance of the silver economy, a productivity paradigm shift is underway. Developed countries, if they want to maintain their standard of living and the 2-3% annual GDP growth rate necessary for this purpose, must radically increase the productivity of their economies. The only way available is through innovation. *McKinsey Quarterly* estimates that in the United States, product and business innovation must account for, at a minimum, 70% of productivity growth (Bisson, 2019). In Western European countries, each additional euro produced must come from 100% innovation; in Japan, due to rapid labour force attrition, innovation must keep pace with the resulting decline in productivity, which means a growth effect from innovation of as much as 160% is required. This means – as a prerequisite for an effective response to the development challenges posed by demographic change – that the demand for competencies is closely linked to innovation.

In conclusion, demographic change is a significant challenge for numerous areas of public policy, such as the family, health care, the labour market, social security, education and active leisure, including in particular the growing interest and demand for health tourism (Szromek, et.al., 2012; Mainil et al., 2017).The indicated challenges and areas of their impact are part of a broader spectrum of reflection that should focus on a holistic approach to active policies, which are the key determinant shaping human capital - in which, as forecasts indicate, by 2050 people aged over sixty-five may constitute 20% of the total population of Europe. Regardlessof the social changes brought about by the transformations described above, demographic change will put enormous pressure on the pension and social security systems of the EU countries. If these processes are disregarded – as numerous studies indicate – the EU is at risk of lowering potential employment growth rates to an extremely low level of around 1% per year (Krysiak, 2007, p. 82). This prognosis clearly shapes the need to develop scenarios of demographic developments. This statement is determined, inter alia, by the fact that societies of developed countries are entering a phase in which the ratio of economically active to inactive people is shifting towards the latter group. On the basis of these determinants the demographic situation of Poland definitely places the country also in the area of dynamically ageing societies.

2. Methodology

Various methods were applied in the research, including: critical analysis of literature, development documents review, comparative and descriptive statistical analysis, including selection of main statistical indicators and scenario forecasting. The indicated research methods focused mainly on socio-demographic development conditions of selected communes of Lower Silesia voivodship – in the context of building local development strategies corresponding to contemporary challenges. The critical analysis of the literature covers numerous complementary works and focuses mainly on processes and megatrends determined by demographic changes – shaping the condition and development perspectives of the studied communes of Lower Silesian voivodship in the perspective of active social and labour market policy responding to contemporary challenges. The resulting conclusions and recommendations are aimed at strengthening the utilitarian part of the conducted analyses. The critical analysis covered both publications of a theoretical nature, as well as publications discussing research results and forecasts in numerous cognitive cross-sections. The research also made use of studies devoted to the development perspectives of the studied areas in the light of analyses of strategic documents concerning their future. These documents included, in particular, long-term development strategies of Europe, Poland and the Lower Silesian voivodeship, in various qualitative cross-sections. Apart from formal and legal issues referring to the development prospects of the areas under study – contained e.g. in the binding legal regulations – the study referred to European and national documents, which set out medium- and long-term objectives and tasks in the area of economic and social policies, especially in the context of ongoing and forecast demographic processes. Due to the main objective of the research and research assumptions, the analyses focused on factual, temporal and spatial characteristics, as well as quantitative abrupt and continuous ones.

Scenario forecasts in the perspective of demographic change focus on predicting both future internal and external development conditions in order to achieve the desired target state, i.e. the justified need to take up – as it has already been stressed in the introduction to the article – a great contemporary challenge for the environments, institutions and people creating the future of the studied areas, which may turn out to be maintaining the professional activity of the ageing population while building a modern active social policy and labour market – corresponding to the economic structure of the studied areas. While presenting the projections, it is assumed *ex ante* that the specificity of the examined area determines preferences defining organizational and systemic solutions directly related to future developmental conditions in the social and demographic dimension. It is also assumed that the current strategic and planning documents of the European, national and voivodeship level have numerous indications, recommendations and supporting premises that make it possible to draw conclusions about the target model of active social and labour market policy. It is also assumed that the ongoing

coronavirus epidemic on the territory of the Republic of Poland will acceleratein various variants – as an unfavorable circumstance – numerous elements of the assumed forecasts, especially concerning existing problems and future development of health resorts. The necessary decision to close SPAs and hotels stopped the intensive development of the SPA industry and healthtourism allover the Europe. For example, in March 2020 the total number of tourists staying at tourist accommodation facilities was lower by 65 % in Poland and by 60% in case of Lower Silesian Voivodeship, in comparison to respective month a year before (Tourism…, 2020) and many of following months have been similarly or even more difficult for health resorts.

In this paper, analyses of socio-demographic conditions focused on selected 11 statutory health resorts of the Lower Silesian Voivodship have been undertaken. Most municipalities in which health resorts are located have the same name as the health resort itself – these are health resorts communes. Three SPAs are the exceptions:

- CiepliceZdrój is located in Jelenia Góra commune,
- Przerzeczyn-Zdrój is located in the commune of Niemcza,
- Długopole-Zdrój is located in the Bystrzyca Kłodzka commune.

Additionally, within administrative borders of Świeradów-Zdrój commune, two SPA towns are located: Świeradów-Zdrój and Czerniawa-Zdrój. Therefore the analyses 11 statutory spas from Lower Silesian voivodship are located in 10 gminas (communes), according to the administrative division representing the level of gmina (LAU 2, formerly NUTS 5) presented in Table 1. Hence, the presented analysis, conducted on the basis of available statistical data coming from three sources: Statistics Poland in Warsaw (GUS)[1], statistical portal *Poland in numbers* and the European Statistical Office EUROSTAT is carried out for 10 administrative units.

Table 1.
Division of the analytical area by administrative units on the basis of statistical data of EUROSTAT and the Statistics Poland (NUTS)

No.	Analyticalarea	Administrative division	Administrative unit (gmina)	Type of administrative unit	District/ Poviat
1	Cieplice Śląskie-Zdrój	now a part of Jelenia Góra	Jelenia Góra	urban commune	Jelenia Góra
2	Czerniawa-Zdrój	now a part of Świeradów Zdrój	Świeradów Zdrój	urban commune	lubański
3	Długopole-Zdrój	village in the commune of Bydstrzyca Kłodzka	Bystrzyca Kłodzka	urban-rural commune	kłodzki
4	Duszniki-Zdrój	urban commune	Duszniki-Zdrój	urban commune	kłodzki
5	Jedlina-Zdrój	urban commune	Jedlina-Zdrój	urban commune	wałbrzyski
6	Kudowa-Zdrój	urban commune	Kudowa-Zdrój	urban commune	kłodzki

[1] Former (till April 2018) Central Statistical Office in Poland.

Cont. table 1.

7	Lądek-Zdrój	urban-rural commune	Lądek-Zdrój	urban-rural commune	kłodzki
8	Polanica-Zdrój	urban commune	Polanica-Zdrój	urban commune	kłodzki
9	Przerzeczyn Zdrój	village in the commune of Niemcza	Niemcza	urban-rural commune	dzierżoniowski
10	Szczawno-Zdrój	urban commune	Szczawno-Zdrój	urban commune	wałbrzyski
11	Świeradów-Zdrój	urban commune	Świeradów-Zdrój	urban commune	lubański

Source: Poland in figures 2019, Local Data Bank Statistics Poland, Statistical Office of the European Union EUROSTAT.

Based on the above theses and megatrends, in the analyses and research presented in the article the authors focused on the following key variables:

1. Total population.
2. Population by biological age groups.
3. Population by economic age groups.
4. Median age.
5. Natural increase.
6. Migration balance.
7. Live births.
8. Net migrationrate.
9. Age dependency ratio.
10. Demographic dynamics rate.
11. Feminisationratio.
12. Gross reproductionrate.
13. Total fertility rate (TFR).
14. Deaths (total number of deaths).
15. Deaths from cardiovascular diseases in persons aged up to 65 per 100 000 population.

3. Discussion of the results

The demographic changes that take place in any society affect almost all spheres of social and economic life. Some of the aspects are somewhat more dependent on the age structure or the number of births (such as pension system), while in other areas this dependence is less noticeable. The dependency of SPA towns development on the demographic changes is exceptionally noticable, as it can be considered from two aspects: 1) the impact of the state and development of health tourism, 2) the changes in the demographic structure of the area, conditioning its human capital.

Health tourism is defined differently by different authors (e.g. Wolski, 1978; Gaworecki, 2008; Jojczyk, 2011; Lewandowska, 2012; Krzyżanowska, 2016), but according to the report *Health tourism in the EU: a general investigation* (Mainil et al., 2017) it's a subsector of general tourism that comprises medical (Connell, 2013, 2015; Lunt et al., 2015), wellness (Johnston et al., 2011) and spa tourism (Smith, Puczkó, 2014). Therefore, health tourism, being significantly associated with improved quality of life (QOL), cannot be seen only as the domain of the elderly. Taking into account the criteria for assessing human quality of life, within which we can list such conditions as: physical well-being, including psychophysical regeneration and health recreation, nutrition, entertainment, mobility, health care, health insurance (insurance), leisure time, activities of daily living (Schalock, 1996), health tourism growth factors are also the change in lifestyle and people's greater awareness about health. At the same time, demographic aspects, especially changes in the age structure may still be crucial the development of health tourism in the future, not only from the aspect of population aging, as well as the occurrence of demographic.

Nonetheless, comparative analyses of the potential and determinants of health tourism are not the subject of the authors' investigations, who focus on the on the second aspect of the links between demographics and spa development – specific conditions determining the condition and development prospects of the Lower Silesian municipalitiesunder study in the phase of demographic change. In the period 2008-2018, the population living in the studied municipalities – with the exception of Szczawno Zdrój – systematically decreased. The largest decrease can be observed in Polanica Zdrój and Świeradów Zdrój, reaching -7,7% (534 persons) and -7,2% (326 persons) respectively (Table 2).

Table 2.
Basic demographic characteristics of the population in the analytical area in 2008-2018 by administrative unit – in alphabetical order of analytical area. Status on 31 December. Year 2008 = 100%

Analyticalarea	Administrative unit [2]	Total population										
		Years										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cieplice Śląskie-Zdrój	Jelenia Góra	85541	85095	84298	83773	83097	82369	81640	81190	80889	80325	79686
		100	99,5	98,5	97,9	97,1	96,3	95,4	94,9	94,6	93,9	93,2
Czerniawa-Zdrój	Świeradów Zdrój	4504	4486	4531	4483	4430	4370	4304	4292	4250	4227	4178
		100	99,6	100,6	99,5	98,4	97,0	95,6	95,3	94,4	93,8	92,8
Długopole-Zdrój	Bystrzyca Kłodzka	19451	19312	19844	19794	19689	19549	19446	19340	19243	19077	18984
		100	99,3	102,0	101,8	101,2	100,5	100,0	99,4	98,9	98,1	97,6
Duszniki-Zdrój	Duszniki-Zdrój	4975	4888	5039	4 995	4977	4899	4837	4787	4745	4728	4629
		100	98,3	101,3	100,4	100,0	98,5	97,2	96,2	95,4	95,0	93,0
Jedlina-Zdrój	Jedlina-Zdrój	5085	5062	5072	5071	5033	5000	4975	4970	4930	4 887	4851
		100	99,5	99,7	99,7	99,0	98,3	97,8	97,7	97,0	96,1	95,4

[2] From January 1, 2018 there are 97 NUTS units in Poland: NUTS 1 - macro-regions (grouping provinces) – 7 units, NUTS 2 – regions (provinces or parts thereof) – 17 units, NUTS 3 – sub-regions (grouping counties) – 73 units. In addition, the NUTS Regulation requires that NUTS 3 units be subdivided into Local Administrative Units (LAU). Since 2017, in agreement with Eurostat, each Member State has indicated one level of units treated as LAU. In the case of Poland, municipalities were indicated as local administrative units.

Cont. table 2.

Kudowa-Zdrój	Kudowa-Zdrój	10137	10111	10463	10379	10350	10241	10249	10180	10085	10018	9954
		100	99,7	103,2	102,4	102,1	101,0	101,1	100,4	99,5	98,8	98,2
Lądek-Zdrój	Lądek-Zdrój	8592	8556	8858	8791	8732	8606	8540	8474	8411	8365	8276
		100	99,6	103,1	102,3	101,6	100,2	99,4	98,6	97,9	97,4	96,3
Polanica-Zdrój	Polanica-Zdrój	6891	6850	6808	6771	6706	6663	6599	6521	6486	6381	6357
		100	99,4	98,8	98,3	97,3	96,7	95,8	94,6	94,1	92,6	92,3
Przerzeczyn Zdrój	Niemcza	5912	5891	5910	5868	5805	5800	5766	5699	5611	5545	5502
		100	99,6	100,0	99,3	98,2	98,1	97,5	96,4	94,9	93,8	93,1
Szczawno-Zdrój	Szczawno-Zdrój	5586	5601	5897	5946	5882	5796	5754	5699	5692	5650	5608
		100	100,3	105,6	106,4	105,3	103,8	103,0	102,0	101,9	101,1	100,4

Source: Local Data Bank, Statistics Poland (GUS), Data aggregated in pre-defined public tables, Population state and natural movement.

The first of key variables is feminization ratio which ranged from 99 (PrzerzeczynZdrój/ Niemcza) to 119 (Polanica-Zdrój) female per 100 male (Table 3).

Table 3.

Basic demographic characteristics of the population in the analytical area by administrative unit - in alphabetical orde. Status as of 31.XII 2017 and 2018

Variable	Analyticalarea/Administrative unit									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Median age[3]	45,6	43,1	43,5	45,1	42,9	43,4	44,9	46,3	43,1	45,8
Feminisation ratio	115/100	111/100	107/100	114/100	111/100	114/100	110/11	119/100	99/100	112/100
Feminisation ratio in 25-29 age group	98/100	110/100	96/100	89/100	93/100	91/100	97/100	100/100	101/100	86/100
Live births (year 2008 = 100%)	83,7	50	78,6	66,7	67,3	55,2	78,3	61,8	111,6	57,7
Total deaths (year 2008 = 100%)	111	136	112	142	103	92	97	97	113	158
Natural increase (year 2008 = 100%)	188	667	195	300	225	662,5	129,3	218,2	152,2	900
Total fertilityrate	1,30	1,18	1,22	1,22	1,08	1,22	1,22	1,22	1,26	1,08
Gross reproductionrate	0,64	0,60	0,59	0,59	0,48	0,59	0,59	0,59	0,62	0,48
Demographic dynamics rate[4]	0,62	0,67	0,63	0,63	0,56	0,63	0,63	0,63	0,63	0,56
Agedependency ratio	48,7	42,4	42,0	50,5	41,4	42,3	43,1	51,8	37,1	41,4
Deaths due to cardiovascular diseases in persons aged up to 65 per 100 000 population, Men/Women[5]	187,6/ 50,8	204,3/ 56	179,1/ 70,2	179,1/ 72	165,9/ 59	179,1/ 72	179,1/ 72	179,1/ 72	165,3/ 51,2	165,9/ 59

Legend: 1. Cieplice Śląskie-Zdrój/Jelenia Góra, 2. Czerniawa-Zdrój/Świeradów Zdrój, 3. Długopole-Zdrój/ Bystrzyca Kłodzka, 4. Duszniki-Zdrój, 5. Jedlina-Zdrój, 6. Kudowa-Zdrój, 7. Lądek-Zdrój, 8. Polanica-Zdrój, 9. Przerzeczyn Zdrój/Niemcza, 10. Szczawno-Zdrój.

Source: Statistics Poland Local Data Bank, stat.gov.pl; *Poland in numbers* - https://www.polskawliczbach.pl/.

[3] As on 31st of December 2017.
[4] As in.
[5] As in.

The phenomena of gender imbalance in the population should be considered at two levels: spatial – including the urban-rural dimension, and age – particular age groups. In the first case, migration is the main factor of the gender imbalance. Their directions and structure lead to a situation of overrepresentation of women in cities and a general gender balance in rural areas. In 2019, generally in Poland there were 101 women per 100 men living in rural areas, in the case of cities – 111 female per 100 male, which reflected the share of women in the urban population at 52.7%, and in rural areas – 50,2% (Population, 2020, p. 25). However, the key issue for determining the demographic consequences of the gender imbalance is the analysis of the feminisation ratio in particular age groups. This is because it is one of the important indicators informing about the reproductive capacity of the population in a given area (Bański, 2002). In this light it is worth emphasizing that in the youngest age groups there is a natural phenomenon of male over-representation, since every year male babies predominate among the newborns. The share of boys in the number of births is approximately 0,51-0,52 (Holzer, 2003). On the other hand, since women live longer than men on average, there is a natural predominance of women in the oldest age groups. Of particular importance for the current and future demographic situation of a given area is the value of the feminization ratio in the age group characterised by the highest fertility rates (30-34) (Celińska-Janowicz, 2010, p. 21). Analyses of the indicated population structure in the studied municipalities clearly showed that in the age range of 25-29 years, the feminisation ratio in 2018 showed a serious shortage of women, ranging between 86 (Szczawno-Zdrój) and 110 female (Świeradów-Zdrój) per 100 male, compared to feminization ratio for the total population in the studied municipalities between 99 and 119 women per 100 men in the same period (Table 3).

One of consequences of the indicated shortage of women in these groups, are a drop in the number of marriages and the number of births, which in consequence deepen population ageing process. It is worth noting that over the last decade in Poland the highest fertility rate (number of live births per 1000 women) was recorded in the 25-29 age group. In recent years, there has been a phenomenon of shifting high fertility rates towards older age groups. While in 2000, nationwide, the highest number of births per 1000 women was characteristic of the 25-29 and 20-24 age groups, already in 2005, the analysed indicator had similar values for the 20-24 and 30-34 age groups – and between 1990 and 2018, the share of mothers aged 30 and over doubled, accounting for 52 percent of those who gave birth in 2018 (Coraz mniej Polaków…, 2021). This phenomenon affects both urban and rural areas, although in the latter case it occurs with some delay, so on a national scale it occurred for the first time only in 2009 (Celińska-Janowicz, 2010).

The median age of the inhabitants of the studied municipalities in 2018 ranged from 41.9 (Kudowa-Zdrój) to 46.3 (Polanica-Zdrój), so in majority of municipalities was significantly higher than the median age for the country (41.9) (Poland in numbers, 2021) (Table 3). Analyzed Lower Silesian municipalities in 2018 were areas with a predominantly young demographic population. However, this state should be considered temporary.

The ongoing process of an increasing life expectancy, intensified by the low fertility rate leads to ageing of population in studied municipalities.As the forecasts indicate, in the next two decades 50% of the described population may reach the age of 50. This process has been accompanied by a steady decline in the rate of live births, which in the years 2009-2018 in the studied communes ranged from 50% (CzerniawaZdrój/ŚwieradówZdrój) to 83.7% (CiepliceŚląskie-Zdrój/Jelenia Góra). The exception was the municipality of Przerzeczyn-Zdrój, where the analysed indicator was 111.6% in 2018. Total deaths showed two trends, a dynamic increase and a slight decrease. The increase was between 103% (Jedlina-Zdrój) and 158% (Szczawno-Zdrój). On the other hand, the decrease in dynamics occurred in three communes municipalities – out of 10 examined – and was in the range of 92% (Kudowa-Zdrój) to 97% (Polanica-Zdrój).

The described distribution of the number of live births and total deaths in 2009-2018 influenced the natural increase in the studied communes, which in the analysed period was profoundly negative and characterised only by growth dynamics. In the analysed period, the dynamic growth of the negative natural increase ranged from 152,2% (Polanica-Zdrój) to 900% (Szczawno-Zdrój) (table 3).

As a result of the described regularities in the studied communes in 2018, the fertility rate, crucial for the reproduction of the population, was at a level from 1,08 (Szczawno-Zdrój) to 1,30 (Cieplice Śląskie-Zdrój/Jelenia Góra) and was in all studied communes clearly lower than the provincial rate, which reached in the analyzed period a level of 1.36 and the national one with a level of 1,45 births/woman (table 3), which also were below the replacement of generations level of 2,1-2,15 births/woman as defined by United Nations Population Division (United Nations, 2001). Similarly to the fertility rate, also the gross reproduction rate (GRR) was evolving, which in the same period in the studied communes ranged from 0,48 (Jedlina-Zdrój and Szczawno-Zdrój) to 0,64 (Cieplice Śląskie-Zdrój/Jelenia Góra) and was also in all studied communes lower than the provincial rate by 0,03 and lower than the national one by 0,07 (table 3). It is worth noting that a coefficient of 1 is a guarantee of simple reproduction of the population, while when it takes a value above 1, there is a process of population expansion (Economic activity of the population, 2014, p. 192). The demographic dynamics rate – the ratio of the number of live births to the number of deaths – was shaped similarly in analysed municipalities (Holzer, 2003), which ranged from 0,56 (Jedlina-Zdrój and Szczawno-Zdrój) to 0,67 (Czerniawa-Zdrój/ŚwieradówZdrój) and was in all the studied municipalities lower than the value of the ratio for the province (0,67) and for the country (0,71).

Migration is another factor influencing local development. However, it should be noted that the assessment of the impact of migration on regional and local development largely depends on its nature: short-term migration is often considered beneficial to the problems of the regional labour market, especially in the context of recession and high unemployment, while long-term migration is strongly negative (Heffner, Solga, 2016). In the analysed period in the studied municipalities, a permanent negative balance of internal and foreign migration for permanent residence can be observed, although with a decreasing trend. In the analysed period 2009-2018

the migration dynamics was between -48.6% (Lądek-Zdrój) and -333.3% (Polanica-Zdrój) and -30% (Jedlina-Zdrój) and 371.4% (Kudowa-Zdrój) (Table 4).

Table 4.
Balance of internal and foreign migration for permanent residence in the analytical area in 2008-2018 by administrative unit – in alphabetical order. Status on 31 December. Year 2008 = 100%

Analytical area	Administrative unit	Years										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cieplice Śląskie-Zdrój	Jelenia Góra	-295	-287	-218	-172	-227	-352	-240	66	-33	33	-104
		100	97,3	73,9	58,3	76,9	119,3	81,4	-22,4	11,2	-11,2	35,3
Czerniawa-Zdrój	Świeradów Zdrój	-19	-37	-23	-46	-37	-33	-18	0	-23	-11	-15
		100	194,7	121,1	242,1	194,7	173,7	94,7	0,0	121,1	57,9	78,9
Długopole-Zdrój	Bystrzyca Kłodzka	-41	-51	-39	3	-29	-66	-29	-57	-34	-73	-24
		100	124,4	95,1	-7,3	70,7	161,0	70,7	139,0	82,9	178,0	58,5
Duszniki-Zdrój	Duszniki-Zdrój	-24	-37	-14	-20	-30	-38	-39	0	-8	-18	-12
		100	154,2	58,3	83,3	125,0	158,3	162,5	0,0	33,3	75,0	50,0
Jedlina-Zdrój	Jedlina-Zdrój	20	41	25	11	-27	-23	-9	0	20	9	-6
		100	205,0	125,0	55,0	-135,0	-115,0	-45,0	0,0	100,0	45,0	-30,0
Kudowa-Zdrój	Kudowa-Zdrój	-7	-23	8	-43	8	-52	-16	0	-34	-39	-26
		100	328,6	-114,3	614,3	-114,3	742,9	228,6	0,0	485,7	557,1	371,4
Lądek-Zdrój	Lądek-Zdrój	-37	-18	-25	-30	-12	-78	-35	0	-15	3	-33
		100	48,6	67,6	81,1	32,4	210,8	94,6	0,0	40,5	-8,1	89,2
Polanica-Zdrój	Polanica-Zdrój	-9	30	0	-2	-15	-8	30	0	-3	-25	6
		100	-333,3	0,0	22,2	166,7	88,9	-333,3	0,0	33,3	277,8	-66,7
Przerzeczyn Zdrój	Niemcza	16	-16	-9	-15	8	5	-18	0	-30	-30	-22
		100	-100,0	-56,2	-93,7	50,0	31,2	-112,5	0,0	-187,5	-187,5	-137,5
Szczawno-Zdrój	Szczawno-Zdrój	29	17	24	59	-29	-40	-21	0	26	28	26
		100	58,6	82,8	203,4	-100,0	-137,9	-72,4	0,0	89,7	96,6	89,7

Source: Local Data Bank of Statistics Poland (GUS). Data aggregated in pre-defined public tables *Population and natural movement.*

Also net migration had a permanent negative tendency, which in the analysed period ranged from -4.79 (Duszniki-Zdrój) to 5.19 (Szczawno-Zdrój) and -3.97 (Przerzeczyn-Zdrój/Niemcza) to 4.63 (Szczawno-Zdrój) (Table 5).

Table5.
Net migration rate in the analytical area in 2008-2018 by administrative unit administrative unit – in alphabetical order. Status on 31 December. Year 2008 = 100%

Analytical area	Administrative unit	Years										
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cieplice Śląskie-Zdrój	Jelenia Góra	-3,46	-3,38	-2,62	-2,04	-2,70	-4,31	-2,98	0,80	-0,36	0,45	-1,29
Czerniawa-Zdrój	Świeradów Zdrój	-4,24	-8,29	-5,11	-10,27	-8,38	-7,55	-4,18	-2,30	-5,36	-2,58	-3,54
Długopole-Zdrój	Bystrzyca Kłodzka	-2,1	-2,6	-2,0	0,2	-1,5	-3,4	-1,5	0,0	-1,8	-3,8	-1,3
Duszniki-Zdrój	Duszniki-Zdrój	-4,79	-7,47	-2,78	-3,98	-6,05	-7,69	-8,01	0,00	-1,68	-3,81	-2,55
Jedlina-Zdrój	Jedlina-Zdrój	3,96	8,08	4,92	2,16	-5,35	-4,59	-1,80	0,00	4,05	1,83	-1,24
Kudowa-Zdrój	Kudowa-Zdrój	-0,69	-2,27	0,77	-4,13	0,77	-5,05	-1,56	0,00	-3,36	-3,87	-2,60
Lądek-Zdrój	Lądek-Zdrój	-4,30	-2,10	-2,81	-3,40	-1,37	-9,01	-4,08	0,00	-1,78	0,36	-3,96
Polanica-Zdrój	Polanica-Zdrój	-1,29	4,35	0,00	-0,29	-2,22	-1,20	4,51	0,00	-0,46	-3,87	0,94
Przerzeczyn Zdrój	Niemcza	2,71	-2,72	-1,52	-2,55	1,37	0,86	-3,13	0,00	-5,31	-5,38	-3,97
Szczawno-Zdrój	Szczawno-Zdrój	5,19	3,03	4,05	9,95	-4,91	-6,85	-3,64	0,00	4,58	4,92	4,63

Source: Local Data Bank of Statistics Poland (GUS). Data aggregated in pre-defined public tables *Population and natural movement.*

Due to the fact that young and educated people predominate among migrants (Heffner, Solga, 2016), this translates not only into social effects (including the problem of so-called 'euro-orphanhood', loosening of family ties, or even the need to organize psychological assistance for people from 'broken' families), but by extension into a reduction of the development potential of municipalities.

The phenomena described above have for years permanently shaped the condition and structure of the population of the studied communes. In the context of EU social policy, meeting the demographic challenges requires action in many areas, among which the following are considered key ones:

- equal opportunities and access to the labour market, including skills development and lifelong learning, as well as active support for employment, in order to increase employability, ease transitions and improve the employability of individuals,
- fair working conditions, with an adequate and reliable balance of rights and obligations between workers and employers, and between flexibility and security to facilitate job creation, take-up of jobs on offer and companies adaptability, and promoting social dialogue,
- adequate and sustainable social protection and access to high quality essential services, including childcare, health care and long-term care, in order to long-term care, in order to ensure a dignified life and protection from risks and to enable citizens to function fully in the labour market and more generally in society (Towards a European..., 2016; European Pillar of Social Rights, 2017).

In conclusion, the changes in the population structure that have taken place between 1988-2008 and 2008-2018 are indeed remarkable and in many aspects consistent with “second demographic transition” (SDT) theory, jointly formulated by R. Lesthaegheand. D.J. van de Kaa in 1986 (Van de Kaa, 1986; Sobotka, 2008). The breakthrough factors are of a cultural nature – closely related to substantial changes in values related to family and children, which include, among others: rapid acceptance of voluntary childlessness and non-family living arrangements, the spread of contraceptives, delaying the age of marriage and procreation, increase in the number of divorces and −prevalence of single-parent families (Van de Kaa, 1999). Although children and parenthood continue to be almost universally valued, it becomes a result of a carefully planned decision of a couple, resulting usually in the −decrease in the average number of children in a family (Sobotka, 2008).

The aforementioned regularities have been particularly noticed in the latest government document setting Poland's development framework, i.e. the *Strategy for Responsible Development until 2020 (with an outlook until 2030).* The Strategy clearly emphasises that, in line with global forecasts, major changes are to be expected in the current shape of the global economy and national economies. The demographic change and the resulting ageing of

societies, the decreasing number of countries characterised by demographic youth of their populations, uncontrolled migration on a huge scale and a rapid increase in the urbanisation rate cause the need for redefinition of the social and economic policy. The aim of the redefinition of the policy is to maintain the standard of living in ageing societies, to introduce new hitherto unknown services and products and the already mentioned need to maintain the effectiveness of social security models and public finances appropriate to the scale of needs. As a result of the changes taking place, the decreasing supply of labour resources and the qualitative and quantitative conditions of the demand for labour will imply a dynamic increase in the already large and global migration. It is connected with the already mentioned increase in the urbanisation rate, which in many evaluations, while favouring the economic growth, will simultaneously create growing social pressure related to satisfying nutrition needs; as a result, it may lead to tensions and uncontrolled growth of economic costs in the described area of changes. Projections – including those for Poland – indicate a broad spectrum of impacts of demographic change, which can be associated with systemic changes in labour markets and structural changes in the economic area – in effect, may lead to a deep impasse. Demographic change also means negative changes in productivity and the already mentioned increase in economic costs associated with e.g. health care and long-term care of the elderly to the benefit of a decline in investment outlays. At the same time –andthis should be particularly emphasized – demographicchange also means the development of new economic sectors, technologies and services, aimedatusing the purchasing potential of older and ageing people and satisfying their consumption, living and health needs (*silver economy*).

The indicated trends and forecasts dynamically shape the demographic structure of the population of the analysed municipalities, including the occurring major changes in economic age groups. As of 2018, the population by economic age groups was shaped by two key trends, dynamic decline and growth (year 2008 = 100%). The trend of dynamic decrease was characterised by the population of pre-productive age and was contained in the analysed period in the range from 80,3% (PrzerzeczynZdrój/Niemcza) to 98.6% (Szczawno-Zdrój). The same trend was observed in the working age population, which decreased from 81.1% (CiepliceŚląskie-Zdrój/Jelenia Góra) to 94.5% (Szczawno-Zdrój). On the other hand, the post-working age population in all the studied communes was subject to dynamic growth in the interval from 117.3% (Szczawno-Zdrój) to 147.1% (Długopole-Zdrój/Bystrzyca Kłodzka) (table 6).

Table 6.
Population by economic age groups in the analytic area - alphabetically alphabetical order. Status as of 31.12.2018. Year 2008 = 100%

Economicage groups	AnalyticalArea/Administrative Unit									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
population in pre-productive age	9679	545	2477	550	639	1276	959	663	683	639
growth/decrease	93,9	83,2	91,0	80,5	85,0	90,0	86,7	80,7	80,3	98,6
population in workingage	47 510	2592	11 771	2749	3019	6164	5160	3804	3552	3418
growth/decrease	81,1	83,5	87,1	82,8	89,1	89,8	87,0	82,6	88,4	94,5
population in post-productive age	22 291	1046	4736	1330	1193	2514	2157	1890	1267	1551
growth/decrease	135,1	143,1	147,1	137,0	126,2	135,3	138,8	129,0	121,7	117,3

Legend: 1. Cieplice Śląskie-Zdrój/Jelenia Góra, 2. Czerniawa-Zdrój/Świeradów Zdrój, 3. Długopole-Zdrój/ Bystrzyca Kłodzka, 4. Duszniki-Zdrój, 5. Jedlina-Zdrój, 6. Kudowa-Zdrój, 7. Lądek-Zdrój, 8. Polanica-Zdrój, 9. Przerzeczyn Zdrój/Niemcza, 10. Szczawno-Zdrój.

Source: Local Data Bank of Statistics Poland (GUS). Data aggregated in predefined tables available to the public. Population state and natural movement.

According to the forecasts, further significant unfavourable changes in the population by economic age groups in the studied municipalities should be expected, which may be characterised by the following processes: a high decrease in the population in two age groups, the population in the pre-working and working age, and a high increase in the population in the post-working age. This regularity is confirmed by the following forecasts. In 2018, the population in the pre-productive age group accounted for a proportion between 12.2% (CiepliceŚląskie-Zdrój/Jelenia Góra) and 15,% (Czerniawa-Zdrój/lubański), in the productive age group between 59,8% (CiepliceŚląskie-Zdrój/Jelenia Góra) and 64, 3% (Szczawno-Zdrój/lubański) and in the post-working age from 19.9% (Szczawno-Zdrój/lubański) to 26,0% (CiepliceŚląskie-Zdrój/Jelenia Góra)[6]. According to forecasts, this distribution in 2035 may be as follows: 12,3% (increase by 0,1%) to 14,7% (decrease by 0,3%), 57,5% (decrease by 2,3%) to 61,4 (decrease by 2,9%) and from 26,6% (increase by 6,7%) to 30,2% (increase by 4,2%). The analysed distribution of the population of the studied communes by economic age groups in 2050 may change further according to the following projected values: from 11,9% (0,3% decrease) to 11,6% (3,4% decrease), from 51,2% (8,6% decrease) to 54,2% (10,1% decrease) and from 34,4% (14,5% increase) to 36,9% (10,9% increase) (table 7).

[6] In the national and European public statistics there are no forecasts for the administrative unit of the commune. Forecast data occur only for the county (poviat) in which administrative area the commune is located. Therefore, in this part of the research work, forecasts are only presented at the level of the administrative unit of the county (poviat).

Table 7.
Population forecast in economic age groups in % - in analytical area by administrative unit – alphabetical order

Analytical area	Administrative unit	Projection area/county	Years/%								
			2018			2035			2050		
			1	2	3	1	2	3	1	2	3
Cieplice Śląskie-Zdrój	Jelenia Góra	Jelenia Góra	12,2	59,8	26,0	12,3	57,5	30,2	11,9	51,2	36,9
Czerniawa-Zdrój	Świeradów Zdrój	lubański	15,8	63,5	20,7	14,7	61,1	26,2	11,6	53,8	34,6
Długopole-Zdrój	Bystrzyca Kłodzka	kłodzki	15,1	62,7	22,2	12,4	60,3	27,3	11,7	53,8	34,5
Duszniki-Zdrój	Duszniki-Zdrój	kłodzki	15,1	62,7	22,2	12,4	60,3	27,3	11,7	53,8	34,5
Jedlina-Zdrój	Jedlina-Zdrój	wałbrzyski	15,8	64,3	19,9	12,0	61,4	26,6	11,5	54,2	34,4
Kudowa-Zdrój	Kudowa-Zdrój	kłodzki	15,1	62,7	22,2	12,4	60,3	27,3	11,7	53,8	34,5
Lądek-Zdrój	Lądek-Zdrój	kłodzki	15,1	62,7	22,2	12,4	60,3	27,3	11,7	53,8	34,5
Polanica-Zdrój	Polanica-Zdrój	kłodzki	15,1	62,7	22,2	12,4	60,3	27,3	11,7	53,8	34,5
Przerzeczyn Zdrój	Niemcza	dzierżoniowski	15,2	62,7	22,1	12,6	60,1	27,2	12,1	53,5	34,4
Szczawno-Zdrój	Szczawno-Zdrój	lubański	15,8	64,3	19,9	12,0	61,4	26,6	11,5	54,2	34,4

Source: Population forecast for the period 2014-2050, Central Statistical Office, Warsaw 2014.

The occurring and projected demographic changes clearly indicate that three age groups will be the most numerous in the structure of studied municipalities: 55-59 years, 60-64 years and 65-69 years. The most representative example for the indicated regularity among the studied municipalities is Jelenia Góra, including Cieplice Śląskie-Zdrój. Given the numbers in 2018 (nearly 25% of the total population), it can be assumed that these are the three age groups that will determine the future quantitative and qualitative structure of the population of the studied municipalities. Due to their age cross-section, they will most dynamically shape the processes occurring in the labour market. In particular those related to dynamic ageing, their professional activity and inactivity, spatial mobility (migrations) and educational mobility, quality and level of social security. In relation to the abovementioned regularity, an important factor is the age range for which a clear decrease in the population of the studied communes can be observed, i.e. the age range from 75 to 85 and more. In this context it should be noted that shifts of particular cohorts in the demographic structure of the studied communes may cause a clear and dynamic increase in the population in the age cohorts entering the retirement age – with a simultaneous decline in the population in the age cohorts characterised by demographic youth and the highest economic activity and mobility. In this context, it is worth noting that the population aged 25-49, because of its size, will be subject to a systematic decline in the labour market of the studied municipalities as a result of the lack of its simple replacement by a numerically much smaller population of the youngest people – in the age brackets 0-4, 0-5, 10-14, 15-19 and 20-24 (26% of the total population of Jelenia Góra). We illustrate this process with the example of two populations living in Jelenia Góra (figure 1).

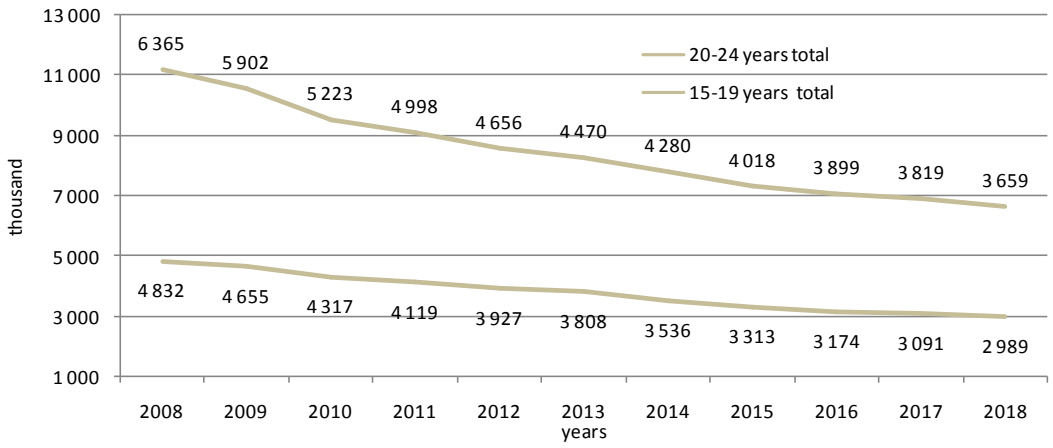

Figure 1. Population of Jelenia Góra by age groups 15-19 and 20-24. Observations for the period 2009-2018. Source: Local Data Bank, Statistics Poland (GUS), Data aggregated in pre-defined public tables, Population state and natural movement.

It should be noted that the indicated distribution of the number of inhabitants of studied municipalities by age groups will determine processes in the labour market which are a resultant of two phenomena: a decline in the population in the age of demographic youth and high educational, occupational and migration mobility, with a simultaneous clear and dynamic increase in the population in older age groups.

In terms of the term "older age groups", it is worth reflecting on the definition of ageing or obsolescence, as noted in the report on the situation of the elderly.

As noted in the *Report on the Situation of Older People in Poland*, the concepts of old age and ageing can be considered in two ways – from the individual aspect and as phenomena concerning the collective of these individuals, i.e. the society of a given region, country, part of the world (Report on the Situation, 2012, p. 15-18). In the individual aspect, ageing is a biological phenomenon constituting a human life cycle (Zych, 2004). According to another approach, ageing is perceived as a process of progressive impairment of the body's life functions and loss of adaptive capacity to environmental changes, along with an increasing probability of death (Kirkwood 1996). In general, the inevitable stage of the ageing process is a state referred to as old age. In turn, ageing, according to the definition accepted in psychogerontological literature, means a certain process and has a dynamic character, while old age as a state has a static character (Porzych, 2004). According to the life cycle theory of D.J. Levinson (Levinson, 1986), old age is one of the phases, which, however, is not homogenous and can be divided into successive periods. The life cycle theory describes changes in the psyche and behavior occurring at successive – progressive with age – stages of an individual's life. The first phase of life is the phase of learning, acquiring experiences (it includes childhood and youth).

The next phase includes adulthood, which is the period of implementation of the knowledge possessed. The last phase – old age – is the phase of regression. The individual phases may occur in different individuals at different times and it is not possible to give rigid limits to the age at which the individual ends or

The individual phases may occur in different individuals at different times and it is not possible to give rigid limits to the age at which the individual phases of the life cycle begin or end. However, the psychological concept of the life cycle – created by E. Erikson (Erikson, 2002) – divides the life of an individual into eight stages. The last stage is late adulthood and begins between the ages of 60 and 65. It should be noted that the division of the last stage of human life is changing with the lengthening of life and improvement of its quality in the community of older people.

In this light, on the basis of analyses of the population of the studied communes, this time in the cross-section of biological age groups, equally unfavourable changes will take place in the perspective of 2050, which may be characterised by the following processes: a high decline in the population in two age groups, the population aged 0-14 and 15-59, and a high increase in the population aged 60 and over. This regularity is confirmed by the following forecasts. In 2018, the population aged 0-14 accounted for a percentage ranging from 12,1% (Cieplice Śląskie-Zdrój/Jelenia Góra) to 13,3% (Szczawno-Zdrój/lubański), aged 15-59 from 58,8% (Przerzeczyn-Zdrój/dzierżoniowski) to 68, 5% (Jedlina-Zdrój/wałbrzyski) and aged 59 and over from 19,1% (Jedlina-Zdrój/wałbrzyski) to 28,5% (Przerzeczyn-Zdrój/dzierżoniowski), According to forecasts, this distribution in 2035 may be as follows: 12,3% (0,2% increase) to 10,4% (2,9% decrease), from 61,9% (3,1% decrease) to 61,9 (6,6% decrease) and from 18,3% (0,8% decrease) to 28,8% (0,3% increase). The analysed population distribution in the studied communes by biological age groups in 2050 may undergo further changes according to the following projected values: from 6,8% (decrease by 5,3%) to 9,5% (decrease by 3,7%), from 52% (a fall of 6,8%) to 52,6% (a fall of 15,9%) and from 38,2% (an increase of 19,1%) to 38,1% (an increase of 25,4%) (Table 8).

Table 8.
Population projection in biological age groups in % - in the analytical area by administrative unit – alphabetical order

Analytical area	Administrative unit	Projection area/county	Years								
			2018			2035			2050		
			1	2	3	1	2	3	1	2	3
Cieplice Śląskie-Zdrój	Jelenia Góra	Jelenia Góra	12,1	59,8	28,1	12,3	57,5	30,2	6,8	51,2	37,0
Czerniawa-Zdrój	Świeradów Zdrój	lubański	13,3	64,0	22,7	10,4	61,9	27,2	9,5	52,2	38,3
Długopole-Zdrój	Bystrzyca Kłodzka	kłodzki	12,6	67,3	20,1	10,1	60,9	28,9	9,6	52,1	38,3
Duszniki-Zdrój	Duszniki-Zdrój	kłodzki	12,6	67,3	20,1	10,1	60,9	28,9	9,6	52,1	38,3
Jedlina-Zdrój	Jedlina-Zdrój	wałbrzyski	12,4	68,5	19,1	9,8	61,9	18,3	9,2	52,6	38,2
Kudowa-Zdrój	Kudowa-Zdrój	kłodzki	12,6	67,3	20,1	10,1	60,9	28,9	9,6	52,1	38,3
Lądek-Zdrój	Lądek-Zdrój	kłodzki	12,6	67,3	20,1	10,1	60,9	28,9	9,6	52,1	38,3
Polanica-Zdrój	Polanica-Zdrój	kłodzki	12,6	67,3	20,1	10,1	60,9	28,9	9,6	52,1	38,3
Przerzeczyn Zdrój	Niemcza	dzierżoniowski	12,7	58,8	28,5	10,3	60,8	28,8	9,9	52,0	38,1
Szczawno-Zdrój	Szczawno-Zdrój	lubański	13,3	64,0	22,7	10,4	61,9	27,2	9,5	52,2	38,3

Legend: 1. Ludność w wieku 0-14 lat, 2. Ludność w wieku 15-64 lata, 3. Ludność w wieku 60 lat i więcej.

Source: Population forecast for the period 2014-2050, Central Statistical Office, Warsaw 2014.

An illustration of the outlined forecasts is presented on the example of the lubański poviat, which, according to the forecast, may experience one of the highest increases in the population aged 60 and above among the poviats with the studied communes (Figure 2).

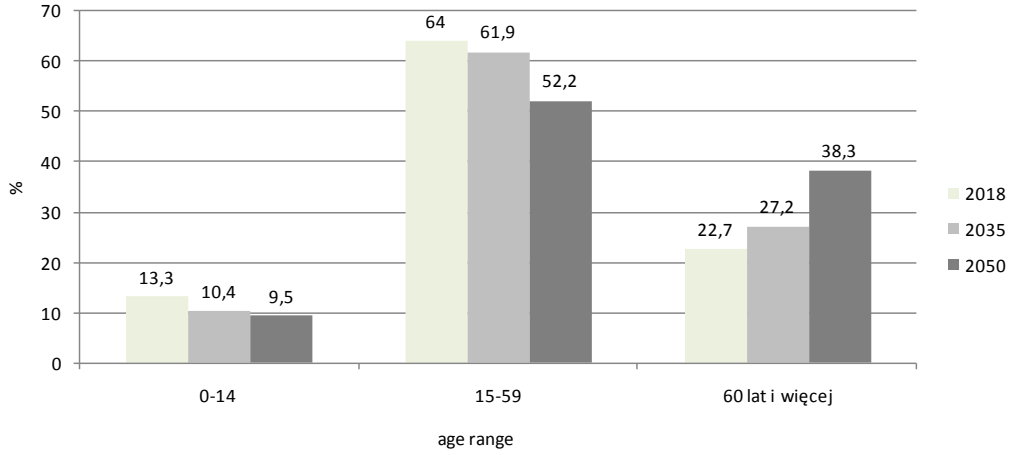

Figure 2. Population changes in biological age groups on the example of lubański district according to the state in 2018 and the forecast till 2050. Source. Own elaboration, based on Population forecast for the period 2014-2050, Central Statistical Office, Warsaw 2014.

Another important variable – describing the population structure – is the age dependency ratio – a measure of the number of dependents aged zero to 14 and over the age of 65, compared with the total population aged 15 to 64. According to the state at the end of 2018, per 100 people of working age in the studied communes there were from 48,7 (Cieplice Śląskie-Zdrój/Jelenia Góra) to 59,5 Przerzeczyn-Zdrój/dzierżoniowski) people of non-working age. The forecast clearly indicates that in the perspective of 2050 the burden of economically inactive population on the working age in the studied communes may increase to 95 and 87,6 (Table 9).

Table 9.
Projection of the age dependency ratio in the analytical area by administrative unit – alphabetical order

Analytical area	Administrative unit	Projection area/county	Years			
			2018	2025	2035	2050
Cieplice Śląskie-Zdrój	Jelenia Góra	Jelenia Góra	48,7	73,8	76	95
Czerniawa-Zdrój	Świeradów Zdrój	lubański	57,5	63,7	63,5	85,8
Długopole-Zdrój	Bystrzyca Kłodzka	kłodzki	59,4	63,6	66	86
Duszniki-Zdrój	Duszniki-Zdrój	kłodzki	59,4	63,6	66	86
Jedlina-Zdrój	Jedlina-Zdrój	wałbrzyski	57,1	62,3	62,9	84
Kudowa-Zdrój	Kudowa-Zdrój	kłodzki	59,4	63,6	66	86
Lądek-Zdrój	Lądek-Zdrój	kłodzki	59,4	63,6	66	86
Polanica-Zdrój	Polanica-Zdrój	kłodzki	59,4	63,6	66	86
Przerzeczyn Zdrój	Niemcza	dzierżoniowski	59,5	66,7	66,4	86,7
Szczawno-Zdrój	Szczawno-Zdrój	lubański	57,5	63,7	63,5	85,8

Source: own calculations based on population projections for 2014-2050, Statistics Poland (GUS). Warsaw 2014.

An illustration of the outlined forecasts is presented on the example of Jelenia Góra poviat, which, according to the forecast, may experience the highest increase in the age-dependency ratio among the studied poviats, in the area of which the studied communes are located (Figure 3).

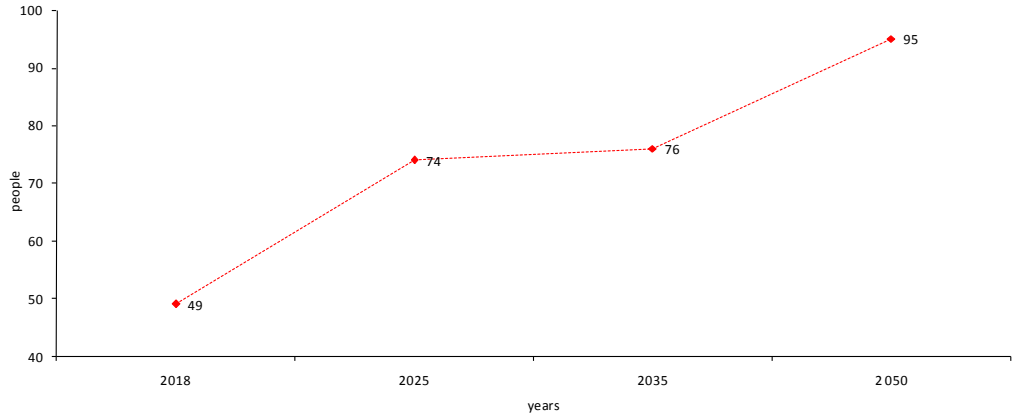

Figure 3. Changes in the age dependency ratio for Jelenia Góra according to the forecast until 2050. Source. Own elaboration, based on Population forecast for the period 2014-2050, Central Statistical Office, Warsaw 2014.

The age dependency ratio in the analysed period ranged from 48,7 (Jelenia Góra/Cieplice Śląskie-Zdrój) to 57,1 (Wałbrzyskie/Jedlina-Zdrój). In subsequent years it may increase dynamically. In the case of the studied communes, in 2025 – in the wałbrzyski district/Jedlina-Zdrój – up to 62,3 people, and in 2050 – 84, and in Jelenia Góra/CiepliceŚląskie-Zdrój – up to 73,8 and 95 respectively (Figure 4).

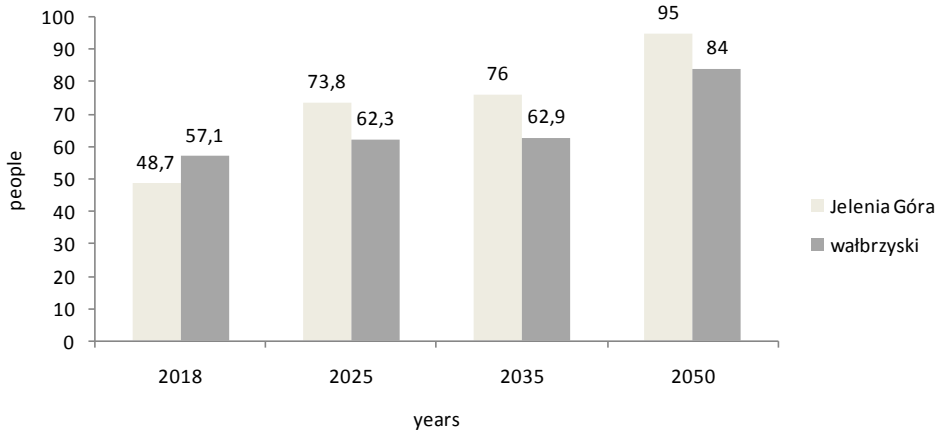

Figure 4. Changes in the age dependency ratio for the wałbrzyski poviat and Jelenia Góra according to the forecast of the Statistics Poland until 2050 and in the years 2018-2050. Source. Own elaboration, based on Population forecast for the period 2014-2050, Central Statistical Office, Warsaw 2014.

The indicated growth in dependency ratio is determined in the forecast primarily by the very high projected increase in the old-age dependency ratio, defined as the ratio of the number of elderly people (aged 65 years and over) compared with the number of people of working-age (15-64 years). In this light, it is worth noting some significant changes that have taken place in Poland in general over the second half of the 20th century – and, according to forecasts,

will continue to take place in future decades. Between 1950 and 2011, the share of the youngest economic group in the Polish population decreased from approximately 35-37% to 19%, while the share of the oldest group increased from approximately 7% to 17.5%. The population projection of the Statistics Poland (GUS) predicts further profound changes in the demographic structure by 2035 – a decrease in the share of population aged 0-17 to 15.8% and an increase in the share of population in the post-working age to 26.7%. The number of people at an advanced age – 80 and over – is expected to grow even faster. It's in line with the general European trends, as the EU old-age dependency ratio is projected to be at 57% in 2100, almost double that of 2019 (31%). Number of people aged 80 years and over projected to rise to 60.8 million in EU-27 by 2100 (EUROSTAT, 2020). It's worth noting, that in Poland – the old-age dependency ratio is projected to be highest (63%) all European countries (EUROSTAT news, 2020).

In the context of the above presented projections proper relations between the population at pre-working, working and post-working age are extremely important for the effectiveness of any pension system, which affect the development of health resort communes both in terms of the stability of income and living standards of the area's residents and because of the variation in demand for health services. The process of intensive population ageing entails many risks and has a negative impact not only on the financial situation of the pension system, but also on public finances as a whole. The growing number of people entitled to receive pension benefits is reflected in an increase in public expenditure on. Pensions account for a large and growing share of public expenditure, averaging over 10% of GDP across the European Union, and could account for up to 12.5% of GDP in 2060 (White Paper, 2014, p. 4). The continued upward trend in the number of pensioners will certainly contribute to an increase in the public deficit and debt in the future. As a consequence of the projected changes, it should be noted that the statements published by the European Commission (European Commission and Economic..., 2012) on the projected changes in the size of the burden resulting from the payment of benefits from both the first (pay-as-you-go) pillar of the pension system and those financed by private mandatory capital plans show that over the next 50 years in Poland, the total public expenditure (relative to GDP) on pension benefits may fall (from 11.8% of GDP to 9.6% of GDP), although it is still expected to be unbalanced over the entire 50-year horizon (European Commission and Economic..., 2012, p. 107).

In the context of these phenomena, it should be noted that from the point of view of social policy one of the most important demographic determinants is the structure of the population by age. As E. Trafiałek (2006) points out, modern civilisation guarantees increasingly longer average life expectancy. This is accompanied by an increase in the number of elderly people and a simultaneous decrease in natural growth. As a result, on a global scale the model of the so-called inverted demographic pyramid is becoming established (Orczyk, 2005, p. 41), which is characterised e.g. in the social sphere by the lack of replacement of generations on the labour market and gives rise to the problem of securing decent conditions for those retiring from

professional activity. On the other hand, in terms of economic effects, it causes the so-called emptying of labour markets (Strzelecki, 2010). Hence the postulate of L. Frąckiewicz, which states that the economic, social, medical and cultural consequences of demographic ageing include various spheres of behaviour, needs, trends, creating a vast catalogue of tasks the implementation of which requires launching appropriate entities and instruments of social policy, is still valid (Frąckiewicz, 2003, p. 11). This process requires, first of all, the development of a catalogue of priority tasks, resolving the main issues caused by the changing demographic structure in global, regional and local dimensions (Trafiałek, 2006, p. 252-258). One of the first tasks in this area is the international integration of activities in the construction and implementation of a new model of economic functioning and a new model of saving and investing. In this respect, the main goal is to provide adequate income and care for old people. This is critical to ensuring dignity and quality of life. It is also important from the health tourism development point of view, as in the case of low incomes of working-age people, especially those aged 50+ and those in retirement age, it is impossible to expect an increase in the volume of demand for spa services financed by patients' funds (Szromek et. al., 2012).

3. Conclusions

On the basis of the analyses and research carried out, it may be concluded that in the analysed administrative areas of Lower Silesia – in the part relating to the stream of labour supply – a dynamic process of ageing of labour resources is clearly visible. On the basis of the above conclusion it seems justified to subordinate the policies implemented in the studied administrative areas to the indicated process. Taking into account the currently implemented and planned policies aimed at successful social and economic development of the analysed areas – it seems that they should primarily focus on such phenomena as:

- imbalance in feminisation ratio,
- serious shortage of women in the age range of 20-29 (the age of the highest matrimonial activity) and high predominance of women in the oldest age groups,
- significant decline in the number of births,
- negative natural growth,
- extremely low fertility rate,
- extremely low gross reproduction rate,
- low rate of demographic dynamism,
- dynamically growing old-age dependency ratio.

As a result of the processes taking place in the age structure – determined by the abovementioned phenomena – in the examined areas further dynamic stratification of the streams of labour demand and labour supply should be expected. The stratification will be first

of all implied by a clear increase in the population of those entering retirement age (economic inactivity) with a simultaneous decrease in the population of those characterised by demographic youth and the highest economic activity and mobility. The key source of these unfavorable tendencies is – already mentioned above – lack of simple substitution of labour resources at the age of the highest economic activity by numerically significantly smaller population of the youngest people.

As a result of the aforementioned processes, a significant increase in the economically inactive population should be expected in the analysed areas. This is confirmed by the forecasts of the Statistics Poland, which unambiguously indicate that in the perspective of 2050, the level of dependency ratio e.g. in Jelenia Góra may increase from 49 in 2018 to an extremely high number of 95 people in 2050 (Prognoza ludności...). The source shaping the indicated forecasts most intensively will be, the dynamic growth of the population in post-working age, i.e. people aged 60/65 and more. This process, in turn, will result in a very high rate of population ageing in the old age group, i.e. in the oldest categories, aged 75 and more (Prognoza ludności...).

In addition, it should be noted that the indirectly indicated changes and projected trends are consolidated by the negative migration balance emptying the labour market in the most active age groups of labour resources (Miłaszewicz, 2016, pp. 109-120) and a very high share of men in deaths of people aged up to 65 due to cardiovascular diseases – more than three times higher than among women (Jelenia Góra in numbers, 2021).

All the changes, processes and forecasts indicate that in order to reduce the stratification in the studied areas, which is the main source of structural mismatch, it is necessary to take action to build the future shape of urban policy – especially in relation to old age.

In this context, the studied communes may be recommended to undertake the following activities:

- developing guidelines for local programmes preparing municipal and district policies on the phenomenon of old age,
- giving public employment services a leading role in the preparation of thematic proposals for social and professional activation of seniors,
- development of proposals for measures to strengthen the participation of seniors in local decision-making shaping the present and future of the municipalities and districts under review (Senior Citizens' Town Council, etc.),
- preparation of guidelines for a programme of intergenerational integration,
- particularly based on the diversity management method and reducing the intergenerational information gap,
- attempting to develop an educational programme outlining the economic and social consequences of the demographic depression,
- developing a package of measures specifically aimed at women senior citizens,
- prioritising education and health in measures to promote the social and professional activity of senior citizens.

Failure to take such measures may delay preparation for the – as it seems inevitable – changes in the age structure of the population living in the study areas. As already noted, these are changes in many aspects, from changes in the consumption structure, through changes on the "production" side (labour force. GDP). and the consequences for public finance systems. As the population ages, the relationship between labour and capital changes, as does the relationship between labour supply and labour demand, which is derived from consumption demand (Börsch-Supan, 2008). The aforementioned need for the studied areas to prepare for the effects of the ageing of the population living in the studied areas will also be determined by further – as already indicated – expected effects, such as: sectoral or occupational mismatches in the labour market (for example, due to increased demand for health and social care workers, associated with an increase in the population aged 65+ and, above all, 80+), which may result from changes in the structure of consumption, labour market consequences for social security systems and the need to fill gaps in labour supply associated with a possible influx of immigrants (Janick,a 2015, p. 26).

The signaled unfavourable changes in the population structure of the studied areas due to economic activity have significant consequences for the economies of these areas and social life. Changes in the age structure of the population translate into changes in many aspects, starting with – already mentioned – changes in the consumption structure, through changes on the "production" side (labour force, GDP) and the consequences for the financial systems. With regard to the labour market, it should be clearly noted that each of these changes in the structure of the population has economic consequences. Since labour is the basic factor of production, the changes taking place in the labour market should be singled out as those which will be of key importance for the functioning of the economy, the GDP growth rate or the GDP per capita growth rate. In this respect, one should first of all mention the changes in the size of the labour force as a whole (reduction of the number of people who can take up a job) and their composition (e.g. increase of the proportion of employees in the pre-retirement age). Changes in the proportions of age groups in the population will translate into changes in the functioning of the labour market, as potential employees from different age groups will differ, e.g. in their participation rate (Bloom, 2008, pp. 17-51).

On the basis of the above conclusions it seems that the greatest contemporary challenge for the environments, institutions and people creating the future of the studied areas may be maintaining the economic activity of the ageing population with simultaneous development of modern active social and labour market policies – corresponding to the economic structure of the studied areas, in particular on the basis of their tourism assets.

In the final reflection it is worth noting that the conclusions and recommendations presented in this article on the socio-demographic determinants of development of selected communes and districts – especially in the demographic perspective – do not cover all the problems in the discussed cognitive area, which results from its wide and interdisciplinary scope. The analyses presented here may serve as a basis for further research on, first of all, the changing conditions

shaping the determinants of development of the studied areas – in the phase of global changes, improving the directions and objectives of their development and practical activities to increase the importance of project activities on the map of Lower Silesia, the country and Europe.

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MINING MUNICIPALITIES AND DISTRICTS IN A PHASE OF DEMOGRAPHIC CHANGE IN AN EQUITABLE PERSPECTIVE OF TRANSFORMATION

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Purpose: the main purpose of this article is to stimulate discussion on the following thesis presented in the article. Anticipating the process of just transition without taking into account demographic changes will incompletely reveal the social and economic effects caused by it.
Design/methodology/approach: the research used the method of descriptive and comparative statistics, as well as literature review, critical analysis of literature, document research and comparative analysis.
Findings: on the basis of the analyses and research carried out in this article, it can be concluded that in the examined areas of mining municipalities – in the part relating to the stream of labour supply – a dynamic process of ageing of labour resources is clearly noticeable. On the basis of the above conclusion, it seems that the need to subordinate the policies implemented in the city to the indicated process is justified.
Originality/value: the entirety of the outlined changes, processes and forecasts indicates that in order to reduce the stratification in the examined areas, which is the main source of structural mismatches, it is necessary to undertake actions aimed at building future-oriented municipal policies – especially with regard to old age. Failure to take such measures in the perspective of social and economic transformation may delay preparation for the seemingly inevitable changes in the age structure of the population living in the studied areas of mining municipalities.

Keywords: man, work, economy.

Category of the paper: research paper.

1. Introduction

As Ewa Frątczak observes, the political and social transformation in the countries of Central and Eastern Europe, including Poland, transformed the region into a kind of "demographic laboratory" in which population processes undergo significant, possibly irreversible changes of a new quality and dimension (Frątczak, 2008, pp. 77-150). In this light, it is reasonable to claim

that further transformation processes – includeng those related to the domestic mining sector – will determine, among others in the area of the Silesian Voivodeship, significant transformations of labour markets and the related – significantly emphasized in the just transition process – the quality of life. As it is noted in the just transformation process, special attention will be paid to the availability of health care, participation in culture, public transport, schools and universities with attractive educational offer, flats for rent, senior citizen services, sports facilities and recreational areas (What is just..., 2020). It seems, therefore, that anticipating the fair transformation process without taking into account demographic changes will incompletely reveal the social and economic effects caused in the transformed areas. Especially that Poland has entered a period of another demographic crisis (GUS on the situation..., 2020).

As a result of the ongoing changes and long-term forecasts, according to experts' assessments, demographic changes will have a significant impact on the future shape of relations between the economically active and inactive populations. On the background of this thesis it is worth noting that the dynamically growing population of seniors constitutes the least active social group in Poland. The prevalence of negative consequences of the ageing process makes it necessary to search for effective ways of mitigating them. Taking into account the growing potential of this group of consumers and the increase in their number, it seems reasonable that for this population: social policy should be addressed which would favour their activity:

- create differentiated products taking into account heterogeneous preferences,
- organise activity on the basis of global trends and changes in the process of demographic modernisation towards individualisation, self-realisation and human independence,
- properly prepare personnel that would make it possible to break down barriers to the participation of seniors in social and economic life (Januszewska ,2017, pp. 257-264).

In the coming decades, demographic trends will determine the shape of the economic model of the world and individual economies. Ageing populations, the still significant (though decreasing) number of "young" societies and countries; migration and spontaneous urbanisation force appropriate adjustments to economic policies. Countries with ageing societies – in the perspective of the next few decades – are determined to make efforts to maintain the living standards of their citizens, develop new types of services, as well as ensure the continuity of social security systems and sustainability of public finances. Limited supply of economically active people and changes in demand for workers (skilled and unskilled) may result in increased global migration. Urbanisation, while creating incentives for economic development, will at the same time increase pressure on food and water resources and, if uncontrolled, may cause excessive economic and social costs (Strategy..., 2017, p. 20). In conclusion, demographic change is an important challenge for numerous public policies, such as family, health care, labour market, social security, education and active leisure. The challenges identified and the areas of their impact are part of a broader spectrum of reflection that should focus on a holistic

approach to active policies, which are a key determinant of human capital – in which, as forecasts indicate, by 2050 people aged over sixty-five may constitute 20% of the total population of Europe. Irrespective of the social changes brought about by the transformations described above, demographic change will put enormous pressure on the pension and social security systems of the EU countries. If these processes are disregarded – as numerous studies indicate – the EU is threatened with a reduction of potential employment growth rates to an extremely low level of around 1% per annum (Krysiak, 2007, p. 82). This prognosis clearly shapes the need to develop scenarios of demographic developments. This statement is determined, inter alia, by the fact that societies of developed countries are entering a phase in which the ratio of economically active to inactive people is shifting towards the latter group. On the basis of these determinants the demographic situation of Poland – including mining municipalities – definitely places it also in the area of dynamically ageing societies.

In light of the principles, regularities and trends outlined above – quoting K. Zamorska (Zamorska, 2014, pp. 19-33) – it is impossible to ignore the causal relationship between work, pay and family maintenance. Ignoring this calls into question the traditional values of social policy, which become mere empty platitudes. A new social context has emerged, in which, under the influence of information technology, the problems of rationalising the sphere of work are translated into new and increasingly complex social conflicts and contradictions. This is a new kind of conflict between the sponsors of social benefits and their recipients (Sloterdijk). On the one hand, the nature of work itself is changing, while on the other, thinking remains with the understanding of work that was generated during the period of large-scale industrial social development. A challenge to the social policies shaped in the 19th century and developed in the 20th century are the processes of globalisation, which ignore social problems. Economic globalisation has overtaken political and social globalisation. The latter have remained at the level of national social policies.

In line with the assumptions adopted in the research, the analyses of demographic conditions in this chapter focus on selected 28 mining municipalities from the Dolnośląskie, Lubelskie, Śląskie and Małopolskie voivodeships (Table 1)[1]. The analyses made use of statistical data from three sources: the statistical portal Poland in Figures, the Central Statistical Office in Warsaw and the European Statistical Office EUROSTAT. Descriptive and comparative statistical methods as well as literature review, critical analysis of literature, document studies and comparative analyses were applied in the study.

[1] The article is the result of a research work entitled Mining communes and counties in Poland in the perspective of a just transformation commissioned by the Central Mining Institute by the Association of Mining Communities in Poland. More: R. Marszowski, Mining communes and counties in Poland in the perspective of just transformation, Katowice 2020.

Table 1.
Breakdown of the analytical area by administrative units based on EUROSTAT and Central Statistical Office statistics and NUTS[2]

Lp.	Administrative unit	Administrative division	Analytical area	Area Poviat
1	Babice	gmina wiejska	Babice	chrzanowski
2	Bestwina	gmina wiejska	Bestwina	bielski
3	Bieruń	gmina miejska	Bieruń	bieruńsko-lendziński
4	Chełm Śląski	gmina wiejska	Chełm Śląski	bieruńsko-lendziński
5	Cyców[3]	gmina wiejska	Gmina Cyców	łęczyński
6	Czerwionka-Leszczyny	gmina miejska	Czerwionka-Leszczyny	rybnicki
7	Gierałtowice	gmina wiejska	Gierałtowice	Gliwicki
8	Grębocice	gmina wiejska	Grębocice	Polkowicki
9	Jastrzębie-Zdrój	gmina miejska	Jastrzębie-Zdrój	Jastrzębie-Zdrój
10	Knurów	gmina miejska	Knurów	Gliwicki
11	Lędziny	gmina miejska	Lędziny	bieruńsko-lendziński
12	Libiąż	gmina miejska	Libiąż	Chrzanowski
13	Ludwin	gmina wiejska	Ludwin	Łęczyński
14	Marklowice	gmina wiejska	Marklowice	Wodzisławski
15	Miedźna	gmina wiejska	Miedźna	Pszczyński
16	Mszana	gmina wiejska	Mszana	Wodzisławski
17	Pawłowice	gmina wiejska	Pawłowice	Pszczyński
18	Pilchowice	gmina wiejska	Pilchowice	Gliwicki
19	Polkowice	gmina miejska	Polkowice	Polkowicki
20	Pszów	gmina miejska	Pszów	Wodzisławski
21	Puchaczów	gmina wiejska	Puchaczów	Łęczyński
22	Radlin	gmina miejska	Radlin	Wodzisławski
23	Rybnik	gmina miejska	Rybnik	Rybnik
24	Rydułtowy	gmina miejska	Rydułtowy	Wodzisławski
25	Siemianowice Śląskie	gmina miejska	Siemianowice Śląskie	Siemianowice Śląskie
26	Suszec	gmina wiejska	Suszec	Pszczyński
27	Świerklany	gmina wiejska	Świerklany	Rybnicki
28	Żory	gmina miejska	Żory	Żory

Source: Poland in numbers 2019, Local Data Bank, Central Statistical Office, Statistical Office of the European Union EUROSTAT.

On the basis of the above theses and megatrends in the analyses and research presented in the article, the author focused – in accordance with the guidelines for research with the above-mentioned title "Mining municipalities and districts in Poland in the perspective of "Just transformation" – on the following key variables:

1. Total population.
2. The feminization coefficient.
3. Population by biological age groups.
4. Population by economic age groups.

[2] In the NUTS classification (Classification of Territorial Units for Statistics) three levels are distinguished: the first one – covering 6 regions grouping voivodships, the second one – 16 voivodships and the third one – 72 subregions grouping poviats. These three levels also correspond to the three regional levels in the national NTS nomenclature (Nomenclature of Territorial Units for Statistics). The NTS classification also includes two local levels: the fourth – counties and the fifth – municipalities. More information on the territorial units classifications applied by the CSO is available at: www.stat.gov.pl/statystyka-regionalna/jednostkiterytorialne/.

[3] The availability of demographic data is very limited for statistical towns – includeing the village of Cycowa. There are many more indicators available at the commune level, e.g. age and marital status of inhabitants, number of marriages and divorces, birth rate, population migration and forecast population. Hence, the analyzes in the case of the village of Cyców are carried out at the commune level.

5.Median age.
6. Live births.
7. Total deaths.
8. Natural increase.
9. Migration balance.
10. Net migration ratio.
11. Demographic dependency ratio.
12. Demographic dynamics coefficient.
13. Generation replacement rate (fertility rate).
14. Gross reproductionrate.

2. Implementation of research – discussion

Taking into account the division of the analytical area according to administrative units on the basis of EUROSTAT and Central Statistical Office statistics, analyses, studies and forecasts for the SGGP were carried out in the area of 28 municipalities presented in the first table. In the years 2009-2019 the population living in the studied municipalities followed two trends: a) systematically decreased and b) remained unchanged. Examples of decreasing population are e.g. SiemianowiceŚląskie and Jastrzębie-Zdrój (Table 2).

The feminisation coefficient in all the municipalities under study was very seriously skewed. In the municipalities under study, it ranged from 102 (Bieruń) to 110 women (SiemianowiceŚląskie) per 100 men in the period under study – year 2019. This resulted in a very low masculinisation rate of between 90 and 98 men per 100 women. It is worth noting that the divergence of the feminisation coefficient in most mining municipalities has been persistent since 2009 (Table 3).

Table 2.

Basic demographic characteristics of mining municipalities in 2009-2019 – year 2009 = 100%

Years	Municipalitie																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Total population																												
2009	8915	10812	19 534	5859	7605	28199	10 795	5309	92988	39207	16282	17391	5087	5190	15670	7157	17894	10590	22216	14045	5086	17739	141372	21897	70712	11356	11475	62022
2019	9097	11909	19 507	6358	7912	28134	12 183	5402	88743	38112	16798	17003	5641	5405	16590	7690	18172	12013	22486	13844	5693	17759	138098	21514	66841	12347	12486	62472
%	102,04	110,15	99,86	108,52	104,04	99,77	112,86	101,01	95,43	97,21	103,17	97,77	110,9	104,14	105,87	107,45	101,81	113,44	101,22	98,57	111,93	100,11	97,68	98,25	94,53	109,69	108,81	100,73
Live births																												
2009	105	–	233	62	97	332	97	69	984	455	194	173	60	42	204	91	231	108	268	160	58	215	1643	244	731	161	112	767
2019	76	53	171	65	92	308	123	47	706	324	179	145	79	58	221	89	188	112	222	112	61	164	1260	219	594	145	131	567
%	72,38	–	73,39	104,84	94,85	92,77	126,80	68,11	71,75	71,21	92,27	83,82	131,67	138,10	108,33	97,80	81,39	103,70	82,84	70,0	105,17	76,28	76,69	89,75	81,26	90,06	116,96	73,92
Total deaths																												
2009	84	–	149	50	90	276	131	59	727	375	132	151	54	46	84	66	117	111	145	142	66	164	1218	238	908	61	94	409
2019	100	99	173	54	70	336	109	55	920	360	166	180	53	67	122	70	152	101	185	164	56	188	1485	213	835	112	105	520
%	119,05	–	116,11	108	77,78	121,74	83,21	93,22	126,5	96,0	123,48	119,21	98,15	145,65	145,24	106,06	101,81	90,99	127,6	115,49	84,85	114,63	121,92	89,50	91,96	183,61	111,70	127,14
Natural increase																												
2009	21	25	–	–	–	–	–	–	256	80	–	–	6	–	120	25	114	-3	123	18	-8	–	425	–	-177	100	18	358
2019	-24	10	-2	11	22	-28	14	-8	-214	-36	-1	-35	26	-9	99	19	36	11	37	-52	5	-24	-225	6	-241	33	12	47
%	-114,3	250,0	–	–	–	–	–	–	-124,3	-222,2	–	–	433,33	–	12,2	76,0	316,6	366,7	332,4	-288,9	160,0	–	-188,9	–	136,16	303,0	144,44	761,7
Migration balance																												
2009	17	111	-78	49	-11	-64	72	-8	-724	-224	-8	-81	24	-12	-79	58	-55	120	-154	-11	59	-36	-183	-4	-235	111	83	-431
2019	-15	65	-98	45	-34	-174	123	36	-295	-157	-46	-66	27	10	-28	-3	-61	162	-77	-74	12	1	-452	-80	-62	45	31	-49
%	-88,24	58,56	125,64	91,84	309,09	271,86	170,83	450,0	-40,74	64,34	575	83,95	112,50	-83,33	35,44	-5,17	110,91	135,0	50,0	672,73	20,34	-2,78	246,99	2000,0	26,38	40,54	37,35	11,37
Net migrationrate																												
2009	1,9	10,3	-4	8,4	-1,5	-2,3	6,7	-1,5	-7,7	-6,2	-0,5	-4,7	4,8	-2,3	-5,1	8,2	-3,1	11,4	-7	-0,8	11,6	-2,0	-1,3	-0,2	-3,3	9,9	7,3	-7,0
2019	-1,6	5,5	-5	7,1	-4,3	-6,2	10,2	6,7	-3,3	-4,1	-2,7	-4,0	4,8	1,9	-1,7	-0,4	-3,4	13,6	-3,4	-5,3	2,1	0,1	-3,3	-3,7	-0,9	3,6	2,5	-0,8
%	-0,84	0,53	1,25	0,85	2,87	2,70	1,52	-4,47	0,43	0,66	5,40	0,85	1,00	-0,83	0,33	-0,05	1,10	1,19	0,49	6,63	0,18	-0,05	2,54	18,50	0,27	0,36	0,34	0,11

Legend: 1. Babice, 2. Bestwina, 3. Bieruń, 4. Chełm Śląski, 5. Cyców, 6. Czerwionka-Leszczyny, 7. Gierałtowice, 8. Grębocice, 9. Jastrzębie-Zdrój, 10. Knurów, 11. Lędziny. 12. Libiąż, 13. Ludwin, 14. Marklowice, 15. Miedźna, 16. Mszana, 17. Pawłowice, 18. Pilchowice, 19. Polkowice, 20. Pszów, 21. Puchaczów, 22. Radlin, 23. Rybnik, 24. Rydułtowy, 25. Siemianowice Śląskie, 26. Suszec, 27. Świerklany, 28. Żory.

'-' indicates that the information is missing because of: a change in the presentation level, changes made to the list of territorial units or modifications.

Source: Local Data Bank of CSO. Data aggregated in pre-defined public tables. Population status and natural movement.

Table 3.
Basic demographic characteristics of mining municipalities in 2009-2019 – year 2009 = 100% (continued – tab. 2)

Years	Municipalities																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Feminisationratio																												
2009	104	105	103	110	106	104	108	98	104	106	102	104	97	104	98	100	103	105	105	105	106	107	104	108	109	103	104	103
2019	105	103	102	109	104	104	107	100	105	106	101	106	102	104	100	101	103	104	104	103	105	107	105	106	110	102	103	105
Feminizationrate in the maritalagegroup (25-29)																												
2009	95	99	102	109	86	94	106	97	98	95	99	90	84	92	88	95	99	101	94	89	100	100	96	102	101	103	99	97
2019	89	97	88	108	91	88	100	92	94	98	99	86	81	86	96	93	102	101	103	84	100	102	95	98	95	93	87	101
Age dependency ratio																												
2009	57,1	54,3	46,2	56,8	60,7	52,7	56,6	57,3	54,6	50,0	50,3	47,1	62,1	63,9	40,9	55,5	46,3	53,4	51,5	55,5	62,5	55,8	51,1	53,8	52,5	54,4	55,2	42,4
2019	66	64,5	60,3	65,8	63,9	62,2	68,7	61,5	67,8	66,6	58,9	65,4	62,9	68,1	49,9	63,4	57,1	63,4	64,3	60,1	63,6	65,4	66,8	67,9	69,8	59,0	64,4	70,1
Demographic dynamics rate																												
2009	1,25	1,27	1,56	1,24	1,08	1,2	1,3	1.2	1,35	1,21	1,45	1,14	1,11	0,91	2,43	1,34	1,97	0.98	1,85	1,13	0.88	1,31	1,35	1,02	0,8	2,64	1,19	1,87
2019	0.,76	1,19	0,99	1,23	1,31	0,92	0,86	0,85	0,77	0,9	1,10	0,8	1,49	0,87	1,81	1,27	1,24	1,11	1,2	0,68	1,08	0,87	0,85	1,03	0,71	1,29	1,25	1,09

Legend:1. Babice, 2. Bestwina, 3. Bieruń, 4. Chełm Śląski, 5. Cyców, 6. Czerwionka-Leszczyny, 7. Gierałtowice, 8. Grębocice, 9. Jastrzębie-Zdrój, 10. Knurów, 11. Lędziny. 12. Libiąż, 13. Ludwin, 14. Marklowice, 15. Miedźna, 16. Mszana, 17. Pawłowice, 18. Pilchowice, 19. Polkowice, 20. Pszów, 21. Puchaczów, 22. Radlin, 23. Rybnik, 24. Rydułtowy, 25. Siemianowice Śląskie, 26. Suszec, 27. Świerklany, 28. Żory

Source: Local Data Bank of CSO. Data aggregated in predefined tables available to the public. Population status and natural movement.

When searching for the sources of this state of affairs, it should be noted that the phenomena of gender imbalance in the population should be considered at two levels: geographical – includeing the urban-rural dimension, and age – particular age groups. In the first case, migration is the main factor of the gender imbalance. Their directions and structure lead to a situation of overrepresentation of women in cities and a general gender balance in rural areas. In 2016, there were 101 women per 100 men living in rural areas, and 111 women in the case of cities, reflecting the share of women in the urban population at 52.7%, and 50.2% in rural areas (Rural areas in Poland, 2017, p. 35). However, the key issue for determining the demographic consequences of the disturbed gender balance is the analysis of the feminisation rate (number of women/100 men) in particular age groups. This is because it is one of the important indicators informing about the reproductive capacity of the population in a given area (Bański, 2002). In this light it is worth emphasising that in the youngest age groups there is a natural phenomenon of male over-representation, since every year male babies predominate among the newborns. The share of boys in the number of births is approximately 0.51-0.52 (Holzer, 199). On the other hand, since women live longer than men on average, there is a natural predominance of women in the oldest age groups. Of particular importance for the current and future demographic situation of a given area is the value of the feminisation index in the age group characterised by the highest fertility rates (25-29) (Celińska-Janowicz, 2010, p. 21). Analyses of the indicated population structure in mining municipalities clearly showed that in the age range 25-29 the feminisation coefficient in 2019 showed a serious shortage of women. In this age group, the coefficient ranged from 81 (Świerklany) to 108 women (Chełm Śląski) per 100 men (Bank Danych..., 2019), with the feminisation coefficient for the total population in mining municipalities – as already highlighted – ranging from 102 to 110 women per 100 men in the corresponding period (Table 3).

The result of the indicated shortage of women in these groups is a decrease in the number of marriages and the number of births, which consequently leads to increasing population ageing processes. It is worth noting that over the last decade in Poland the highest fertility rate (number of live births per 1000 women) was recorded in the 25-29 age group. In recent years, there has been a phenomenon of shifting high fertility rates towards older age groups. While in 2000, nationwide, the highest values of the number of births per 1,000 women were characterised by the 25-29 and 20-24 age groups, already in 2005, the analysed indicator took on similar values in the 20-24 and 30-34 age groups – and between 1990 and 2018, the share of mothers aged 30 and over doubled and they account for 52 percent of women who gave birth in 2018. This phenomenon affects both urban and rural areas, although in the latter case it occurs with some delay and on a national scale it occurred for the first time only in 2009 (Celińska-Janowicz, 2010, p. 21).

The median age of the inhabitants of mining municipalities in 2019 is in the rangefrom 37.3 (Suszec) to 43.7 years (Siemianowice Śląskie) and was in most municipalities significantly higher than the median age for the country (41.9) 21 (Table 4). Mining municipalities in 2019

were areas where the population of demographic youth predominated. However, this state of affairs should be considered temporary. As a result of the further development of demographic changes, the phenomenon of demographic old age of the population living in the mining municipalities should be expected. As the forecasts indicate, the described population in the perspective of the next two decades may – eyes written below – reach the age of 50 in 50%.

This process has been accompanied by two permanent trends of decline and a slight increase in the dynamics of live births, which in the years 2009-2019 in the studied mining municipalities. The downward trend ranged from 68.11% (Grębocice) to 97.80% (Mszana). The total number of deaths was similar, ranging from 77.78% (Cyców) to 98.15% (Ludwin) and from 101.81% (Pawłowice) to 183.61% (Suszec) (Table 2).

The described distribution of the number of live births and total deaths influenced the natural increase in the studied mining municipalities in the years 2009- 2019, which in the analysed period was characterised by two tendencies of decreasing or increasing dynamics. In the analysed period the decrease in natural increase ranged from -114.3% (Babice) to 761.7% (Żory) and an increase from 336.7 (Pilchowice) to 433% (Ludwin) (Table 2).

As a result of the described regularities in the mining municipalities in 2019, the fertility rate, which is crucial for the reproduction of the population, was at a level from 1.22 (Babice) to 1.58 (Miedźna, Suszec) and was, in the majority of municipalities, clearly above the provincial rate, which reached a level of 1.36 in the analyzed period, and the national rate of 1.42 (Table 4). It should be noted that if the fertility rate is between 2.10 and 2.15 number of births per one woman of reproductive age (15-49 years), then there is full replacement of generations (Women's Health, 2012, p. 22). Similarly to the fertility rate, the gross reproduction rate was similar, which in the same period in the mining municipalities ranged from 0.60 (Jastrzębie-Zdrój, Libiąż) to 0.78 (Miedźna, Pawłowice, Suszec) and was in the majority of the studied mining municipalities lower than the voivodeship coefficient by 0.06 and lower than the national one by 0.09 as well (Table 4). It is worth noting that a coefficient with a value of 1 is a guarantee of simple reproduction of the population, while when it takes a value above 1, a process of population expansion occurs (Aktywność ekonomiczna..., 2014, p. 192). The demographic dynamics coefficient (the ratio of the number of live births to the number of deaths) was shaped similarly in mining municipalities, ranging from 0.68 (Pszów) to 1.81 (Miedźna) and was, in most mining municipalities, higher than the coefficient for the province (0.78) and the coefficient for the country (0.92). The demographic dependency ratio in the analysed period ranged between 49.9 (Miedźna) and 70.1 (Żory) persons in the post-working age bracket per 100 persons in the working age bracket (Table 3).

It may increase dynamically in subsequent years. In the case of the mining municipalities of Miedźna (data for the Pszczyna poviat) to 51 people in 2035 and 78 in 2050, and the Żory commune to 53 and 83 respectively (Table 5).

Table 5.
Changes in the demographic burden ratio for mining municipalities according to the CSO forecast until 2050[4]

Yeras	Poviats												
	chrzanowski	bielski	bieruńsko-lendziński	łęczyński	rybnicki	gliwicki	Polkowicki	Jastrzębie-Zdrój	wodzisławski	pszczyński	Rybnik	Siemianowice Śląskie	Żory
2018	45	35	33	20	36	39	35	42	40	19	41	48	43
2035	63	53	44	51	36	55	52	64	57	51	56	67	53
2050	98	75	67	80	76	80	77	91	86	78	87	103	83

Source: own calculations based on Prognoza ludności na lata 2014-2050. CSO, Warsaw 2014.

[4] The population forecast for 2014-2050 was developed in accordance with the Classification of Territorial Units for Statistical Purposes. The forecast distinguishest here levels: the first – covering 6 regions grouping voivodeships in Poland, the second – 16 voivodeships and the third – 72 subregions grouping powiats. Hence, forecasts for the level of a commune unit are made only at the poviat level.

It is worth noting that the indicator has been increasing dynamically over the past years. In 2004, in the pszczyński poviat this indicator was at the level of 21.1 and in Żory 10.7 people in the post-working age per 100 people in the working age (Fig. 1).

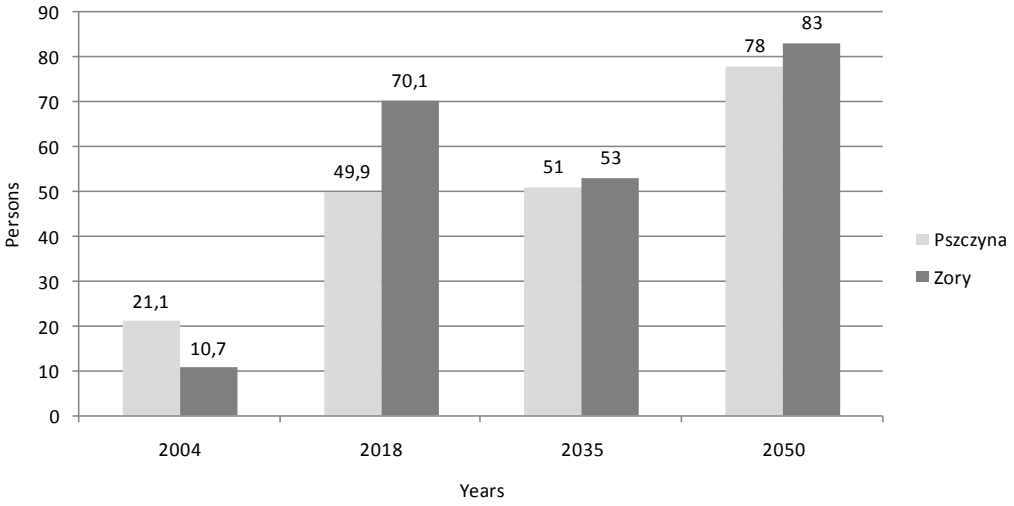

Figure 1. Changes in the dependency ratio for the Pszczyna district and the Żory municipality according to the CSO forecast until 2050 and in the years 2004, 2018. Source: Population forecast for 2014-2050. CSO, Warsaw 2014, CSO Local Data Bank.

In the analysed period in the mining municipalities, a permanent negative balance of internal and foreign migration for permanent residence is observed – with a decreasing trend. In the analysed period 2009-2019 the migration dynamics ranged from -88.24% (Babice) to 2000% (Rydułtowy). The net migration was also characterised by a permanent negative trend, which in the analysed period ranged from -4.47 (Gręboce) to 18.50 (Rydułtowy) (Table 2).

The phenomena described above have for years permanently shaped the condition and structure of the population of the studied mining municipalities. In the context of EU social policy, meeting demographic challenges requires action in many areas, among which the key ones are:

- equal opportunities and access to the labour market, including skills development and lifelong learning, and active employment support to increase employability, ease transitions and improve individuals' employability,
- fair working conditions, with an adequate and reliable balance of rights and obligations between workers and employers, as well as between flexibility and security to facilitate job creation, take-up of jobs on offer and companies' adaptability, and the promotion of social dialogue,
- adequate and sustainable social protection and access to high quality essential services, including childcare, health care and long-term care, in order to ensure a decent life and protection from risks and to enable citizens to function fully in the labour market and more generally in society (Towards a European Pillar..., 2016).

They also manifest themselves intensively in the area of mining municipalities and provinces, as well as the country (Marszowski, 2017, pp. 229-244). The changes in the population structure that took place in 1988-2008 and 2009-2019 are even remarkable. Looking for their sources, one can point to several reasons as follows. It seems that the breakthrough factors were of a cultural nature, which include (Kaa, 1999):

- the spread of premarital sexual relations,
- the delaying of the age of marriage,
- diversification and dissemination of alternative forms of partnerships,
- increase in the phenomenon of permanent celibacy (staying out of civil partnerships),
- increase in the number of divorces,
- prevalence of single-parent families,
- multiplicity and diversity of partnerships during the individual's life,
- reduction in the proportion of people in formal marriages,
- decrease in the average number of children in a family,
- the disappearance of multiple births,
- increase in voluntary childlessness,
- the spread of contraceptives,
- delay in the age of procreation.

The indicated regularities dynamically shape the demographic structure of the population of mining municipalities, including the occurrence of major changes in economic age groups. As of 2019, the population by economic age groups was shaped by two key trends, a downward trend and a slight increase. The downward trend in the population of the pre-working age group ranged from 92% (Babice) to 99.98% (Knurów). The Cyców and Gierałtowic emunicipalities, among others, were under the influence of a slight increase trend, which ranged from 100.56% to 136.06%. The population in the working age was, respectively, from 84.19% (Siemianowice Śląskie) to 97.84% (Grębocice) and from 100.47 (Mszana) to 110.71% (Puchaczów). On the other hand, the population of the population in the post-working age in all the studied mining municipalities was subject to dynamic growth in the range from 118.12% (Marklowice) to 203.56% (Żory) (Table 6).

Table 6.

Population of mining districts by economic age groups in 2009-2019 – year 2009 = 100%

Years	Municipalities																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Pre-workingagepopulation																												
2009	1362	1704	3012	916	1428	4266	1564	963	14276	5975	2586	2533	956	880	2514	1177	3105	1517	3808	2115	965	2738	20868	3125	9243	2096	1947	9781
2019	1253	2013	3167	1030	1436	4638	2128	896	12755	5965	2815	2481	1016	866	2973	1390	3281	2031	3687	2000	1035	2798	21685	3300	9436	2441	2296	10320
%	92,0	118,13	105,15	112,45	100,56	108,72	136,06	93,04	89,35	99,98	108,86	97,95	106,28	98,41	118,26	118,10	105,67	133,88	96,82	94,56	107,25	102,19	103,91	105,60	102,09	116,46	117,93	105,51
Workingagepopulation																												
2009	6035	7446	14181	3953	5085	19563	7266	3619	63856	27549	11517	12430	3360	3355	11911	4891	12943	7245	15667	9544	3308	12076	98577	14989	48612	7836	7875	45005
2019	5895	7596	12695	4014	5077	18064	7554	3541	55371	23859	11034	10723	3646	3411	11491	4914	12097	7699	14333	8937	3671	11211	86444	13345	40925	8141	7981	38440
%	97,68	102,01	89,52	101,54	99,84	92,34	103,96	97,84	86,71	86,61	95,81	86,27	108,51	101,67	96,47	100,47	93,46	106,27	91,49	93,64	110,97	92,84	87,69	89,03	84,19	103,89	101,35	84,47
Post-workingagepopulation																												
2009	1518	1662	2341	990	1092	4370	1965	727	14856	5701	2179	2428	771	955	1245	1089	1801	1828	2741	2386	813	2925	21927	3783	12857	1324	1653	6736
2019	1949	2300	3645	1314	1399	5432	2501	965	20617	8297	2949	3799	979	1128	2126	1386	2794	2283	4466	2907	987	3750	29969	4869	16480	17865	2209	13712
%	128,39	138,39	155,70	132,73	128,11	124,30	127,28	132,74	128,78	145,54	135,34	156,47	126,98	118,12	170,76	127,27	155,14	124,89	162,93	121,84	121;,40	128,21	136,68	128,71	128,18	133,31	133,64	203,56

Legend: 1. Babice, 2. Bestwina, 3. Bieruń, 4. Chełm Śląski, 5. Cyców, 6. Czerwionka-Leszczyny, 7. Gierałtowice, 8. Grębocice, 9. Jastrzębie-Zdrój, 10. Knurów, 11. Lędziny. 12. Libiąż, 13. Ludwin, 14. Marklowice, 15. Miedźna, 16. Mszana, 17. Pawłowice, 18. Pilchowice, 19. Polkowice, 20. Pszów, 21. Puchaczów, 22. Radlin, 23. Rybnik, 24. Rydułtowy, 25. Siemianowice Śląskie, 26. Suszec, 27. Świerklany, 28. Żory.

'-' indicates that the information is missing because of: a change in the level of presentation, changes made to the list of territorial units or modifications.

Source: Local Data Bank of the Central Statistical Office. Data aggregated in public predefined tables. Population status and natural movement.

According to the forecasts, further significant unfavourable changes in the population by economic age groups in the mining municipalities should be expected, which may be characterised by the following processes: a high decrease in the population in two age groups, the population in the pre-working age and the working age, and a high increase in the population in the post-working age. This regularity is confirmed by the following forecasts. In 2018, the population in the pre-productive age constituted a percentage in the range from 13.54% (Poviat of Chrzanów) to 20.20% (Poviat of Pszczyna), in the productive age from 59.53% (Poviat of Chrzanów) to 64.78% (Poviat of Pszczyna) and in the post-productive age from 12.83% (Poviat of Bieruńsko-Lendzinski) to 27.80% (Poviat of Gliwice). According to forecasts, this distribution in 2035 may be as follows: 11.09% (decrease by 2.45%) to 17.16% (decrease by 3.03%), from 53.83% (decrease by 5.7) to 61.47 (decrease by 3.31%) and from 21.28% (increase by 8.45%) to 22.52% (increase by 5.28%). The analysed population distribution of mining municipalities by economic age groups in 2050 may change further, according to the following projected figures: from 10.94% (decrease by 0.96%) to 16.38% (decrease by 0.78%), from 45.08% (decrease by 8.3%) to 56.61% (decrease by 4.86%) and from 25.90% (increase by 4.62%) to 27.80% (increase by 5.38%) (Table 7).

Table 7.
Changes in the population according to economic age groups for mining districts as projected by the Central Statistical Office until 2050

Population	Poviats												
	chrzanowski	bielski	bieruńsko-lendziński	łęczyński	rybnicki	gliwicki	polkowicki	Jastrzębie-Zdrój	wodzisławski	pszczyński	Rybnik	Siemianowice Śląskie	Żory
2018													
1	13,54	19,02	19,14	19,09	19,23	15,59	19,30	17,15	17,74	20,20	17,93	15,27	19,33
2	59,53	63,70	65,15	65,51	63,84	56,61	64,18	61,56	63,00	64,78	63,18	62,43	61,94
3	26,93	17,28	12,83	15,40	16,94	27,80	16,52	21,28	19,26	15,02	18,89	22,30	18.73
2035													
1	11,09	16,28	16,66	16,00	16,68	15,82	17,01	14,82	15,16	17,16	15,58	12,47	16,57
2	53,83	62,99	62,06	62,14	62,20	61,66	61,94	60,84	61,47	61,47	60,95	60,21	61,39
3	35,08	20,74	21,28	21,86	21,12	22,52	21,05	24,34	23,37	21,37	23,47	27,32	22,04
2050													
1	10,94	15,70	16,04	14,79	16,22	15,59	16,11	14,00	14,76	16,38	15,37	12,04	17,58
2	45,08	57,69	56,56	57,46	57,21	56,61	56,70	54,24	55,72	56,65	55,07	53,94	53,52
3	43,98	26,61	25,90	27,76	26,57	27,80	27,28	31,76	29,52	26,97	29,56	34,02	28,90

Legend: 1. Population in pre-working age, 2. Population in working age, 3. Population in post-working age.

Source: own calculations based on Prognoza ludności na lata 2014-2050. CSO, Warsaw 2014.

An illustration of the outlined projections is presented on the example of the Chrzanów poviat, which, according to the projections, may experience the highest increase in the post-working age population among the studied poviats with mining municipalities (Fig. 2).

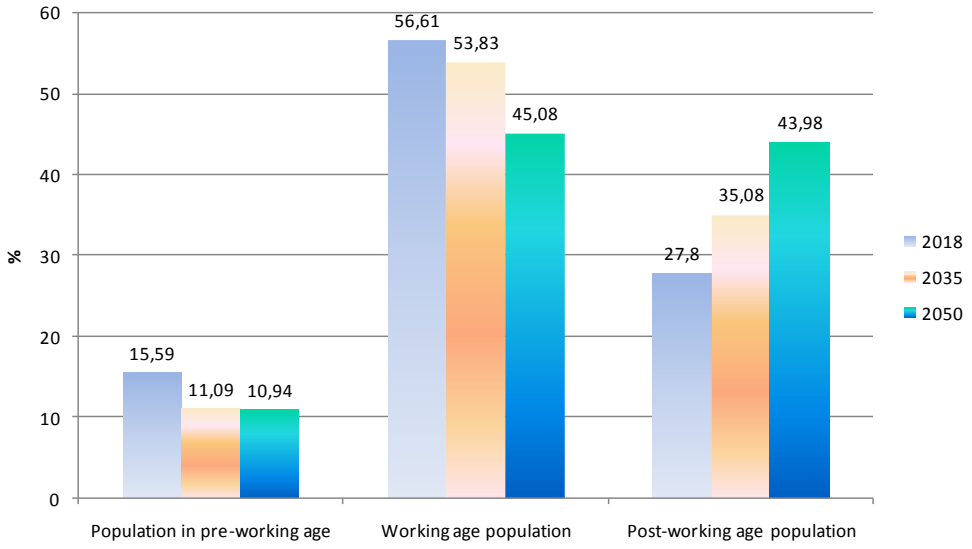

Figure 2. Changes in population in economic age groups on the example of Chrzanów poviat according to the state in 2018 and CSO forecast for 2014-2050. Source: Population forecast for the years 2014-2050. CSO, Warsaw 2014.

The occurring and forecasted demographic changes clearly indicate that in the studied structure of mining municipalities the most numerous are and will be four age groups: 50-54, 55-59, 60-64 and 65-69. The example most representative of the indicated regularity among the studied mining municipalities is once again the district of Chrzanów. Due to its population in 2019 (over 28% of the total population), it can be assumed that these are the four age groups that will determine the future quantitative and qualitative structure of the population of the mining municipalities under study. Due to their age cross-section, they will most dynamically shape the processes occurring in the labour market. In particular those related to dynamic ageing, their professional activity and inactivity, spatial mobility (migrations) and educational mobility, quality and level of social security. In relation to the indicated regularity, an important factor is the age bracket in the case of which a clear decrease in the population of mining municipalities' inhabitants is observed. This bracket is made up of those aged 75 to 85 and over. In this context, it should be noted that shifts of particular cohorts in the demographic structure of mining municipalities may cause a clear and dynamic increase in the population age cohorts entering retirement age – with a simultaneous decline in the population in the age cohorts characterised by demographic youth and the highest labour force participation and mobility. In this context, it is worth noting that the population aged 25-49 will, due to its size, undergo a systematic decline in the labour market of mining municipalities as a result of its lack of simple replacement by the numerically significantly smaller population of the youngest people – in the age brackets 0-4, 0-5, 10-14, 15-19 and 20-24 (22.9% of the total population). We illustrate this process – again – with the example of Chrzanów Poviat (Fig. 3).

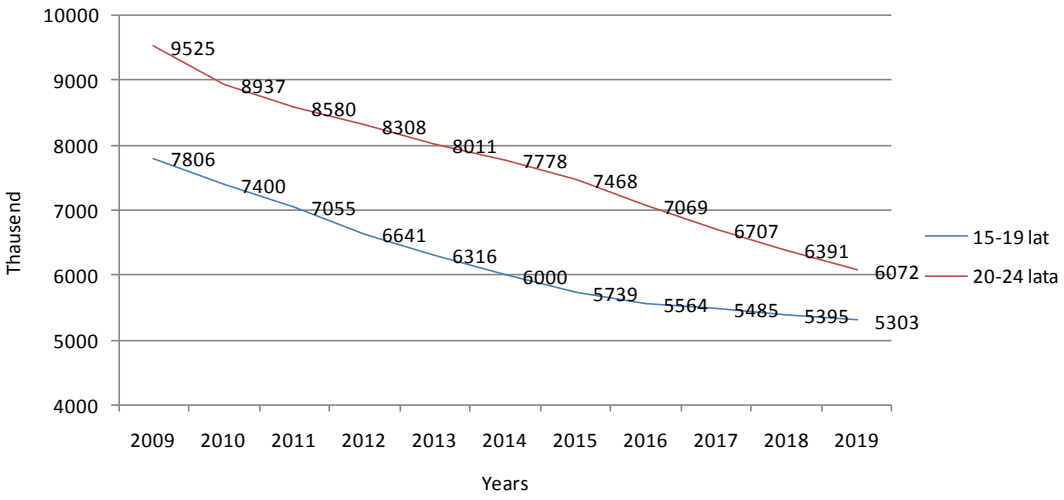

Figure 3. Population of Chrzanów Poviat by age groups 15-19 and 24-25. Observations for the years 2009-2019. Source: Local Data Bank of CSO. Data aggregated in pre-defined public tables. Population status and natural movement.

It should be noted that the indicated distribution of the number of inhabitants of mining municipalities by age groups will determine processes in the labour market which are a resultant of two phenomena: a decline in the population at the age of demographic youth and high educational, occupational and migration mobility with a simultaneous clear and dynamic increase in the population in older age groups. In terms of the term "older age groups", it is worth reflecting on the definition of ageing or old age. As noted in the Report on the Situation of Older Persons in Poland, the concepts of ageing and ageing can be considered in two ways – from the individual aspect and as phenomena concerning the collective of these individuals, i.e. the society of a given region, country, part of the world (Report..., 2012, pp. 15-18). In the individual aspect, ageing is a biological phenomenon constituting a human life cycle (Zych, 2004). According to another approach, ageing is perceived as a process of progressive impairment of vital body functions and loss of adaptive capacity to environmental changes, along with an increasing probability of death (Kirkwood, 1996). In general, the inevitable stage of the ageing process is a state referred to as old age. In turn, ageing, according to the definition accepted in psychogerontological literature, means a certain process and has a dynamic character, while old age as a state has a static character (Porzych, 2004). According to the life cycle theory of D.J. Levinson (Levinson, 1896), old age is one of the phases, which, however, is not homogenous and can be divided into successive periods.

The life cycle theory describes changes in the psyche and behaviour occurring at successive – progressive with age – stages of an individual's life. The first phase of life is the phase of learning, acquiring experiences (it includes childhood and youth). The next phase includes adulthood, which is the period of implementation of the knowledge possessed. The last phase – old age – is the phase of regression. The various phases may occur in different individuals at different times and it is not possible to give rigid limits to the age at which the various phases

of the life cycle begin or end. However, the psychological concept of the life cycle – created by E. Erikson (Erikson, 2002) – divides the life of an individual into eight stages.

The last stage is late adulthood and begins between the ages of 60 and 65. It should be noted that the division of the last stage of human life is subject to change along with the lengthening of life and improvement of its quality among older people. It should be noted that the division of the last stage of human life is changing with the lengthening of life and improvement of its quality in the community of elderly people. It is worth noting that over the next twenty-five years Poland will face population ageing. In this light, based on analyses of the population of the analysed mining municipalities, this time in the cross-section of biological age groups, equally unfavourable changes will take place in the 2050s, which may be characterised by the following processes: a high decrease in the population in two age groups, the population aged 0-14 and 15-59, and a high increase in the population aged 60 and over. This regularity is confirmed by the following forecasts.

In 2018, the population aged 0-14 accounted for a percentage ranging from 12.99% (Siemianowice Śląskie district) to 17.90% (Pszczyna district), aged 15-59 from 58.51% (Żory district) to 65.05% (Bieruńsko-Lendzinski district) and aged 59 and over from 18.92% (Bieruńsko-Lendzinski district) to 24.94% (Żory district). According to forecasts, this distribution in 2035 may be as follows: 10.19% (decrease by 2.8%) to 13.96% (decrease by 3.94%), to 56.36% (decrease by 2.15%) to 57.32 (decrease by 7.73%) and from 29.15% (increase by 10.23%) to 30.0% (increase by 5.06%). The analysed population distribution of mining municipalities by biological age groups in 2050 may change further, according to the following projected figures: from 10.01% (decrease by 0.18%) to 13.63% (decrease by 4.27%), from 46.60% (decrease by 9.76%) to 49.20% (decrease by 8.12%) and from 37.43% (increase by 8.28%) to 38.62% (increase by 8.62%) (Table 8).

An illustration of these forecasts is presented on the example of Siemianowice Śląskie district, which, according to the forecast, may experience the highest increase in the population aged 60 and above among the surveyed districts with mining municipalities (Fig. 4).

Table 8.
Changes in population in biological age groups for mining municipalities according to CSO forecast until 2050

Age groups	**Poviats/Years**												
	chrzanowski	bielski	bieruńsko-lendziński	łęczyński	Rybnicki	gliwicki	polkowicki	Jastrzębie -Zdrój	wodzisławski	pszczyński	Rybnik	Siemianowice Śląskie	Żory
2018													
0-14	13.54	15,93	16,03	15,99	16,38	15,08	16,27	14,36	14,99	17,19	15,28	12,90	16,55
15-59	59,53	62,32	65,05	63,11	61,53	61.02	61,68	60,11	60,72	62,67	60,20	58,66	58,51
60 and more	26,93	21,75	18,92	20,90	22,09	23,90	21,87	25,54	24,30	20,14	24,52	28,44	24,94
2035													
0-14	59.53	13,27	13,53	13,01	13,54	12,84	13,86	12,10	12,32	13,96	12,67	10,19	13,63
15-59	54.36	57,85	57,32	57,43	57,37	56,36	56,57	53,55	55,79	57,03	55,85	53,89	56,36
60 and more	45.08	28,89	29,15	29,55	29,09	30,80	29,57	34,35	31,89	29,01	31,48	35,92	30,00
2050													
0-14	26.93	13,3	13,37	12,18	13,49	12,99	13,33	11,54	12,24	13,63	12,80	10,01	14,78
15-59	34.45	49,57	49,20	48,76	49,09	48,32	49,01	46,33	47,10	48,49	46,64	44,42	46,60
60 and more	43.98	37,40	37,43	39.0	37,42	38,69	37,66	42,13	40,66	37,88	40,56	45,57	38,62

Source: own calculations based on Prognoza ludności na lata 2014-2050. CSO, Warsaw 2014.

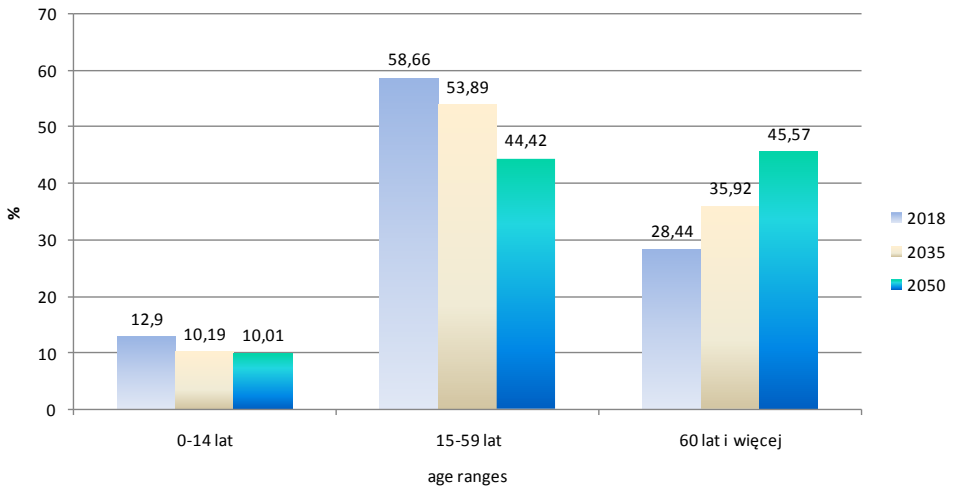

Figure 4. Changes in the population in biological age groups on the example of the district of Siemianowice Śląskie as at 2018 and the CSO forecast for 2014-2050. Source: Population forecast for 2014-2050. CSO, Warsaw 2014.

Another important variable – describeing the population structure – is the dependency ratio. As at the end of 2018, there were from 19 (Pszczyna poviat) to 49 (Siemianowice Śląskie poviat) people of non-productive age per 100 people of productive age in mining municipalities there were from 19 (Pszczyna poviat) to 49 people (Siemianowice Śląskie poviat) in non-working age. The forecast clearly indicates that in the perspective of 2050, the burden of economically inactive people of working age in mining districts may increase from 36 (Rybnik district) to 66 (Siemianowice Śląskie district) in 2035 and from 67 (Bieruńsko-Lędziński district) to 103 (Siemianowice Śląskie district) in 2050. An illustration of these forecasts is presented on the example of the district of Siemianowice Śląskie, which, in accordance with the forecast, may experience the highest increase in the old-age dependency ratio among the studied districts with mining municipalities (Fig. 5).

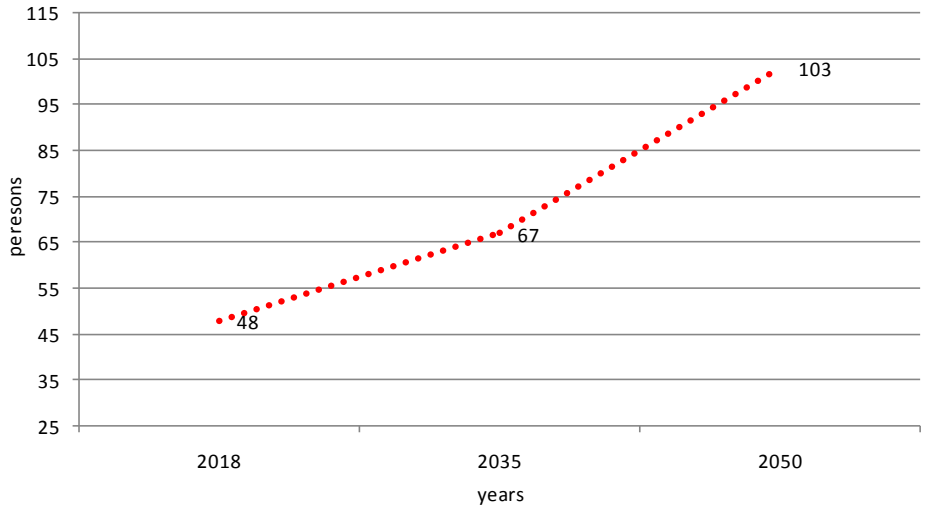

Figure 5. Changes in the dependency ratio for the district of Siemianowice Śląskie according to the forecast of the Central Statistical Office until 2050. Source: own calculations based on the population forecast for 2014-2050. CSO, Warsaw 2014.

The indicated growth is determined in the forecast primarily by a very high projected increase in the old-age dependency ratio. It should be noted that according to the forecast until 2050 a clear domination of the burden of working-age population on the economically inactive population can be expected in cities (Population..., 2014).

On the background of the projections presented above – to which special attention is drawn – proper relations between the population of pre-working age, working age and post-working age are extremely important for the effectiveness of any pension system. Beginning in the mid-20th century, societies in highly developed countries, especially in Western Europe, began to age intensively, which distorts these proportions. The process of population ageing entails many risks and has a negative impact not only on the financial situation of the pension system, but also on public finances as a whole. The growing number of people entitled to receive pension benefits is reflected in an increase in public expenditure for social purposes. Pensions represent a large and growing share of public expenditure, on average over 10% of GDP across the European Union, and in 2060 could account for up to 12.5% of GDP (White Paper..., 2012, p. 4). The continued upward trend in the number of pensioners will certainly contribute to an increase in the public deficit and debt in the future. As a consequence of the projected changes, it should be noted that statements published by the European Commission (European Commission and Economic..., 2012) concerning the projected changes in the size of the burden resulting from the payment of benefits from both the first (pay-as-you-go) pillar of the pension system, as well as those financed by private mandatory capital plans, show that over the next 50 years in Poland, the total amount of public spending (in relation to GDP) on pension benefits may fall (from 11.8% of GDP to 9.6% of GDP), although it is expected to remain unbalanced over the entire 50-year horizon (European Commission and Economic..., 2012, p. 107). Apart from Latvia, we are an exception in this respect compared to other European countries (European Commission and Economic..., 2012, p. 101) – in fact, most of them are to experience an increase in the relative burden of pension financing relative to GDP (Janicka, 2015, p. 26). In this light, it is worth noting some significant changes that have occurred in Poland over the course of the second half of the 20th century – and, according to the projections, the permanent economic population of Poland has decreased from around 35-37% to 19%, while the oldest has increased from around 7% to 17.5%. The GUS population projection envisages further profound changes in the demographic structure by 2035 – a decrease in the share of population aged 0-17 to 15.8% and an increase in the share of population in the post-working age to 26.7% (Central Statistical Office, 2009, p. 163). The population aged 80 and over is expected to grow even faster. According to Eurostat, it is expected to increase from 1.1 million in 2008 to 3.3 million in 2040 and 4 million in 2060, i.e. from the initial rate of ca. 3% to 13% at the end of the forecast period (Population forecast...).

In the context of these phenomena, it should be noted that from the point of view of social policy one of the most important demographic determinants is the structure of the population by age (Orczyk, 2005, p. 31). As E. Trafiałek notes, modern civilisation guarantees

an increasingly longer life expectancy. This is accompanied by an increase in the number of elderly people and a simultaneous decrease in natural growth. As a result, on a global scale the so-called inverted demographic pyramid model (Strzelecki, 2010) is becoming established. On the other hand, in terms of economic effects, it causes the so-called emptying of labour markets (Trafiałek, 2006, p. 246). Therefore the postulate of L. Frąckiewicz, which states that the economic, social, medical and cultural consequences of demographic ageing include various spheres of behaviours, needs, trends, creating an extensive catalogue of tasks the implementation of which requires launching appropriate social policy entities and instruments, is still valid (Frąckiewicz, 2003). The results of this research are presented in the work of E. Trafiałek entitled: "On new social policy towards old age" (Frąckiewicz, 2003). In response to this postulate is, among others, the work of E. Trafiałek titled "On new social policy towards old age" (Trafiałek, 2002, pp. 179-196). As it was stressed earlier, the author of the text notes the need to build a future shape of social policy, in particular, with regard to old age. This process requires, first of all, the development of a catalogue of priority tasks, which would resolve the main issues caused by the changing demographic structure in global, regional and local dimensions (Trafiałek, 2002, pp. 252-258). One of the first tasks in this area is the international integration of activities in the construction and implementation of a new model of economic functioning and a new model of saving and investing. In this respect, the main objective is to provide old people with adequate income and care.

3. Conclusions

On the basis of the analyses and research carried out, it may be concluded that in the analysed areas of mining municipalities – in the part referring to the stream of labour supply – a dynamic process of ageing of labour resources is clearly visible. In view of the above conclusion, it seems justified to subordinate the policies pursued in the city to the indicated process.

What is clearly unfavourable to the development of the examined areas, indicated in the chapter, is the age structure of the population. As a result of the processes taking place in the age structure in the examined areas, further dynamic stratification of the streams of labour demand and supply should be expected. The stratification will be first of all implied by a significant increase in the population of those entering retirement age (economic inactivity) with a simultaneous decrease in the population of those characterised by demographic youth and the highest economic activity and mobility. The key source of these unfavourable tendencies is – already mentioned above – lack of simple substitution of labour resources at the age of the highest economic activity by numerically significantly smaller population of the youngest people.

As a result of the aforementioned processes, a significant increase in the economically inactive population should be expected in the analysed areas. This is confirmed by the forecasts of the Central Statistical Office, which unambiguously indicate that in the perspective of 2050, the burden of the working-age population on the economically inactive population, e.g. in Siemianowice Śląskie – whichh we have already written about – may increase from 48 in 2019 to an extremely high number of 103 people in 2050 (Prognoza ludności na lata 2014-2050...). The source shaping the indicated forecasts will primarily be the dynamic growth of the population of non-working age, i.e. people in the 60/65 years and over bracket. This process, in turn, will induce a very high rate of population ageing in the studied areas in the old-old group, i.e. in the oldest categories, aged 75 and over (Population forecast for 2014-2050...). Additionally, it should be noted that the indirectly indicated changes and projected trends are consolidated by the negative migration balance (emptying the labour market in the most active age groups of labour resources (Miłaszewicz, 2016, pp. 109-120).

All the outlined changes, processes and forecasts indicate that in order to reduce stratification in the studied areas, which are the main source of structural mismatches, actions should be taken to build a future-oriented shape of municipal policies – especially towards old age. Lack of such actions in the perspective of social and economic transformation may delay preparation for – as it seems inevitable – changes in the age structure of the population living in the examined areas of mining municipalities. As it has already been noted, these are changes in many aspects, starting from changes in the consumption structure, through changes on the "production" side (labour force, GDP) and the consequences for public finance systems.

As the population ages, the relationship between labour and capital changes, as does the relationship between labour supply and labour demand, which is derived from consumption demand (Börsch-Supan, 2008). The aforementioned need for the studied areas to prepare for the effects of the ageing of the population living in the studied areas will also be determined by further – as already indicated – expected effects, such as: sectoral or occupational mismatches in the labour market (for example, due to increased demand for health and social care workers, associated with an increase in the population aged 65+ and, above all, 80+), which may result from changes in the structure of consumption, labour market consequences for social security systems and the need to fill gaps in labour supply associated with a possible influx of immigrants (Janicka, 2015, p. 26).

Against this background both quantitative and qualitative changes concerning human resources needs are taking place. Unfavourable demographic changes and the related aging of the society reinforced by migrations outside Poland and the perspective of fair transformation additionally weaken the provision of adequate, well-qualified and creative human resources to the national economy. In economics and social policy, the recognition and anticipation of changes on the labour market – as confirmed by numerous sources – is of particular importance. As noted by E. Kryńska and E. Kwiatkowski, nowadays each state implements, on behalf of and for society, a policy regarding the labour market, which consists of influencing supply and

demand for labour in order to maintain or restore balance. This policy takes particular account of the need to achieve the fundamental goal of a high level of employment and low unemployment. Due to the economic and social importance and specific functions of employment, these measures are among the most important undertaken in the field of economic policy. This is because employment fulfils two basic functions – economic and social (Kryńska, 2010, p. 1). As a final reflection, it is worth noting that the conclusions presented in this report concerning the socio-demographic determinants of the development of mining municipalities – particularly in this part of the work – in the demographic perspective do not cover all the problems in the discussed cognitive area, which results from its broad and interdisciplinary scope. The analyses and forecasts presented here may provide a basis for further research on, first of all, the changing conditions shaping the determinants of development of the areas under study – at the stage of global changes, the improvement of the directions and objectives of their development and practical actions to increase the significance of transformation activities on the map of mining municipalities, the country and Europe.

Acknowledgements

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FROM COMPETENCY-BASED HUMAN RESOURCES MANAGEMENT TO COMPETENCE-BASED STRATEGIC MANAGEMENT

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Purpose: The aim of the article is to identify the most significant assumptions and conditions for the development of the Competence-Based Strategic Management concept embedded on the assumptions and elements of the Competency-Based Human Resources Management concept. Moreover, the aim of the article is to identify the place of competences in the hierarchy of the firm success potentials in the concept of Competence-Based Strategic Management.
Design/methodology/approach: The article indicates the most important stages on the road from the Competency-Based Human Resources Management concept to the Competence-Based Strategic Management concept. An extensive literature review and an identification approach were used.
Findings: The basis for the formation and development of firm competences are personal competences. Consequently, the basis for the formation and development of the Competence-Based Strategic Management concept is the Competency-Based Human Resources Management concept. Moreover, firm competences occupy the most significant places in the hierarchy of the firm success potentials.
Practical implications: The outcomes of the research presented in the article confirm the significance of the firm competences – which are embedded on the personal competences – in strategic management and business practice.
Originality/value: The article presents the most important steps in the roadmap transition from the Competency-Based Human Resources Management concept (competency-oriented approach) to the Competence-Based Strategic Management concept (competence-oriented approach).

Keywords: competences, competency, potentials of success, Competency-Based Human Resources Management, Competence-Based Strategic Management.

Category of the paper: Conceptual paper.

1. Introduction

Firms are constantly looking for ways leading to the sustainable, long-term competitive advantage creation. Competences are one of the most important potentials of firm success which influence the creation of a competitive advantage. They can be perceived both from the personal (individual) perspective as well as from the managerial (collective) perspective.

The personal approach to competences is related to the term *competency* and to the *Competency-Based Human Resources Management* concept. In turn, the managerial approach to competences is related to the term *competence* and to the *Competence-Based Strategic Management* concept.

The aim of the article is to identify the most significant assumptions and conditions for the development of the Competence-Based Strategic Management concept embedded on the assumptions and elements of the Competency-Based Human Resources Management concept. Moreover, the aim of the article is to identify the place of competences in the hierarchy of the firm success potentials in the concept of Competence-Based Strategic Management. The article attempts to identify the most important stages on the road from the Competency-Based Human Resources Management concept to the Competence-Based Strategic Management concept. The article uses an extensive literature review and identification approach related to the above both concepts.

2. From competency to competence – personal (individual) vs. managerial (collective) approach to competences

The notion "competence" may be perceived from two major points of view (Delamare-Le Deist, and Winterton, 2005; Haddadj, and Besson, 2000; Klarsfeld, 2000):

1. From a personal (individual) perspective, related to the approach based on human abilities, including detailed personal skills in the implementation of the specific processes and activities as well as the execution of the assigned tasks.
2. From a managerial (collective) perspective, related to the approach based on the integration and coordination of the firm resources and capabilities.

The first approach means that competences are sets of capabilities that take into account specific features, including the skills and abilities of people performing the tasks assigned to them. These features (skills and abilities) arise and are developed primarily under the influence of knowledge and experience possessed and constantly enriched by these people. In the case of the approach based on personal skills and abilities, one can talk about a "personal" or "individual" approach to competences.

The personal approach focuses on individual human characteristics and behaviors, considered primarily in relation to specific tasks performed by the right people. In this case, we can talk about personal competences, and in a broader sense about *Competency-Based Human Resources Management*.

In turn, in the second approach, we can talk about competences that include integrated sets of capabilities possessed by the firm, enabling the implementation of the set goals and performance of tasks primarily due to the proper use of firm resources. The approach based on the integration and coordination of the firm resources and capabilities can be described as a "managerial" or "collective" approach to competences.

The collective approach to competences is focused on building and developing competences across the entire firm, or possibly its businesses or strategic business units. In this case, we can talk about the firm competences or organizational competences, and in a broader sense, about *Competence-Based Strategic Management*.

The differences between the two above approaches to the nature (essence) of competences are also reflected in the terminology. In many works devoted to the issue of competences, two terms are mainly noticeable: *competency* and *competence* (Armstrong, 2006).

The term *competency* mainly concerns the symptoms (effects) of the tasks implementation by competent persons. Competent conduction means the proper performance of the assigned tasks by these persons. Sometimes in this case it is referred to as "personal competency", enabling the implementation of the assigned tasks.

In turn, when using the term *competence*, the capability to achieve the set goals is mainly emphasized. In the case of the firm competences, it is usually related to the firm disposal of specific resources that enable or sometimes make it difficult to achieve these goals.

Referring to personal competences, Burgoyne (Burgoyne, 1989) additionally points out that in the context of the individual approach to competences, apart from the necessary capabilities, one should also take into account the willingness of a given person(s) to perform the entrusted task(s). In this sense, Burgoyne distinguishes between the situations in which a given person is only considered as competent to perform a specific task, and the situations in which he or she actually has the appropriate competences, thanks to which he or she can properly, i.e. with the intended effect, perform this task. Competences understood in this way seem to be most closely related to the term *competency*.

The position represented by Burgoyne is largely confirmed by Woodruffe (Woodruffe, 1991; Lau, Chan, and Man, 2000). Woodruffe writes that in the case of personal competences, on the one hand, it is possible to expose – what can be confirmed by previous activities – the skills and abilities of the person(s) to perform the assigned task(s) in accordance with specific requirements. On the other hand, at the same time, competences may be perceived as ways and/or symptoms of the behavior of the person(s) who perform (implement) the assigned tasks (Durand, 2000; Mansfield, 2004).

Sometimes the differences between the terms *competency* and *competence* can also be observed within the firm itself. Delamare-Le Deist and Winterton emphasize that the term *competency* refers to the ways of behavior or ways of execution concerning individual managers and/or employees performing specific tasks for the firm, while the term *competence* is often related to the functional areas of a firm (e.g. research and development, marketing, sales, logistics etc.). For these reasons, the term *competency* relates primarily to personal (individual) competences, while the term *competence* relates primarily to the managerial (firm) competences (Delamare-Le Deist, and Winterton, 2005; Teodorescu, 2006).

Taking into account the above-mentioned features of both approaches to the category of competences, as well as taking into consideration the terminological differences, Heene and Bartholomeeusen propose a deeper "embedding" of the terms *competency* and *competence* in the appropriate management concepts (Heene, and Bartholomeeusen, 2000).

In opinion of these authors, the *competency* approach may be mainly found within the *Competency-Based Human Resources Management* concept, in which the most significant role in the defining of the competences is played by the skills and abilities of managers and employees of a firm, who strive to perform the tasks entrusted to them in accordance with the set goals. In the concept of human resources management, a very important role is assigned, among others, to the proper identification of personal competences affecting the effective and efficient implementation of the assigned tasks.

Therefore, one may say that the term *competency* mainly refers to the concept of *Competency-Based Human Resources Management*, which emphasizes the necessity of having the required competences by persons performing the tasks entrusted to them. In other words, the term *competency* means the broadly understood "competetiveness" of people, i.e. having certain, often quite advanced, predispositions, conditions, skills, abilities, etc. to perform the required tasks.

In turn, the approach related to the *competence* concerns firm competences and is directly related to one of the contemporary concepts of strategic management, referred to as Competence-Based Strategic Management (Heene, and Sanchez, 1997; Sanchez, Heene, and Thomas, 1996; Matwiejczuk, 2018a). Within the framework of this concept, the competences are perceived primarily as the firm capabilities that allow for the sustainable and coordinated use of the firm resources (resources base) in the pursuit of achieving the set goals.

Thus, the term *competence* emphasizes most of all the firm competences within the framework of the management concept based on the strategic importance of competences in achieving goals by the firm, reffered to as Competence-Based Strategic Management. Competences understood in this way are the result of the integration of resources, capabilities and knowledge of a firm, as well as their coordinated – in the managerial context – use in the pursuit of the above-mentioned goals.

Based on the competences of people, it is possible to develop the competences of the firms, which are the most significant type of the firm success potentials, affecting the creation of the sustained, long-term competitive advantage of a firm.

3. Embedding of firm competences within a strategic profile of firm success potentials in the concept of Competence-Based Strategic Management

Resources, capabilities and competences, which are the potentials of the firm success, and thus the determinants of the firm competitive advantage, create the so-called strategic profile of the firm success potentials, including the following (figure 1):

1. First-order success potentials in the firm competitive advantage creation, which include firm resources (in particular key resources), understood as all tangible and intangible assets at its disposal, constituting the basis for the development of firm capabilities and competences
2. Second-order success potentials in the firm competitive advantage creation, which include firm capabilities (in particular key capabilities), enabling the integration of various resource compositions, as well as their active and effective involvement in the achievement of the firm goals.
3. Third-order success potentials in the firm competitive advantage creation, which include firm competences resulting from the integration and coordination of firm resources and firm capabilities. Among the specific types of firm competences can be indicated key competences, which are of particular importance in firm competitive advantage creation, as well as metacompetences, conditioning the securing of the present firm competences as well as enabling the development of the new competences of a firm.

The initial and primary condition for creating the firm competitive advantage is having adequate, both tangible and intangible resources (including knowledge resources) by a firm, which are the basic premise for achieving this advantage. For this reason, the firm resources can be perceived as the first-order success potentials in the firm competitive advantage creation.

While having resources is a necessary condition for creating a competitive advantage, it does not seem to be a sufficient condition. As mentioned above, the mere possession of resources, i.e. the disposal of resources often does not immediately “translate” into a competitive advantage of the firm. To achieve it, specific capabilities to use resources in the implementation of the set goals and tasks are required. In this sense, the firm capabilities represent the second-order success potentials in the firm competitive advantage creation.

The integration and coordination of the firm resources and capabilities lead to the development of firm competences. Competences, perceived as sets of capabilities of active engaging and use of the diverse resource compositions in achieving the set goals, represent the third-order success potentials in the firm competitive advantage creation.

In the context of the premises (conditions) and symptoms (effects) of the firm competitive advantage creation, the two types of firm competences play a significant role:

1. Key competences, characterized by a significant impact on a firm competitive advantage creation, resulting from their unique characteristics.
2. Metacompetences, securing continuous and effective use of the competences possessed by a firm as well as shaping the new firm competences, strengthening the firm aspirations to maintain or increase its competitive advantage (Matwiejczuk, 2018b).

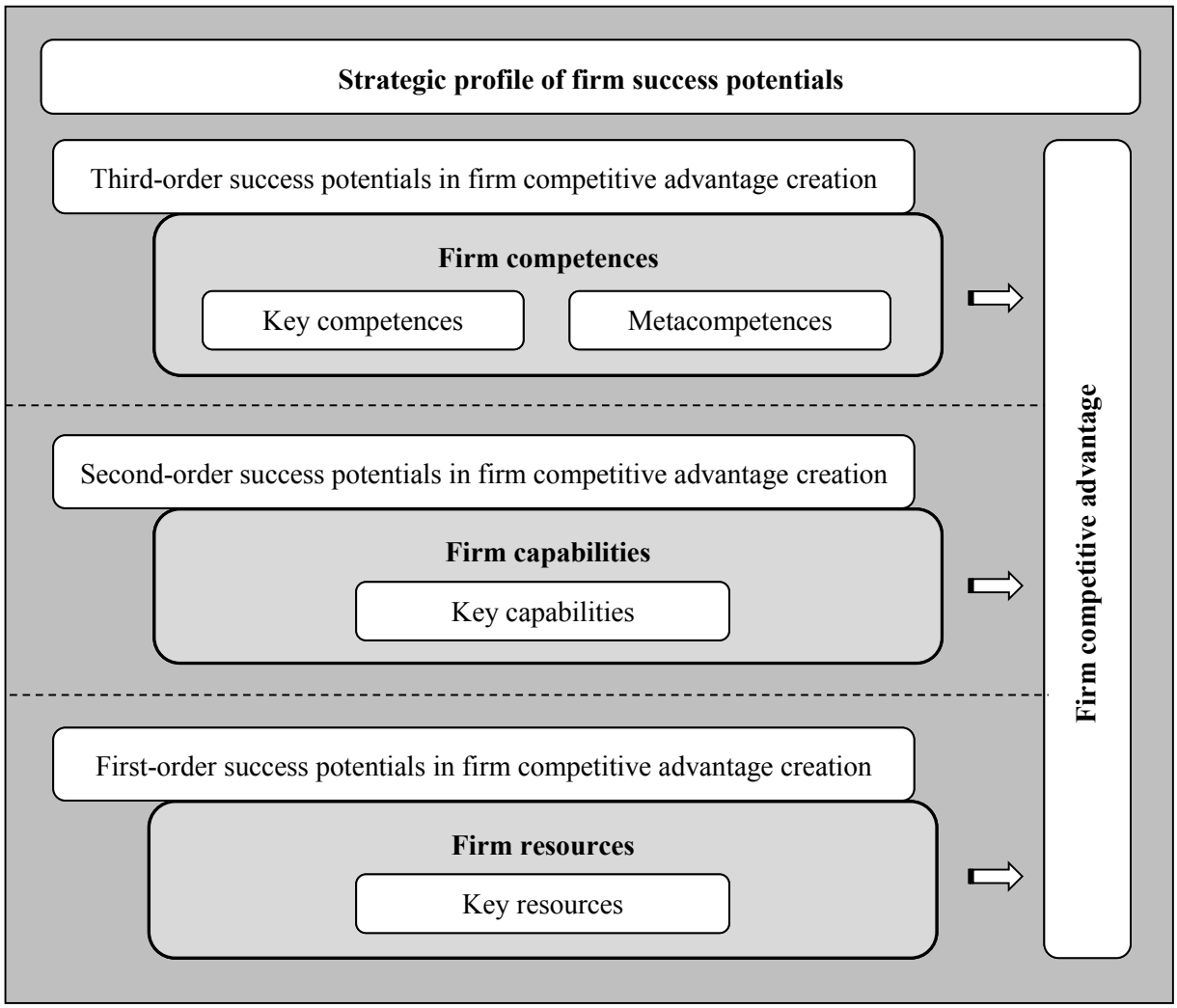

Figure 1. Basic levels in strategic profile of firm success potentials. Adapted from: Matwiejczuk, 2014.

4. Competences in the hierarchy of the firm success potentials in the concept of Competence-Based Strategic Management

With regard to the firm success potentials, one can speak not only about their strategic profile presented above, but also about a specific hierarchy that is co-created by individual levels concerning this hierarchy. The concept of the "hierarchy of success potentials" is a result of the development and refinement of the concept of the "hierarchy of competences", proposed by Javidan (Javidan, 1998). The various types of success potentials are located at consecutive levels of this hierarchy, taking into account the context of their increasing importance in the firm competitive advantage creation (figure 2).

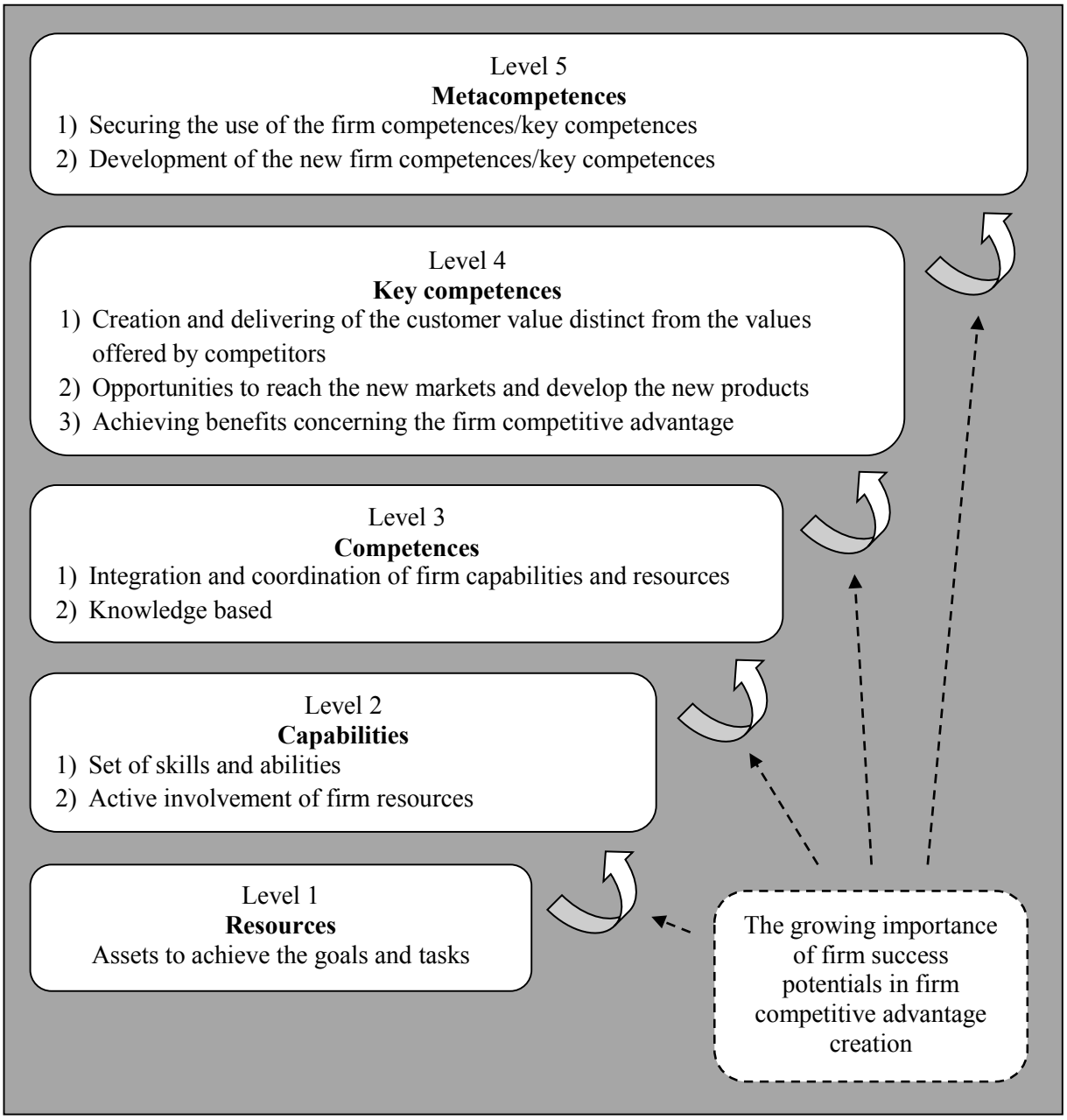

Figure 2. Hierarchy of success potentials affecting the firm competitive advantage creation. Adapted from: Matwiejczuk, 2014.

The basis for the development of the firm success potentials are its resources. The firm resources, which possess the first, and the lowest level in the hierarchy of success potentials of a firm affecting the creation of the competitive advantage, are necessary for the development of the firm capabilities. It is difficult to talk about capabilities themselves without any reference to resources.

Moreover, assuming that firm competences are the result of the integration of firm resources and firm capabilities, it can be said that resources are also necessary for the development of competences, including key competences as well as metacompetences of the firm.

As a final result, the capabilities, competences, key competences and metacompetences, perceived as potentials of the firm success, and situated at successive, higher and higher levels in the hierarchy of these potentials, "spread" on the resources possessed by the firm.

5. Conclusion

Within the article the most important characteristics of the roadmap transition from the Competency-Based Human Resources Management concept to the Competence-Based Strategic Management concept were presented.

The basis for the formation and development of firm competence(s) is (are) personal competency(es). As a result, the basis for the formation and development of the Competence-Based Strategic Management concept is the Competency-Based Human Resources Management concept. The outcomes of the research presented in the article confirm the significance of the firm competences in strategic management and business practice, which are embedded on the personal competences.

Moreover, competences occupy a very distinctive place in the entire hierarchy of the firm success potentials, not only from the perspective of the concepts of the Competency-Based Human Resources Management as well as the Competence-Based Strategic Management, but also from the perspective of building broadly understood, long-term and sustainable competitiveness and competitive advantage of a firm.

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THE ENTREPRENEURIAL DETERMINANTS OF SUSTAINABLE DEVELOPMENT OF ENTERPRISES IN EMERGING EU ECONOMIES

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Purpose: This paper aims to assess the impact of entrepreneurial determinants on the sustainable development of enterprises in emerging EU economies from 2008 to 2020.
Design/methodology/approach: This paper is empirical, and it consists of conceptual background, research methodology, research results, discussions, and conclusions. The survey covers the enterprise sector in Bulgaria, Croatia, Poland, Romania, and Hungary (emerging and developing economies in the EU). I used the correlations coefficients and the Ordinary Least Square Method to verify the strength and direction of influence of entrepreneurial determinants on the sustainable development of enterprises.
Findings: In the analyzed countries, there is a diversified influence of individual entrepreneurial determinants on the sustainable development of enterprises, both in terms of direction and strength of influence.
Research limitations/implications: The paper has serious limitations in selecting and integrating indicators for the research. Further research requires considering a larger group of determinants, not only strictly entrepreneurial factors.
Practical implications: The analysis results indicate that entrepreneurial factors influence the sustainable development of the enterprise sector; therefore, the authorities should coordinate activities and initiatives related to sustainable development and entrepreneurship. Creating financial and non-financial incentives is necessary to run a sustainable business.
Social implications: Sustainable development is crucial for the conditions and quality of life. Separating entrepreneurial factors and creating effective institutional support for business initiatives is crucial for sustainable development.
Originality/value: A novelty in the paper is an attempt to isolate entrepreneurial determinants of the sustainable development of enterprises. The article is intended for a wide audience, theoreticians and practitioners interested in sustainable development.

Keywords: entrepreneurial determinants, sustainable development, emerging economies.

Category of the paper: research paper.

1. Introduction

Sustainable development is important for counteracting climate change, preserving natural resources, and caring for citizens' health and quality of life. Concerning the theory of enterprise growth and development, this term can be understood as an activity aimed at economic development, expanding the company's financial and property base, supporting, and developing employees and local communities, and taking measures to protect the natural environment. Sustainable development is based on eco-innovation and social and environmental investments.

The determinants of sustainable development of enterprises are poorly understood, both in terms of its measurement and factors influencing it. However, the literature on the subject contains considerations on the problems and methods of measuring the sustainable development of enterprises at the sector level (Valaskova et al., 2018; Pieloch et al., 2021; Teng et al., 2021; Misztal, 2021; Comporek et al., 2022), listed companies (Dissanayake et al., 2016; Loch et al., 2017; Ismail et al., 2021) or individual enterprises (Ciambotti et al., 2021; Tutaj et al., 2021). The sustainable development of enterprises is often related to corporate social and environmental responsibility.

The article's main aim is to assess the impact of entrepreneurial determinants on the sustainable development of enterprises in the developing economies of the European Union from 2008 to 2020. The central hypothesis of the research is as follows: "In the developing countries of the European Union, there is a variation in the strength and directions of the influence of entrepreneurial factors on the sustainable development of enterprises from 2008 to 2020". I used Spearman, Gamma and Tau Kendall's rank correlation coefficients and the Ordinary Least Square Method to verify the hypothesis.

The structure of the paper is formed by conceptual background, research methodology, research results, discussions, and conclusions. Isolating the strength and significance of entrepreneurial determinants is important in creating government policy and running a business. A novelty in the paper is an attempt to isolate entrepreneurial determinants of the sustainable development of enterprises. The article is intended for a wide audience, theoreticians and practitioners interested in sustainable development.

2. Conceptual background

Sustainable development (SD) meets the needs of people today without reducing the ability of future generations to meet their own needs (Bruntland Commission Report, 1987). It requires an effort to build a sustainable and disaster-resistant future for all people. To achieve sustainable development, the consistency of three essential elements is necessary: economic growth, social

inclusion, and environmental protection. They are interconnected, and they are all vital to the well-being of individuals and societies (Baker, 2015; Sach et al., 2019; Thacker et al., 2019; Zakari et al., 2022).

Eliminating poverty and fighting climate change is a requirement for achieving sustainable development. It requires promoting sustainable, inclusive, and equal economic growth and responsibility and real activities of the institutions, organizations, enterprises, and the entire community (Borys, 2011; Misztal, 2021; Muhammad Kamran Khan et al., 2021).

Considering the goal of business activity as maximizing profits, achieving sustainable development is difficult but not impossible. In business practice, it is often associated with the need to give up part of the profits and allocate them to implementing innovative ecological solutions and the support and development of employees. The financial and property effects of enforcing the sustainable development goals should appear in the long term and strengthen the competitive position on the market (Bocken et al., 2014; Misztal, 2019; Hummels and Argyrou, 2021; Latysheva, et al., 2021).

Sustainable development depends on several factors, including external and internal. As the research results show, one of the key factors is the macroeconomic situation (Pieloch et al., 2021; Comporek et al., 2022). Research on various economic sectors shows that the relationship between economic growth and sustainable development of enterprises is positive. In addition, sustainable development is influenced by globalization (Pawłowski, 2013; Amodu, 2020; Misztal and Kowalska, 2020), technology development (Goralski and Tan, 2020; Dantas et al., 2021), the general economic situation (Hess, 2016; Kihombo et al., 2021), stability of laws and regulations regarding business (Lang and Murphy, 2014; Orzeszyna and Tabaszewski, 2021). The internal factors include the financial situation (liquidity, profitability, debt level and structure), the level of knowledge, access to technology, implemented strategies and business models, the degree of commitment of management and employees to social and environmental issues (Hahn and Kühnen, 2013; O'Shea et al., 2021).

The added value of the paper is an attempt to check whether factors related to entrepreneurship impact the sustainable development of enterprises. So far, there is no similar research relating to sectoral analyses of sustainable development. From the theoretical considerations and practical implications, it is important to distinguish whether factors such as external financing (E_{Fin}), creation and diffusion of knowledge (K_c), entrepreneurial skills and capabilities (Ent_{Cap}), regulations (Reg), influence the sustainable development of enterprise (the OECD-Eurostat Entrepreneurship Indicators).

Access to external financing sources seems particularly important for enforcing economic, social, and environmental tasks. Facilitating running a sustainable business creates an economic system that allows entrepreneurs to take out low-interest loans and credits for social and environmental purposes. In addition, business angels and venture capital investments play an outstanding role in building a sustainable business (Weber, 2014; Ziolo and Sergi, 2019; Lagoarde-Segot, 2020).

Indeed, sustainable investments positively correlate with government spending on research and development, cooperation between corporations, open innovation, and the economy's innovation (Misztal, 2019; Misztal and Kowalska, 2020).

The level of sustainable development is also influenced by the skills of the management and employees, their knowledge, flexibility, and the ability to adapt to the changing market environment. Therefore, the level of education in society, self-employment, or the development of students and their international mobility also contribute to a new perception of socio-economic reality and greater activity in the fight against climate change (Hind et al., 2009; Abdelkafi and Täuscher, 2016; Rodenburg and MacDonald, 2021).

Another factor influencing entrepreneurship and sustainable development is the ease of setting up and running a business and a low level of bureaucracy (Blinova et al., 2021; Bryant and Thomson, 2021). Stable legal systems and tax regulations are of key importance here. Low and simple taxes combined with a system of tax encouragements for green investments should positively affect sustainable development (Śleszyński, 2014; Misztal, 2020; Newell, 2022).

3. Research methodology

The main research aims to assess the impact of entrepreneurial determinants on the sustainable development of enterprises in the developing economies of the European Union from 2008 to 2020. The research sample includes enterprises from developing economies in the European Union, including Bulgaria, Croatia, Hungary, Poland, and Romania. Selected countries went a long way from central to market economies.

The central research hypothesis is as follows "In the developing countries of the European Union, there is a variation in the strength and directions of the influence of entrepreneurial factors on the sustainable development of enterprises from 2008 to 2020". The justification for such a hypothesis is that despite a similar path to economic freedom, these countries differ in size, level of socio-economic development, entrepreneurship and executing environmental protection policies.

The following research sub-hypotheses were also put forward:

- First sub-hypothesis: "In emerging economies, there is a positive dynamic of the indicator of sustainable development of enterprises in 2008-2020". Justification: these countries are undergoing a gradual transformation of their economies and use EU funds to achieve economic, social, and environmental goals. In addition, they must comply with environmental protection requirements. Verification of the sub-hypothesis with the use of the trend function (Table 3).
- Second sub-hypothesis: "The most important factor for the sustainable development of enterprises is the external financing". The justification for this fact is that investments,

including eco-innovations, require large financial resources. Verification using the results of the OLS method (Table 7).

- Third sub-hypothesis: "Legal regulations in developing countries are one of the key factors limiting the sustainable development of enterprises" due to complicated legal regulations concerning running a business and complicated tax systems. Verification of the hypothesis is by using the results of OLS estimation (Table 7).

The research consists of three stages. In the first step, I distinguished analytical indicators important for assessing sustainable development and its entrepreneurial determinants. Then, I create synthetic (integrated) indicators based on analytical measures. I determined correlation measures (Spearman, Gamma and Tau Kendall's rank correlation coefficients) and created models based on the OLS method (Table 1).

Table 1.
Research steps

Step 1 **Selecting analytical indicators for models**

• Enterprise sustainable development indicators:
  • turnover or gross premiums, production value, value added at factor cos, gross operating surplus, total purchases of goods and services, gross investment in tangible goods, investment rate, share of personnel costs in production, average personnel costs, wages and salaries, social security costs, total number of employees in a country, turnover per person employed, apparent labour productivity, gross value added per employee, growth rate of employment, number of persons employed per enterprise, investment per person employed, personnel costs, emissions of carbon dioxide, methane emission, nitrous oxide emission, sulphur oxide, ammonia, carbon monoxide, nitrogen oxides emission, generation of total waste.
• Entrpreneurial indicators:
  • External financing: ease in access to loans, venture capital investments, angel investment by country
  • Creation and diffusion of knowledge: gross domestic expenditure on R&D (percentage of GDP), patents – international collaboration in technology development (number), innovation index
  • Entrepreneurial capabilities: tertiary educational attainment (%), self-employment, international mobility of students Bachelor's and master's level;
  • Regulatory framework: ease of doing business, corporate income tax rate (%).

Step 2 **Transforming the explanatory variables to unify their measuring scales using the following formulas**
• for the stimulants $z_{ij} = \frac{x_{ij} - \min_i\{x_{ij}\}}{\max_i\{x_{ij}\} - \min_i\{x_{ij}\}},\ z_{ij} \in [0;1];$ • for the destimulants: $z_{ij} = \frac{\max_i\{x_{ij}\} - x_{ij}}{\max_i\{x_{ij}\} - \min_i\{x_{ij}\}},\ z_{ij} \in [0;1]$ 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 in the *i*-thyear; $\min_i\{x_{ij}\}$ is the lowest value of the *j*-th variable in the *i*-th year; $\max_i\{x_{ij}\}$ is the highest value of the *j*-th variable in the *i*-th year. • To calculate the indicator of sustainable development of enterprises I assume the same impact of different indices on the aggregate measure and use the following formula: $SI_i = \frac{1}{n}\sum_{j=1}^{n} z_{ij},\ (i = 1,2,\dots,n)$ where: SI_i stands for the indicator in the *i*-year; *n* is the number of metrics; others as above.

Cont. table 1.

Step 3 **Examination of the strength and direction of a linear relationship between indicators**
• Spearmans rang: $$r_s = \frac{\frac{1}{6}(n^3 - n) - (\sum_{i=1}^{n} d_i^2) - T_x - T_y}{\sqrt{\left(\frac{1}{6}(n^3 - n) - 2T_x\right)\left(\frac{1}{6}(n^3 - n) - 2T_y\right)}},$$ $$d_i = Rx_i - Ry_i; T_x = \frac{1}{12}\sum_j (t_j^3 - t_j)\ ;\ T_y = \frac{1}{12}\sum_k (u_k^3 - u_k)$$ where t_j is the number of observations in the sample having the same j-th rank value of the variable x; u_j is the number of observations in the sample having the same k-th rank value of the variable y; $R_x$is the ranks of x in the sample; $R_y$is the ranks of y in the sample • Gamma Coefficient (Goodman and Kruskal's Gamma) : $$r_g = \frac{N_c - N_d}{N_c + N_d}$$ *where* N_c is the total number of pairs that rank the same; N_d is the number of pairs that don't rank the same • Tau Kendall's Coefficient: $$R_{TK} = \frac{N_{CP} - N_{DP}}{\frac{n(n-1)}{2}};$$ N_{CP} − number of concordant pairs, N_{DP} − number ofdiscordant pairs I adopt the ranges of correlation strength that were suggested by Evans: |rxy| = 0—no correlation; 0 <|rxy| ≤ 0.19—very weak; 0.20 ≤ |rxy| ≤ 0.39—weak; 0.40 ≤ |rxy| ≤ 0.59—moderate; 0.60 ≤ |rxy| ≤ 0.79—strong; 0.80 ≤ |rxy| ≤ 1.00—very strong.
Step 4 **Creating the models (the OLS estimation method)**
• $SDi=\beta 0+\beta 1\cdot E_{Fini}+\beta 2\cdot E_{Fin}(i-1)+\beta 3\cdot K_{ci}+\beta 4\cdot K_{c\,(i-1)+}\beta 5\cdot Cap_{Enti}+\beta 6\cdot Cap_{Ent}(i-1)+\beta 7\cdot Reg(i)+\beta 8\cdot Reg(i-1)+\varepsilon i$ Where SDi – sustainable development of enterprise; E_{Fin} – external financing; Kc- creation and diffusion of knowledge; Cap_{Ent}- entrepreneurial skills and capabilities; Reg- legal regulations Model tests: White's test for heteroskedasticity; Frequency distribution for residual; Breusch-Godfrey test for first-order autocorrelation; the variance inflation factor (VIF)

Source: own study.

The following part of the article presents a discussion and conclusions. In the discussion, the Author verifies the research hypotheses concerning the literature on the subject, indicates the study's key limitations, and shows practical implications. The ending contains the final conclusions and directions for future scientific work.

4. Research results

Table 2 presents the indicator of enterprise sustainable development in emerging economies in the European Union. In all countries, there is a positive trend in the SD indicator, which is a positive phenomenon that proves that enterprises from these countries undertake activities for economic, social, and environmental development.

Table 2.
Sustainable development of enterprise indicators (SD) from 2008 to 2020 in EU emerging markets

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bulgaria	0.44	0.41	0.29	0.32	0.41	0.49	0.53	0.63	0.66	0.65	0.69	0.72	0.76
Croatia	0.62	0.39	0.36	0.37	0.34	0.50	0.54	0.53	0.55	0.52	0.53	0.54	0.55
Hungary	0.45	0.30	0.45	0.51	0.49	0.54	0.67	0.74	0.67	0.76	0.80	0.84	0.89
Poland	0.42	0.39	0.43	0.57	0.51	0.55	0.68	0.68	0.66	0.74	0.78	0.82	0.85
Romania	0.57	0.35	0.48	0.59	0.57	0.65	0.69	0.65	0.67	0.73	0.76	0.79	0.82

Source: own calculations based on https://ec.europa.eu/eurostat/databrowser/view/sbs_na_sca_r2/default/table?lang=en.

Descriptive statistics for the indicator of sustainable development of enterprises are presented in Table 3. The highest average value of the sustainable development is in Romania (0.64), the lowest in Croatia (0.49). The highest maximum value of SD is in Hungary (0.89), the lowest minimum value of SD is in Bulgaria (0.29).

Table 3.
Descriptive statistics of the sustainable development of enterprise indicators (SD) from 2008 to 2020 in EU emerging markets

	Mean	Standard deviation	Max	Min	Trend line	R^2
Bulgaria	0.54	0.15	0.76	0.29	SD = 0.0373t + 0.2768	0.8404
Croatia	0.49	0.09	0.62	0.34	SD = 0.01t + 0.4163	0.1893
Hungary	0.62	0.17	0.89	0.30	SD = 0.044t + 0.3155	0.9168
Poland	0.62	0.15	0.85	0.39	SD = 0.0389t + 0.3487	0.9444
Romania	0.64	0.13	0.82	0.35	SD = 0.03t + 0.4307	0.7962

Source: own calculations based on https://ec.europa.eu/eurostat/databrowser/view/sbs_na_sca_r2/default/table?lang=en.

Table 4 presents indicators of entrepreneurial determinants influencing the sustainable development of enterprises in the analyzed countries. The obtained values indicate their significant diversification, resulting from different levels of economic and social development, different conditions of running a business, and legal regulations in entrepreneurship.

Table 4.
Indicators of external financing (E_{Fin}), creation and diffusion of knowledge (Kc), entrepreneurial skills and capabilities (Cap_{Ent}), regulations (Reg), influence the sustainable development of enterprise in the emerging economies in the EU from 2008 to 2020

Country	Indicator	Year												
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bulgaria	E_{Fin}	0.65	0.58	0.10	0.20	0.20	0.37	0.23	0.52	0.73	0.75	0.90	0.81	0.85
	K_c	0.26	0.27	0.29	0.26	0.39	0.36	0.75	0.88	0.60	0.81	0.71	0.65	0.74
	Cap_{Ent}	0.36	0.36	0.28	0.11	0.02	0.26	0.38	0.45	0.51	0.67	0.80	0.67	0.70
	Reg	0.38	0.90	0.92	0.94	0.90	0.92	0.50	0.52	0.56	0.77	0.94	0.98	1.00
Croatia	E_{Fin}	0.46	0.24	0.08	0.14	0.06	0.07	0.09	0.06	0.52	0.57	0.65	0.70	0.73
	K_c	0.17	0.18	0.03	0.13	0.28	0.73	0.35	0.55	0.30	0.31	0.55	0.48	0.48
	Cap_{Ent}	0.33	0.38	0.45	0.40	0.30	0.31	0.40	0.38	0.46	0.54	0.67	0.66	0.67
	Reg	0.89	0.89	0.90	0.91	0.99	1.00	0.50	0.50	0.54	0.12	0.19	0.12	0.13

Cont. table 4.

Hungary	E_{Fin}	0.20	0.10	0.12	0.18	0.14	0.08	0.14	0.16	0.78	0.66	0.78	0.93	0.94
	K_c	0.67	0.56	0.57	0.57	0.75	0.68	0.38	0.43	0.51	0.39	0.56	0.59	0.56
	Cap_{Ent}	0.19	0.23	0.23	0.25	0.26	0.28	0.47	0.49	0.63	0.62	0.83	0.97	0.98
	Reg	0.82	0.86	0.81	0.85	0.88	0.95	0.45	0.45	0.49	0.29	0.46	0.43	0.46
Poland	E_{Fin}	0.42	0.12	0.11	0.17	0.09	0.11	0.17	0.30	0.67	0.76	0.73	0.95	1.00
	K_c	0.07	0.04	0.14	0.24	0.54	0.45	0.51	0.71	0.56	0.59	0.78	0.80	0.79
	Cap_{Ent}	0.31	0.39	0.34	0.46	0.39	0.21	0.36	0.63	0.70	0.80	0.80	0.80	0.83
	Reg	0.47	0.97	1.00	1.00	0.82	0.78	0.55	0.51	0.50	0.54	0.62	0.71	0.72
Romania	E_{Fin}	0.67	0.22	0.03	0.03	0.07	0.07	0.10	0.12	0.30	0.36	0.35	0.42	0.45
	K_c	0.33	0.34	0.48	0.63	0.57	0.50	0.25	0.54	0.53	0.54	0.54	0.59	0.59
	Cap_{Ent}	0.32	0.34	0.39	0.37	0.44	0.45	0.31	0.45	0.55	0.51	0.61	0.62	0.63
	Reg	0.01	0.21	0.21	0.54	0.54	0.55	0.43	0.35	0.51	0.32	0.67	0.78	0.85

Source: own study based on Eurostat, OECD, World Bank, EBAN, Global Economy, Trading Economics.

Table 5 presents indicators of entrepreneurial determinants of sustainable development of enterprises in developing countries in the EU. The highest average value of E_{Fin} is in Bulgaria (0.53), and the lowest is in Romania (0.25). The highest value of the K_c index is in Hungary (0.56), the lowest is in Croatia (0.35). The highest value of the Cap_{Ent} index is in Poland (0.54), the lowest is in Bulgaria (0.43). The highest Reg level is in Bulgaria (0.79) and the lowest in Romania (0.46). The obtained results are diversified, which means that none of the surveyed countries creates a favourable framework for running a sustainable business.

Table 5.
Descriptive statistics of the entrepreneurial determinants indicators (SD) from 2008 to 2020 in the EU emerging economies

Country	Indicator	Descriptive statistics			
		Mean	Standard deviation	Max	Min
Bulgaria	E_{Fin}	0,53	0,27	0,90	0,10
	K_c	0,54	0,23	0,88	0,26
	Cap_{Ent}	0,43	0,23	0,80	0,02
	Reg	0,79	0,21	1,00	0,38
Croatia	E_{Fin}	0,34	0,26	0,73	0,06
	K_c	0,35	0,19	0,73	0,03
	Cap_{Ent}	0,46	0,13	0,67	0,30
	Reg	0,59	0,34	1,00	0,12
Hungary	E_{Fin}	0,40	0,34	0,94	0,08
	K_c	0,56	0,11	0,75	0,38
	Cap_{Ent}	0,49	0,28	0,98	0,19
	Reg	0,63	0,22	0,95	0,29
Poland	E_{Fin}	0,43	0,33	1,00	0,09
	K_c	0,48	0,26	0,80	0,04
	Cap_{Ent}	0,54	0,22	0,83	0,21
	Reg	0,71	0,19	1,00	0,47
Romania	E_{Fin}	0,25	0,19	0,67	0,03
	K_c	0,49	0,11	0,63	0,25
	Cap_{Ent}	0,46	0,11	0,63	0,31
	Reg	0,46	0,23	0,85	0,01

Source: own study based on Eurostat, OECD, World Bank, EBAN, Global Economy, Trading Economics.

Table 6 presents the correlation coefficients between the sustainable development of enterprises and the individual determinants of entrepreneurship. The obtained results are varied. The bold values are statistically significant at p <0.5. In Bulgaria, there was a statistically significant correlation between SD and E_{Fin}, SD and K_c, and SD and Cap_{Ent}. The results show a high and very high level of dependency. However, it should be noted that these results differ depending on the selected correlation coefficient. The situation in Bulgaria should be assessed positively, as these relationships are positive, which means that sources of financing, knowledge transfer and entrepreneurial skills positively impact the sustainable development of enterprises. There is no statistically significant dependence in terms of legal regulations. Therefore, it is necessary to introduce changes in the tax system in this country and create more favourable conditions for setting up and running a business.

Table 6.
Correlations between the dependent and the explanatory variable

Country	Correlaction with SD	R Spearman	p	Gamma	p	Tau Kendalla	p
Bulgaria	EFin	**0.86**	**0.00**	**0.71**	**0.00**	**0.71**	**0.00**
	Kc	**0.69**	**0.01**	**0.48**	**0.02**	**0.48**	**0.02**
	CapEnt	**0.88**	**0.00**	**0.74**	**0.00**	**0.73**	**0.00**
	Reg	0.25	0.41	0.20	0.35	0.20	0.35
Croatia	EFin	0.53	0.07	0.40	0.06	0.40	0.06
	Kc	0.29	0.34	0.13	0.54	0.13	0.54
	CapEnt	0.33	0.27	0.23	0.29	0.22	0.29
	Reg	-0.53	0.06	-0.31	0.15	-0.30	0.15
Hungary	EFin	**0.72**	**0.01**	**0.61**	**0.00**	**0.60**	**0.00**
	Kc	-0.39	0.19	-0.24	0.26	-0.24	0.26
	CapEnt	**0.95**	**0.00**	**0.87**	**0.00**	**0.86**	**0.00**
	Reg	**-0.74**	**0.00**	**-0.53**	**0.01**	**-0.52**	**0.01**
Poland	EFin	**0.78**	**0.00**	**0.63**	**0.00**	**0.62**	**0.00**
	Kc	**0.92**	**0.00**	**0.79**	**0.00**	**0.79**	**0.00**
	CapEnt	**0.80**	**0.00**	**0.68**	**0.00**	**0.66**	**0.00**
	Reg	-0.27	0.37	-0.09	0.67	-0.09	0.67
Romania	EFin	0.51	0.08	**0.47**	**0.03**	**0.47**	**0.03**
	Kc	0.46	0.11	0.38	0.08	0.37	0.08
	CapEnt	**0.75**	**0.00**	**0.66**	**0.00**	**0.66**	**0.00**
	Reg	**0.71**	**0.01**	**0.53**	**0.01**	**0.52**	**0.01**

Source: own calculations based on Eurostat, OECD, World Bank, EBAN, Global Economy, Trading Economics.

In Croatia, there is no significant statistical relationship between the analyzed dependent variable and the explanatory variables, indicating that enterprises' sustainable development may depend on other factors, including macroeconomic conditions and the global economic situation.

In Hungary, there is a high level of statistical dependency between sustainable enterprise development and entrepreneurial capabilities, which is positive; education, self-employment, and student mobility influence their perception of sustainable business development. A negative relationship is between sustainable development and legal regulations. A negative correlation indicates that legal regulations and the tax system in Hungary harm the sustainable development of enterprises.

In Poland, there was a statistically significant correlation between SD and E_{Fin}, SD and K_c, and SD and Cap_{Ent}. There is no statistically significant relationship between legal regulations and sustainable development of enterprises, which allows us to conclude that it is necessary to introduce more friendly rules for running a business and simplify the tax system.

There is a statistically significant correlation between Cap_{Ent} and SD, and Reg and SD in Romania. The lack of a statistically significant relationship between sustainable development and the availability of finance or a knowledge transfer may indicate some difficulties with access to external financing sources and a low level of research and development, which do not translate into economic, social, and environmental development.

Table 7 shows the results of the OLS estimation. The estimation results meet the requirements of the applied estimation method (the linear regression model is linear in parameters, there is a random sampling of observations, the conditional mean should be zero, there is no multi-collinearity, no homoscedasticity and no autocorrelation, and error terms are normally distributed).

Table 7.
Results of the OLS estimation of entrepreneurial determinants of enterprise sustainable development in the emerging markets from 2008 to 2020

Bulgaria		**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
	const	0,307103	0,0567687	5,410	0,0006
	EFin	0,602029	0,0404966	14,87	<0,0001
	Reg	−0,411066	0,0667624	−6,157	0,0003
	Reg_1	0,342794	0,0606934	5,648	0,0005
	Descriptive statistics and tests				
	Mean dependent var	0,546408	S.D. dependent var	0,162394	
	Sum squared resid	0,009873	S.E. of regression	0,035130	
	R-squared	0,965966	Adjusted R-squared	0,953203	
	F(3, 25)	75,68619	P-value(F)	3,26e-06	
	Log-likelihood	25,58991	Akaike criterion	−43,17982	
	Schwarz criterion	−41,24019	Hannan-Quinn	−43,89794	
	rho	−0,450439	Durbin-Watson	2,826184	
	LMF = 2,07667with p-value = P(F(1, 7) > 2,07667) = 0,192761				
	Chi-square(2) = 1,35053 with p-value = 0,509022				
	LM = 11,6366with p-value = P(Chi-square(9) > > 11,6366) = 0,234582				
	EFin 1,230 VIF(j)<10; Reg 1,380 VIF(j)<10 Reg_1 1,529 VIF(j)<10				

Cont. table 7.

Croatia		**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
	const	0,404076	0,0369025	10,95	<0,0001
	Kc	0,152291	0,0485771	3,135	0,0139
	Kc_1	0,187816	0,0556094	3,377	0,0097
	Reg	−0,0845864	0,0311050	−2,719	0,0263
	Descriptive statistics and tests				
	Mean dependent var	0,475218	S.D. dependent var	0,083447	
	Sum squared resid	0,006947	S.E. of regression	0,029468	
	R-squared	0,909306	Adjusted R-squared	0,875296	
	F(3, 25)	26,73629	P-value(F)	0,000160	
	Log-likelihood	27,69897	Akaike criterion	−47,39794	
	Schwarz criterion	−45,45831	Hannan-Quinn	−48,11606	
	rho	−0,048365	Durbin-Watson	2,081670	
	LMF = 0,0278899 with p-value = P(F(1, 7) > 0,0278899) = 0,87209				
	Chi-square(2) = 1,51787with p-value = 0,468165				
	LM = 10,2991with p-value = P(Chi-square(9) > 10,2991) = 0,326822				
	Kc = 1,208 VIF(j)<10; Kc_1 =1,641 VIF(j)<10 Reg_1 = 1,606 VIF(j)<10				
Hungary		**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
	const	0,225861	0,0897215	2,517	0,0360
	Kc_1	−0,493601	0,189660	−2,603	0,0315
	Reg_1	0,358140	0,146564	2,444	0,0403
	time	0,0606744	0,00665017	9,124	<0,0001
	Descriptive statistics and tests				
	Mean dependent var	0,637971	S.D. dependent var	0,178843	
	Sum squared resid	0,010968	S.E. of regression	0,037026	
	R-squared	0,968827	Adjusted R-squared	0,957137	
	F(3, 25)	82,87794	P-value(F)	2,29e-06	
	Log-likelihood	24,95903	Akaike criterion	−41,91806	
	Schwarz criterion	−39,97844	Hannan-Quinn	−42,63618	
	rho	−0,357828	Durbin-Watson	2,688788	
	LMF = 1,52012 with p-value = p = P(F(1, 7) > 1,52012) = 0,257397				
	Chi-square(2) = 1,93342 with p-value = 0,380333				
	LM = 10,0598 with p-value = P(Chi-square(9) > 10,0598) = 0,345667				
	Kc_1 = 3,781 VIF(j)<10; Reg_1 = 9,415 VIF(j)<10 time = 4,613 VIF(j)<10;				
Poland		**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
	const	0,486690	0,0471190	10,33	<0,0001
	EFin	0,389850	0,0927512	4,203	0,0030
	Kc	0,356399	0,0686995	5,188	0,0008
	CapEnt_1	−0,386896	0,144807	−2,672	0,0283
	Descriptive statistics and tests				
	Mean dependent var	0,638057	S.D. dependent var	0,150221	
	Sum squared resid	0,012294	S.E. of regression	0,039202	
	R-squared	0,950471	Adjusted R-squared	0,931898	
	F(3, 25)	51,17436	P-value(F)	0,000015	
	Log-likelihood	24,27380	Akaike criterion	−40,54760	
	Schwarz criterion	−38,60797	Hannan-Quinn	−41,26572	
	rho	−0,150874	Durbin-Watson	2,160969	
	LMF = 0,263832with p-value = p = P(F(1, 7) > 0,263832) = 0,623311				
	Chi-square(2) = 0,412441with p-value = 0,468165				
	LM = 10,2475 with p-value = P(Chi-square(9) > 10,2475) = 0,330825				
	EFin 7,951VIF(j)<10; Kc 2,209 VIF(j)<10 CapEnt_1 7,028 VIF(j)<10				

Cont. table 7.

Romania		**Coefficient**	**Std. Error**	**t-ratio**	**p-value**
	const	0,120550	0,0569270	2,118	0,0720
	EFin_1	−0,364044	0,0592629	−6,143	0,0005
	Kc_1	−0,313542	0,128998	−2,431	0,0454
	CapEnt_1	1,10723	0,170867	6,480	0,0003
	SD_1	0,426923	0,109568	3,896	0,0059
	Descriptive statistics and tests				
	Mean dependent var	0,646572	S.D. dependent var	0,135111	
	Sum squared resid	0,007387	S.E. of regression	0,032485	
	R-squared	0,963212	Adjusted R-squared	0,942191	
	F(3, 25)	45,82022	P-value(F)	0,000042	
	Log-likelihood	27,33027	Akaike criterion	−44,66054	
	Schwarz criterion	−42,23601	Hannan-Quinn	−45,55819	
	rho	−0,565129	Durbin-Watson	−2,116006	
	LMF = 3,01339 with p-value = p = P(F(1, 6) > 3,01339) = 0,133261				
	Chi-square(2) = 4,70886 with p-value = 0,0949475				
	LM = 8,97617 with p-value = P(Chi-square(8) > > 8,97617) = 0,34431				
	EFin_1 1,418 VIF(j)<10; Kc_1 2,379 VIF(j)<10 CapEnt_1 3,504 VIF(j)<10; SD_1 = 1,943 VIF(j)<10;				

Source: own calculations based on Eurostat, OECD, World Bank, EBAN, Global Economy, Trading Economics.

The results of the OLS estimation show that in developing economies, there is a strong variation in the impact of individual explanatory variables on the explained variable, which may be the result of differences in the implemented social, economic, and environmental policies, different levels of sector development, a different structure and potential for the sector's development.

It can be concluded that the determinants of entrepreneurship are not fully used and do not transfer directly to the sustainable development of enterprises. In all analyzed countries, it is necessary to implement changes in entrepreneurship, facilitate the establishment and running of a business, and create more friendly legal regulations supporting and promoting sustainable business.

5. Discussion

The research results confirm the central research hypothesis that "In the developing countries of the European Union, there is a variation in the strength and directions of the influence of entrepreneurial factors on the sustainable development of enterprises from 2008 to 2020". The results confirm that creating favourable conditions for running a business is extremely important (Bocken et al., 2014; Misztal, 2019; Latysheva et al., 2021). The study's novelty is assessing the impact of entrepreneurial conditions on the sustainable development of enterprises. It is necessary to verify the research at the level of developed economies.

The research results confirm the first research sub-hypothesis "In emerging economies; there is a positive dynamic of the indicator of sustainable development of enterprises in 2008-2020". The analysis results confirm the previous research conducted on the level of sub-sectors of the economy in the analyzed countries (Pieloch et al., 2021; Comporek et al., 2022).

The second research sub-hypothesis, "The most important factor for the sustainable development of enterprises is the external financing", was not confirmed. It means that sustainable development is a complex phenomenon conditioned by various factors that may depend on individual countries' situations and development conditions. The determinants of sustainable development are complicated and require a holistic approach (Borys, 2011; Śleszyński, 2014; Bocken et al., 2014).

The third research sub-hypothesis, "Legal regulations in developing countries are one of the key factors limiting the sustainable development of enterprises," maybe partially accepted because, in countries such as Bulgaria and Croatia, the sign in front of the variable legal regulations is negative, which means that legal regulations may negative way to contribute to the realization of sustainable development (Amodu, 2020; Orzeszyna and Tabaszewski, 2021).

The obtained results are conditioned by the selection of variables, the choice of the variable normalization method, or the selected estimation method. Another major limitation is that the analyses do not consider many other important factors, such as macroeconomic conditions or the financial and property situation of enterprises. It has been limited only to the entrepreneurial determinants of sustainable development, which may be a serious limitation.

It seems that the research results may be important for economic practice. It seems right to introduce more transparent regulations for running a business, create an institutional framework supporting sustainable economic initiatives, or promote financial support for sustainable entrepreneurship.

6. Conclusions

Sustainable development of enterprises means improvement of the economic situation of the enterprise by respect for social issues and protection of the natural environment. It is extremely important for citizens and future generations' quality of life and health. Sustainable development depends on several factors, both external and internal. One of the critical determinants of sustainable development is the entrepreneurial conditions of running a business. In developing economies, there is a strong variation in the impact of individual entrepreneurial determinants on enterprises' economic, social, and environmental development.

Factors such as the availability of finance, knowledge transfer, entrepreneurial capabilities or legal regulations are statistically significant for the sustainable development of enterprises. However, the degree of their influence differs depending on the country. Therefore, it is of essential importance here to create institutional and financial conditions conducive to achieving sustainable business goals. The financial incentives and substantive support system should be conducive to social and environmental investments enterprises.

Further research will be devoted to a broader analysis that will assess the situation in developing economies and developed ones. In addition, future research will look at a more comprehensive approach to determinants of sustainable business.

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PHILOSOPHY OF VALUES IN LEADERSHIP COACHING: LEADER IN SELECTED TYPES OF LEADERSHIP

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Purpose: The focus of this article is on the axiology of leadership, which is a description of the guiding values and characteristics of a leader, including innovation, growth, skilful direction-setting, listening and attentiveness, proactive empowerment, accountability, judgment, and persuasion.
Design/methodology/approach: The article uses the method of comparative-descriptive analysis**.** In this article, I characterize the different types of leadership including its strategic, activating, operational and forcing form.
Findings: I refer to the scientific theory of authorities in the field of organizational management and leadership coaching by Owen, Krupp, Schoemaker, as well as Kaplan and Kaiser; for comparison, I also include Sieraczkiewicz's leadership typology. Unconsciously, however, the leader's qualities/attributes, when abused, can become the greatest obstacle and disadvantage, which not only thwarts all the efforts of the team, but also makes the leader-head of that team ineffective.
Research limitations/implications: The text takes up issues related to the problem of development and self-development in the field of business.
Practical implications: The paper concerns the development of an individual, leader and his team in the professional and private sphere. Text will be interest broadly understood business**.**
Social implications: Unconsciously, however, the leader's qualities/attributes, when abused, can become the greatest obstacle and disadvantage, which not only thwarts all the efforts of the team, but also makes the leader-head of that team ineffective.
Originality/value: Originality of the article is confirmed by the description of basic features/values that every contemporary leader should cultivate. Characteristic feature of the contemporary leader is his versatility and the related axiological pluralism.

Keywords: philosophy of values, axiology, leadership, leadership coaching, Kaplan – Kaiser – Sieraczkiewicz.

Category of the paper: review and conceptual paper.

1. Introduction

In this article, using the method of comparative-descriptive analysis, I characterize selected contemporary types of leadership. Basing my analysis on the theories and assumptions of the leading authorities in the field of management and research on leadership issues, I consider, among others, its strategic, activating, operational and forcing form. Each of the distinguished types of leadership is associated with the dominance/reign of a specific system of values, the implementation of which allows to accurately indicate the advantages and disadvantages of a particular style of management, and thus also leading a team in modern times; also in the context of the challenges of industry 4.0. (Kreyenberg, 2010, pp. 28-29, 54-55; Michna, and Kaźmierczak, 2020; Schwab, 2017)[1].

The aim of the paper is to show that among the leading characteristics of business leaders include the ability to manage without violence, the ability to create and integrate a team, the charisma of the leader and their respect for people. A leader's attitudes and reactions are also determined by his or her preferred value system: every leader is characterized by a specific set of values – that is, a specific axiology. In this paper, I define axiology in a non-traditional way, as a leader's value system/network, or, in other words, as a leader's philosophy of values: the preferred and pursued (by a leader) subjective order of values that manifests itself in the techniques and patterns of business and professional action.

2. Axiology as a philosophy of values

In the traditional sense, axiology is, of course, the science of values[2]. Values are most closely associated with a particular person and his or her subjective experiences (Borowski, 1992, p. 5). That is why axiology as an objective science of values should be distinguished from subjective axiology (of a subject)[3]. At the same time, it should be noted that „the basis of objective axiology must be subjective axiology. This is because subjective axiology is closely

[1] The extensive scope of topics related to the characteristics of a leader and leadership coaching does not allow for a detailed analysis of the problem in the context of industry 4.0.

[2] According to Bohdan Dziemidok, axiology „as a general theory of values and valuing belongs to the youngest philosophical disciplines. It began to emerge at the end of the 19th century in Austria (Franz Brentano and his disciples: Alexius Meinong and Christian Freiherr von Ehrenfels) and Germany (especially in the Baden school: Wilhelm Windelband, Heinrich Rickert and Hugo Muensterberg), and took shape in earnest in the early 20th century" (Dziemidok, 2014, p. 17).

[3] That is, relating to man as an individual. Representatives of equal disciplines have tried to answer the question of who is man? Philosophers, anthropologists, sociologists, as well as economists have tried to consider this indagination. As a rule, a person is perceived as an exceptional being: independent, individual, rational, unique, constituting an autotelic value. The uniqueness of man is evidenced by his achievements. „We can enumerate them by pointing, for example, to the field of architecture, to the products of intellectual and artistic culture, to social and economic solutions" (Dymarski, 2011, p. 277; Skarga, 2007, p. 28).

related to the specific experience of goodness, beauty, freedom, justice, and to the direct experience of utilitarian values, which are the subject of research in political, economic, pedagogical, and other sciences" (Borowski, 1992, p. 5; Kuzior, 2007).

Value defines that which is valuable and worthy of desire. It is not uncommon for value to be „what people aspire to, what they would like to have and experience. Of course, in addition to positive values, there are also negative qualities or, as some claim, negative values, which are the opposite of the positive ones" (Borowski 1992, p. 7). For this reason, when describing the different types of leadership, it is worthwhile to analyze not only the positive values of the leader/head, but it is also important to pay attention to the negative/less flattering qualities. By examining the negative values, it will be possible to see the shortcomings and deficiencies in the leader's leadership style and then, as a result of seeing the specific values and deficiencies that hinder management, it will be possible to make necessary or appropriate changes to the leader's preferred style.

A leader's awareness of both his or her positive and negative values is an important and valuable experience because a leader's value system determines his or her behavior (often unconsciously): it influences his or her actions/activities, attitudes, reactions, judgments, and choices. Therefore, certain values underlie all of a leader's actions and choices. Some of them are the leader's positive values, others are his negative values. And it is these negative values of the leader/head that constitute a specific axiological area worthy of transformation, reworking and change (Bielińska, and Jakubczyńska, 2016, pp. 247-258; Kuzior, 2017, pp. 77-81).

It is not uncommon that the reason for the development of certain values, and therefore also of established forms of behavior, is functioning in a specific culture, including organizational (corporate) culture. It is the values prevailing in a given organization that determine, among other things, the communication style of people/entities working in it - unique individuals who are often the foundation of effective teamwork.

In this way „what we call culture [also corporate culture – A.M.] and what we call value lies first of all in the subject" (Borowski, 1992, p. 7). Good management, including the management of a business organization, will therefore involve humanism in the broadest sense: the axiological sensitivity of the subject manifested in its axiological maturity as the ability to choose higher values and a holistic and comprehensive view of the environment in which the leader acts, functions and works.

3. Leadership as a form of management

Steven Krupp CEO of the consulting and training firm Decision Strategies International Inc. (DSI), a classic of strategic thinking, management and implementation of change, and Paul J.H. Schoemaker, founder and chairman of the aforementioned company, entrepreneur, scholar, and trainer, in their attempt to characterize the qualities of a leader, note that a leader/head is usually a visionary with extraordinary courage, willpower, resourcefulness, and the ability to challenge established patterns. It is also a person with the ability to manage through interpretation and to establish and build relationships (including through forgiveness; the ability to manage through forgiveness is one of the leading characteristics of the modern leader).

According to Krupp and Schoemaker, a leader is also a coordinator who is capable of learning, a person who is determined and aware of the value of unity and peace (Krupp, and Schoemaker, 2016, pp. 239-252). Both experts in the field of Leadership Development and recognized leader in future-focused consulting assume that such qualities (values) were exhibited by Nelson R. Mandela, among others. In the attitude of this South African politician, we can see a combination of key characteristics of a good leader.

The combination of qualities and values present in Mandela's character is the reason why Krupp and Schoemaker wrote the following about this black charismatic: „Nelson Mandela grew into one of the most influential strategic leaders of the 20th century. He possessed uniquely developed cognitive, emotional, and behavioral skills, as well as organizational and strategic competencies that would come in handy throughout his life. To achieve all that he became, he needed not only a great willingness to learn, but also the ability to predict outcomes and interpret even the most subtle reports and events" (Krupp, and Schoemaker, 2016, p. 237). Krupp and Schoemaker assume that the combination of cognitive-emotional and behavioral qualities made this man, politician and leader, a brilliant strategist.

Strategic leadership, however, is only one form/style of managing people and teams. Experts in the field of leadership coaching distinguish several leading types of leadership. The most commonly cited are strategic leadership, activating leadership, operational leadership, and forcing leadership. Each of these leadership types is defined by the leader's specific characteristics and values. For this reason, it is worthwhile to characterize these leadership types in detail, so that we can then discern the influence of the people representing them.

4. Characteristics of leadership types according to Bob Kaplan and Rob Kaiser

In the book *Uważaj na swoją siłę. Mocne strony lidera mogą być źródłem jego największych problemów*, which was created in scientific cooperation with Polish psychotherapist and entrepreneur Jacek Santorski, its authors Kaplan and Kaiser describe selected types of leadership (Kaplan, and Kaiser, 2013, p. 13.).

Among other things, the monograph considers strategic leadership. This type of leadership is associated with the ability to think strategically; it manifests itself in the predisposition to look ahead. A strategic leader's strengths include a drive for innovation, passion, curiosity and a desire to grow, and a knack for setting direction. The priority qualities/values of a strategic leader are:

a) innovation,

b) development, and

c) direction setting.

Undisputedly, the main advantage of strategic leadership is skillful indication/determination of the direction, dynamizing and stimulating development processes, as well as discovering, precursorship and originality (innovativeness). On the other hand, the disadvantages of strategic leaders include difficulty in adapting the leader to the realities of everyday life (having head in the clouds); also greed as the use of predatory solutions and a tendency to „fix what works" (Kaplan, and Kaiser, 2013, p. 58.). For this reason, a leader with strategic traits is valued for visionary and warrior-like qualities, but at the same time is reproached for a lack of focus on reality (Kaplan, and Kaiser, 2013, p. 57.).

Another type of leadership is activation leadership. Activation leadership is associated with the value of empowering and engaging. Empowering and engaging involves delegating/ coordinating „to subordinates some of the authority and joint decision making for the team or organization" (Kaplan, and Kaiser, 2013, p. 47.). The characteristics of an activating leader revolve around the ability to provide support, as well as the ability to listen actively and to proxy, delegate, and empower (empowerment). Therefore, some of the priority characteristics and values of an activation leader include:

a) supporting,

b) listening, and

c) empowering.

The advantages of activating leadership are skillful delegation of authority, listening, and systematic support of team activities. The disadvantages of this leadership style are overconfidence often combined with lack of verification, excessive openness, and immoderate (excessive) friendliness (Kaplan, and Kaiser, 2013, p. 52). An activating leader likes to share competencies, motivate for action, and support in action (Kaplan, and Kaiser, 2013, p. 52).

Another type of leadership is operational leadership. It is responsible for operational management skills that aim to efficiently achieve the required short-term results. Significant qualities of an operational leader are the ability to maintain order in the team, a high degree of team productivity, and the ability to direct the team to complete the task. The fundamental characteristics/values of operational leadership are:

a) order,

b) efficiency, and

c) execution.

The immediate advantages of this type of leadership focus on precise and conscientious completion of tasks, emphasis on team productivity, and supervision manifested through concern for order. Disadvantages in the operational leadership system include tunnel vision, intransigence, over-restrictiveness, tendency to revise, frequent cost control, as well as total process orientation (Kaplan, and Kaiser, 2013, p. 58). Operational leaders are distinguished by their ability to be focused and systematic organizing the work of the company, but unfortunately they lack the courage that is a characteristic of a strategic thinking style leader (Kaplan, and Kaiser, 2013, p. 57).

The last leadership style, and of course team management style, cited by Kaplan and Kaiser is forcing leadership. This leadership involves the value of power and imposing one's opinions, rationale, and decisions. The strengths of a forcing leader are the ability to persuade, urge, agree, and give opinions, as well as frequent scrutiny of the team's actions. The axiological pillars of a forcing leader are:

a) persuasive ability (persuasion),

b) ability to form opinions; and

c) systematic control.

The advantages of forcing leadership are to be willing to take control, to be open-minded, and to encourage action; in other words, to mobilise activity. The disadvantages associated with this form of leadership include, for example, over-controlling and exaggerated dominance, which is often externalized in setting a negative – overbearing – tone to meetings (Kaplan, and Kaiser, 2013, p. 52).

A slightly different division (different typology) of leadership is described by Mariusz Sieraczkiewicz. In his book *Technical Leadership. Od eksperta do lidera*, citing Kurt Lewin, Max Weber and Arthur Carmazzi, among others, Sieraczkiewicz writes about charismatic, transactional, transformational, visionary and servant leadership (Sieraczkiewicz, 2016, p. 18).

Charismatic leadership, as explained by Sieraczkiewicz, refers to leaders who hold high positions. Basically, these are leaders who influence with the power of words (language) and emotions. The role of a charismatic leader is to stimulate energy and develop passion. Through their ability to influence, a charismatic leader builds strong relationships that help in the pursuit and completion of the task (Sieraczkiewicz, 2016, pp. 18-19).

In the case of transactional leadership, the most important role is played by the manager who uses a system of rewards and punishments as a form of motivating the employee/team member. A team managed by a transactional leader is focused on task completion. Sieraczkiewicz measures that this model of management will work „in a predictable and uncomplicated environment, while it will fail in the case of a group of passionate people who want to do something on their own" (Sieraczkiewicz, 2016, p. 19).

Alignment of declarations and actions are hallmarks of transformational leadership. This type of leader is characterized by a very high emotional intelligence, self-awareness, empathy, visionary, and at the same time simplicity and humility, through which they motivate, inspire, and communicate creating with the team a common future filled with the implementation of specific tasks (Sieraczkiewicz, 2016, p. 19).

A higher level of visionary/predictive leadership is manifested by a leader who is a visionary leader. Visionary leadership makes the leader a person characterized by uncommon creativity in creating attractive ideas (visions) that he or she can easily vividly present to the team. A visionary leader is an influential idealist who infects an idea, but needs others to implement it (contemporary examples include Elon Musk, Robert Murdoch, Ted Turner, and the late Steve Jobs) (Sieraczkiewicz, 2016, p. 19)[4].

The last type of leadership that Sieraczkiewicz distinguished is servant leadership. It focuses on meeting the needs of team members and the goals set by the team. This type of leadership works well in a culture that respects ethics and values. It involves the use of agile methodologies and a coaching style of influencing team members who are characterized by independence (Sieraczkiewicz, 2016, p. 19)[5].

5. Selected leadership skills of a leader – characteristics

Sustainable leadership and related sustainable management should include all of its patterns. Unfortunately, a leader often pushes only one form of management, which affects the shape of relationships built in the team. However, leaders need to nurture a unique ability to blend contexts, such as operational and strategic contexts, which is the ability to combine the characteristics of these two types of leadership: effective tactics with clear and decisive messaging; and clear and transparent communication.

[4] Elon Musk is the owner of SpaceX and co-founder of Tesla Motors; Robert Murdorch is the owner of „The Times"; Ted Turner is an American media entrepreneur; and Steve Jobs was the inventor of the Macintosh computer and co-founder of Apple.

[5] Agile methodologies address contemporary forms of management and are based on constantly changing priorities; it is a set of management methods that takes into account contemporary working conditions/realities.

Often the ability to combine contexts is associated with the art of creating a vision, the talent of leading and inspiring motivation; also building alliances or conducting difficult, demanding and complex negotiations (Kaplan, Kaiser, 2013, pp. 129-130.). According to the Hungarian-American psychologist Mihaly Csikszentmihalyi, linking management contexts is a specific state of „flow" as a form of „relaxed focus" in which all attention is diverted to achieving the goal (Csikszentmihaly, 2005; Kaplan, and Kaiser, 2013, p. 133).

As Rob Kaiser writes: „Leaders today face a serious dilemma. On the one hand, conservative, strong, top-down management has become the key to success over the past decade. On the other hand, however, creativity, the ability to collaborate, and the full involvement of employees, made possible by involving them in the management and decision-making process, may be paramount in the hard-to-predict future" (Kaplan, and Kaiser, 2013, p. 15).

A leader is able to mitigate/suppress his or her inner contradictions in order to engage in the team's professional activities with passion, yet great composure and calmness (Kaplan, Kaiser, 2013, p. 133). A versatile leader does not develop only one talent – the chosen dominant leadership trait. A versatile leader does not neglect his/her other talents/traits. While nurturing his or her minor talents, they demonstrate a concern for other, more important, leadership skills.

According to the previously mentioned Jo Owen, they include, among others: efficient discovery of one's leadership style, the ability to convince people by using a specific management style; a positive attitude and fostering happiness. Subsequently, also the development of problem-solving skills, above-average use of time and the accompanying constant learning to be a leader (also by drawing up one's own leadership plan), systematic and continuous education in the field of informal survival rules, combined with high-efficiency use of business ethics; motivating shaping of people of various characters combined with the efficiency of building a management team; effective acquisition of loyalty among colleagues/subordinates, also the ability to formally assess subordinates, including taking responsibility for the selection of employees (including their employment in a specific position). The ability to provide informal feedback and implement a coaching culture in the organization, the resourceful management of a mismatched team, the ability to manage conflict/crisis situations, project management, and change management may also be included (Owen, 2012, p. 5).

Similarly, a good leader should have: knowledge of the 10 laws of power, modeling support networks, and reinforcing the value of trust; technical speaking and presentation skills; a willingness to develop excellence in listening; and writing proficiency. Owen also suggests that a good leader should have business competencies combined with an effective form of communication, use of power mechanisms, and the ability to conceptualize/create a vision (Owen, 2012, p. 5).

However, the list of leadership skills for a team leader is much longer and should include many niche characteristics, such as the mathematical ability to read results from numerical data, the leader's willing participation in business deliberations and meetings, fruitful collaboration with the board of directors, the realization of values while creating value for the company, and the leader's/leader's constant discovery of the context of his or her actions (Owen, 2012, p. 5).

6. Nature of leadership

Leadership is a learned skill – it is based on skills that everyone can and should learn, for example through observation. In the systematic learning of leadership, it is important to remember to develop and use one's own strengths, while recognizing that it is impossible to fully develop all the qualities of a leader. The ideal leader does not exist (the ideal leader is an invention).

Authentic leadership is about encouraging people to go „where they would never go on their own" (Owen, 2012, p. 13). The nature of leadership, then, is to realize several aspects of management: the realization that „everyone can learn to lead and to lead others better" (Owen, 2012, p. 13); and the realization that there is no flawless leader; „a leader can be at any level" (Owen, 2012, p. 13), however, there will always be certain characteristics of a leader that will dominate over other characteristics determining the nature of the leader.

7. The nature of leadership versus personality types

To recognize the nature of leadership is to know oneself openly and to recognize the influence one has on others. The mode of influence determines/encourages an extroverted or introverted way of acting, resorting to cognition or intuition in one's actions, deciding a problem based on thinking or feeling, or acting based on judgment or observation.

Extroversion describes a personality type that gains energy among people. Introversion characterizes the personality type that draws energy from within itself. Therefore, while „introverts think before they utter a single word [extroverts – A.M.], speak because it helps them gather their thoughts" (Owen, 2012, p. 21).

From a psychologist's point of view, a person who relies on cognition is a non-creative, but very good, because she performs/executes tasks collaborator. On the other hand, a person based on intuition is a great creator of unique ideas and new ideasbut is not able to translate these ideas and ideas into concrete actions; she cannot complete tasks (Owen, 2012, p. 21).

In comparison, a thinking person focuses attention on finding concrete and appropriate solutions, so working with him or her will facilitate the work of the team. In contrast, the feeling person will psychologically support the team during difficult times/moments, that is, when the team is experiencing difficult moments (Owen, 2012, p. 21).

The judging type as organized and schematic values order, discipline, rigid framework, and punctuality, while the observing type is an opportunist who seizes new opportunities and seizes opportunities. While the judgmental type is distinguished by a high work ethic, the observant type appreciates and pursues the concept of time management in a work-life balance (WLB) scheme: a coherent and balanced work-life (Owen, 2012, pp. 21-22).

So, in light of the above leadership/management analyses, what is leadership coaching and what purpose does it serve? Consequently, what is the supportive nature of leadership coaching?

8. What is leadership coaching

Leadership coaching is a method of coaching; a form of human resources management dedicated to team leaders. A leader is a person responsible for the effective functioning of a team. He is the father of successes and failures of this team; it is not uncommon to say that he is also „the person responsible for making things happen" (Sieraczkiewicz, 2016, p. 13).

A good leader, on a technical level, should know what needs to be done, how it should be done, and how to win/recruit allies, i.e. influence individual team members to complete a project or successfully complete a task with their help/active participation (Sieraczkiewicz, 2016, p. 13; Nieckarz, Celińska Nieckarz, and Godlewska-Werner, 2017, pp. 83-99; Kuzior, 2017, pp. 81-82). Helping nature of leadership coaching is hidden in the mentioned characteristics of a leader.

Dariusz Wylon consultant and agile and business coach notes that the factor that significantly affects the sense of belonging and commitment of team members/co-workers is the behavior and conduct of the leader. A leader should be able to define his leadership model, should see the positive impact he can have on people, also find a way to achieve the company's vision and learn to say „I don't know" (See pl.linkenin.com/in/dariuszwylon). In this way a leader shows his authenticity.

9. Conclusion

Authenticity, openness, and willingness to learn are important characteristics of a modern leader in an organization. These qualities confirm that an organization is not walls, but people properly managed. A proper form of management, in the form of leadership coaching, among others, is distinguished by noticing and nurturing not only leading traits but also niche traits that will make a leader a versatile executive. This versatility is provided by holistic and non-directive coaching. In this article, I attempted to describe selected types of leadership by linking them to a specific, inherent axiology and at the same time pointing out that the broader the axiological horizon, i.e. the leader's value system, the better the way he or she manages the team.

Awareness of the leader's and the team's axiological resources, openness to change, action, and systematic work on transformation seen through the prism of daily multifaceted formation of positive habits in oneself and team members are important steps in building the personality of a versatile leader and an effective team (Bielińska, and Jakubczyńska, 2016, p. 259; Stoltzfus, 2005; Hawkins, 2021). Good and versatile leaders can build healthy teams in imperfect organizations. Action is a prerequisite, so do not wait and do not put off your goals, values, needs and feelings. One should take activity and boldly implement beneficial ideas.

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THE DILEMMAS OF IMPLEMENTING SMART MOBILITY IN CAPE TOWN

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Purpose: To establish underlying issues that have hindered the implementation of smart mobility systems in Cape Town.
Design/methodology/approach: This article review is based on a theoretical literature review on the idea of mobility and smart City in Cape Town, South Africa. The theoretical approach was based on published journals, government sources, and other sources.
Findings: Smart mobility is one of the developmental strategies of this City with a focus on enhancing the existing transport system. This will help improve commuter transfer speed and the overall quality of life. However, the current transport systems have greatly undermined commuter experience, leading to traffic congestion, high transport costs, air and noise pollution, and generally low quality of life. This has had a significant negative impact on the local inhabitants' economic, social, and psychological. The government has also lost revenue due to frequent maintenance, vandalism, and an underutilized transport system.
Originality/value: the presented review paper provides a realistic overview of the issues affecting the local government and residents of Cape Town. These issues directly affect the national government and, therefore, there is a need to change the underlying transport structures to ensure that Cape Town meets its smart mobility goals.

Keywords: Cape Town, smart city, smart mobility, digital infrastructure, quality of life.

Category of the paper: Literature Review.

1. Introduction

Cape Town, also known as the *Mother City*, has been listed as one of the cities in Africa at the forefront to become a smart city. It's the second-largest city in South Africa and has earned an international reputation for its touristic beaches and natural setting on the northern end of the Cape Peninsula. Besides that, it has been involved in several conversations relating to creative innovation, with the Cape Innovation and Technology Initiative (CiTi) being the oldest tech incubator in Africa.

Regionally, cape town has been applauded for its significant efforts to improve the City's needs based on current technological trends. The local governing body has implemented several strategies to make it smart to the core, especially concerning mobility. This has been catalyzed by implementing four pillars to facilitate the smart city initiative- digital inclusion, digital economy, digital infrastructure, and e-government (Luke & Isabella, 2019)

The idea of smart mobility is designed to improve the City's developmental dimensions, such as reduced traffic congestion and environmental pollution. Besides that, it's meant to improve commuter transfer speeds, increase safety, integrate several modes of transport, and improve the locals' quality of life.

With a rapidly growing population of over 4.71 million people (World Population Review, 2021), spatial variation in the socio-economic profile, environmental pressure resulting in air pollutants and greenhouse gas emissions, Cape Town, has all the key drivers (Fig. 1) needed to catalyze the development of smart mobility.

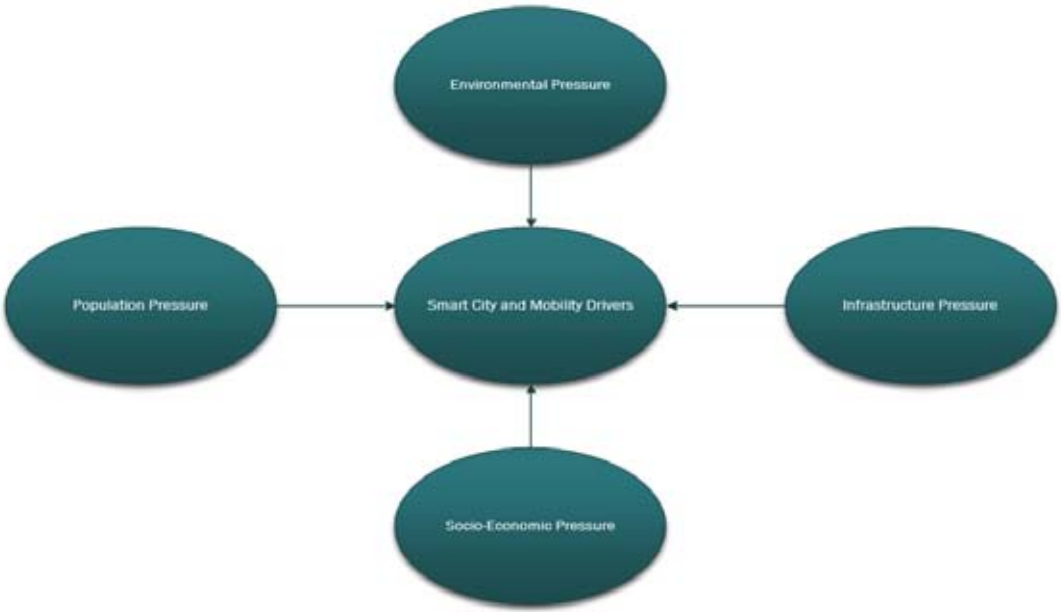

Figure 1. Key drivers of smart mobility. Source: own study.

But even though this City, through its officials, has put the necessary pillars and strategies already in place, it's clear that it's still far away from attaining its smart city status that would eventually result in smart mobility. Taxi wars have taken center stage in the transport system, with multiple reports of murder nearly every month. Railway vandalism caused by greenhouse gases, poor waste management, and poor transport system integration has made it hard to implement smart mobility. Additionally, environmental pollution and diversity in the transport system are some of the main dilemmas facing cape town.

This research paper specifically examines these dilemmas and the consequent implications of these causes in slowing down the journey of turning this touristic harbor into a safer and more sustainable city with mobility networks and intelligent transport systems.

2. Environmental Pollution

Poor management of waste is one of the top causes of environmental pollution. Even though Cape Town is one of the most populated cities in South Africa, its waste management plan is inadequate. Like other parts of the country, this City has poor waste management systems regarding the collection, delivery, and recycling of waste. There is a lack of clear line of authority and unreliable waste collection service and frequency. There are inadequate street containers, wrongly located containers, careless waste disposal, and illegal dumping of waste-by-waste disposal companies (Fakoya, 2014).

Due to the lack of public and municipal government cooperation, this City can't implement an effective waste management strategy. This has led to poor sustainability and increased environmental pollution, which would deter an element of the smart city living lifestyle. Pedestrians and other road users have problems effectively accessing different parts of the City due to poor waste disposal, health hazards.

While Cape Town's air quality is relatively good based on the current air quality index, there is no doubt that the presence of photochemical smog resulting from fuel-based motor vehicles has serious health effects. Note that the concentration of PM2.5 at Cape Town is currently 12 ($\mu g/m^3$). According to the World Health Organization (WHO), the recommended threshold for concentration at PM 2.5 is 25 $\mu g/m^3$. This means that the current concentration is 0.48 times better than the recommended limit (WHO, 2021). However, smog and other air particles can significantly reduce drivers' and pedestrians' visibility.

The first recorded smog in Cape Town was in 1990, and this prompted many inquiries from the public and press. The frequency and amount of smog have increased subsequently due to the increased population and petroleum-based motor vehicles. This has led to low-level mist inversion, episodes of visible brown haze, and a "sweetly-acidic" smell (Popkiss, 1992). This warrants concerns, especially concerning respiratory diseases, mobility, and quality of life.

3. Lack of Smart Lighting

Smart lighting is important in promoting sustainability, increased security, lower energy use, and easier light customization. It should be noted that street lighting systems consumers higher power than most application domains. In the case of Cape Town, the high-power consumption and frequent blackouts have only implemented smart mobility a challenge.

The local government has admitted that poor lighting in many parts of the City has spurred crime and affected transport, especially at night. Even though there are plans to replace the high-intensity discharge (HID) lamps with light-emitting diodes (LEDs), this program hasn't

been implemented due to a lack of funds and vandalism. It should be noted that HID bulbs have a poor orange glow that makes it difficult for road users to see the surroundings. Additionally, these bulbs have poor lumen maintenance, and they lose a considerable light output and eventually burn out completely, leading to a waste of energy.

Of all the City's traffic lights, it's estimated that only 15% of street lights have LED bulbs. Besides that, managing traffic in some areas has become a menace due to the ongoing vandalism of street lights. The sprawling townships have the highest crime rates due to poor spatial development and poor connectivity.

Besides that, South Africa's main power supplier, Eskom, has been facing energy issues, leading to lasting and frequent interruptions. Eskom accounts for almost 98% of South Africa's electricity (Stott, 1997). Load shedding is a rolling blackout that involves the intentional shutdown of electrical power. The company's chief operations officer has stated that the reason for load shedding is due to neglect and lack of maintenance for over a decade, resulting in an unreliable and unpredictable system.

Loading shedding has a serious threat to security since a well-functioning infrastructure relies on a good transport system. The loss of electricity has a significant effect on transport, including the rail system. Besides that, the frequent power outages have led to the loss of millions of monies in revenue that would otherwise be used to make Cape Town a smart city. Overall, these factors have made it impossible to create an intelligent streetlight control solution that uses motion sensors. The lack of reliable power supply and constant vandalism means that this City still has a long way to go.

4. Lack of a well-integrated transport system and inefficiency

Cape Town's transport model mainly features metered taxis, metro trails, and MyCiti-a bus rapid transit service with feeders. All these were designed to integrate the City's public transport system. However, these modes of transport are not well integrated. There are no specific bus or taxi stages, and commuters can't rely on the available public means of transport to drop them on their doorsteps. This City hasn't implemented a scheduling mechanism that guarantees minimal disruption to transport. As a result, it isn't easy to schedule day-to-day commute.

The BRT bus system and metro trails were introduced to diversify the already struggling taxi industry. However, there is a missing link between these three transport systems. Even though the BRT system was introduced as a revolutionary public transport system to improve commuter service during the buildup to the 2010 Soccer World Cup, its service delivery is restricted to the "urban poor" in high-traffic areas only. It's not seamlessly integrated with the metro trail or the metered taxis; hence commuters can't connect from one mode of transport while commuting to the next.

The metro trail has occasionally been "crippling" transport services due to equipment failure. The train network, which serves approximately 620,000 commuters every day, operates on a 460 km track. However, commuters face delays and poor communication. The worsening conditions have resulted in inefficiency in service delivery. The limited and unreliable network has often left commuters stranded, interfering with economic productivity.

According to Wired (Stinson, 2017), thousands of commuters in Cape Town have had to navigate the extensive informal taxi stage network by word of mouth. Minibus taxi drivers are forced to garner information regarding routes based on experience. According to Madeline Zhu of WhereisMyTransport, a South African start-up, "People don't know how it works – they just know the few routes that they're used to running", the poor transport network integration means that people in informal settlements don't have access to metered taxi services easily. Besides that, the combination of over-reliance on poorly integrated taxis and affordability issues is a perfect recipe for failure to make this City implement smart mobility. The post-apartheid government means that most people still have to rely on public transport systems while they are socially and economically excluded. This has resulted in urban low-income residents who over-weight the public transport system (Teffo & Zuidgeest, 2019).

5. Taxi Wars

Taxi wars are serious triggers for the economy of South Africa. The violent system, which has a history that dates back to the late 1980s, has been caused by the fact that this industry is determined to regulate itself. In Cape Town, for instance, the ongoing taxi dispute has been due to taxi routes. Local news reports that 82 people have been killed between January and July 2021. Violent entrepreneurship isn't new in South Africa. In the fight for more lucrative taxi routes and power brokerage, it becomes impossible to upgrade this City's public transport sector, with different factions fighting for power and control of the taxi market share.

Note that the metered taxi, the most popular option, is also in competition with shared riding services such as Uber (Carmody & Fortuin, 2019). This has resulted in the Uber-taxi war within Cape Town City. Drivers from both sides have raised regulatory issues with metered taxi drivers claiming that uber drivers operate without legal permits, for instance. A report by Gareth Van Zyl (Van Zyl, 2016)indicates that almost 2000 Cape Town Under drivers operated illegally without the metered taxi permits in 2016. This led to the impounding of over 300 Uber cabs. (ADEBAYO, 2019)

6. Lack of flexibility

There are only three primary forms of transport in this City. Note that other forms of flexible options such as trains, trams, e-bikes, and hoover boards are limited. So, commuters are restricted when it comes to transport options. For a city with over 4.7 million people, a limited transport system increases the risk of accidents, transport delays, and extremely high commuting costs.

But even with the available roads, there is a big pothole problem in the townships. The City's transport directorate is estimated to have repaired almost 18,080 potholes between January and August 2021, only in addition to resurfacing 121 km of roads (City of Cape Town, 2021). While the massive repair process may be ideal in enhancing the transport system in this region, they also contribute to commuter delays due to frequent road diversions. The City of cape town government indicates that they repair approximately 2,260 potholes monthly, which translates to 75 potholes per day. It should be noted that the high number of potholes also contributes to accidents and hinder efficient mobility.

7. Railway vandalism

A functional rail network is important in providing commuters with an efficient and cost-effective transport alternative. Besides that, this is important in helping Cape town city attain its smart mobility goals and align with its economic development.

The widespread vandalism of fiber optic cables has resulted in frequent delays across the main transport corridors in Cape Town. In most cases, commuters are constantly advised to seek alternative means of transport due to communication outages and the high risk of accidents (George & Rust, 2018)

The unprecedented level of passenger rail infrastructure reached an extremely large scale, especially during the 2020-2021 lockdown period due to the pandemic. For the few functional railway systems, the commuter overcrowding has sparked the risk of accidents and delays.

8. Conclusion and Suggestions

The idea of Cape Town city implementing smart mobility seems close to fruition yet so far away. This City has a reasonable potential of becoming a smart city that's mobility friendly. This is because its location, global popularity, smart and innovative platforms, and availability

of resources, including data, can facilitate the whole process. However, the local governing body should consider diversifying its smart mobility profile, implementing intelligent transport systems, and using big data solutions that guarantee efficiency, flexibility, and safety. Besides that, it should implement clean technology by using vehicles with zero-emission. To curb taxi wars and public transport violence, the government should step in by implementing the right governing bodies that guarantee public safety. to prevent waste management and align this City with its smart city goals; this City should consider using **smart waste resources**. (SmartCitiesDive, n.d.) which could be key in enhancing transport efficiency and integration that commuters need.

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THE PROBLEM OF BURNOUT IN THE JUDICIARY

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Purpose: This publication focuses on issues related to occupational burnout. The aim of this publication is to show how occupational burnout determines the management of an organization (District Court in Koszalin in Poland).
Design/methodology/approach: A survey and participating observation were used in this publication. The research was conducted on a group of 84 employees of the company. The values of the analysed indicators were calculated by using the Excel program.
Findings: The analysis of the collected data for the years 2019-2020 showed that this study should be regarded as a survey, and thus gives the opportunity to widen the area and scope of study. The research confirmed the H1 hypothesis: Occupational burnout among the employees of the District Court in Koszalin is at an average level and strongly determines the management method and their work efficiency. Research results indicate a correlation between occupational burnout and the management method, which directly determines the effectiveness of employees. The study showed that as many as 96% of the respondents District Court in Koszalin in Poland believe that they have or have had contact with the symptoms of burnout.
Research Limitation/implication: There were limitations in the course of the study in the assessment of occupational burnout by the superiors, due to the reason that the research was conducted among a professional group burdened with social trust. The most important implication of the research is the statement that work, relations with employees, HR policy, etc. should be properly shaped in order to minimize or eliminate the symptoms of occupational burnout.
Originality/Value of paper: The analysis showed the more impact burnout has on superiors, in particular lack of prospects for professional, family and personal development, the less empathy they show and are less effective at work.

Category of the paper: Research paper.

Keywords: occupational burnout, management, depersonalization, development of incentive systems.

1. Introduction

For several years, the problem of occupational burnout has become increasingly common, since it is an integral element of the labour market (Alarcon et al., 2009; Al-Sareai et al., 2013). It is a complex phenomenon determined by many internal and external factors. Even though the employees and employers tend to not speak about it openly, there is little doubt that professional burnout can affect anyone, regardless of the gender, age, seniority or held position. (Batayneh et al., 2019; Borg and Riding, 1991) This phenomenon can be conditioned by our body, workplace, working time and the environment in which we exist and work. What is means is that burnout has a negative impact on the development of the organization. Every new employee (person) when starting a new job is full of enthusiasm, ambition, creativity etc. He is focused on achieving success. However, with time he has to face an increasing number of duties, overtime, stressful situations, being underestimated or inadequate remuneration. This may result in the drop of the worker's enthusiasm for work and in the decrease of the possibility of developing his personal and professional potential. An employee can feel overwhelmed by his professional responsibilities, which can determine and limit his private life development plans. (Busch et al., 2013) Such an employee becomes exhausted, disappointed, and in particular, ineffective at work and that may lead to professional burnout very quickly. The phenomenon of occupational burnout occurs among various professional groups, in particular those who have contact with other people, such as doctors, nurses, psychologists, teachers, etc. (Catano et al., 2010; Cherniss, 1992) This is especially important for organizations which enjoy public trust and are to ensure proper and stable development of enterprises, industries and national economy. This study focuses on the Court's staff who are burdened with high social trust. The authors were not able to find any publications devoted to the issue of burnout in the judiciary, which emphasizes the importance and contribution of the publication to science.

Therefore, it becomes essential to manage employees in an appropriate manner, develop their skills, knowledge and experience in a way so that their willingness to work stays at the expected and satisfactory level for both the employer and the employee. This allows to minimize or eliminate occupational burnout by eliminating routine (monotonous, mechanical activities when performing tasks) and by influencing the development of professional and private life of employees. The aim of the publication is to show that the phenomenon of occupational burnout occurs and determines the management of the organization, which is the court.

2. Literature review

The phenomenon of occupational burnout was first introduced in professional literature in the 1960s. However, the person who popularized this topic was H.J Freudenberg who is widely regarded as the founding father of this concept. According to his definition, occupational burnout *is a process that arises as a result of total exhaustion and being overwhelmed by many problems.* (Crouter et al., 1989) It is the result of the person's sense of dedication and commitment to perform a task or job with the need to prove himself (Demerouti et al., 2001). Over time, this affects a person's attitude and behaviour and decreases his self-esteem and reduces the level of life energy. A different approach to the issue of professional exhaustion was introduced by Ch. Masloch (Ekore et al., 2020; Fairbrother and Warn, 2003; Fedai et al., 2017) who on the basis of a number of studies, distinguished three factors of burnout (Fernet et al., 2010):

- emotional exhaustion,
- depersonalization,
- low evaluation of own professional accomplishment.

A similar classification of the groups of factors responsible for occupational burnout is presented by the International Classification of Diseases (ICD) developed by the World Health Organization (WHO) and defines this phenomenon as a result of chronic stress at work, which could not be effectively addressed (Finney et al., 2013; Gillespie et al., 2001). The concept of occupational burnout is not clearly defined. Hence it is often referred to in professional literature based on comparison to "something", e.g. (Heinemann and Heinemann, 2017; Hombrados-Mendieta and Cosano-Rivas, 2011):

- a splinter stuck in a finger *If it is large enough, it can be quickly located and removed. However, if it is thin and barely visible, it can bring constant discomfort, a burning sensation, pain but one does not know where it hurts… At first nothing happens. It gets a little uncomfortable until a big inflammation appears,*
- a kerosene lamp, *which has too little kerosene in it but is supposed to shine brightly*, or
- a flu, *that anyone can get, but not everyone has to go through it just as severe*.

Hence, occupational burnout is not a new phenomenon and has accompanied people for a very long time (Karabay et al., 2014; Karpeta, 2008). It plays an important role in the development of a human (employee) because its symptoms known as the triad include: emotional exhaustion (feeling of excessive emotional tension during work), depersonalization (excessive distancing as a result of trying to protect oneself from strong emotional stimulation) and reduced sense of personal achievement (manifested by a negative perception of one's own competences, a sense of own ineffectiveness and lowered self-esteem) (Keinan and Malach-Pines, 2007; Koutsimani et al., 2019; Kovač et al., 2017). The qualification of the number of symptoms of occupational burnout are also presented in the literature in a heterogeneous way,

e.g. according to S. Kahill (5 groups) or J.P. Schröder (4 groups), as well as the stages of the occurrence of this phenomenon Freudenberger and North (12 stages), Litzke (6 stages) or Burisch (7 stages) (Fernet et al., 2010; Lambert et al., 2013).

It is worth noting that it is exactly the symptoms that serve as a warning sign for the entrepreneur and ourselves that the current situation at work is not good and changes should be made in our lives. Although, there are many reasons for professional exhaustion, from the point of view of managing an organization (Leiter and Schaufeli, 1996), they can be classified into three groups of factors:

- interpersonal (employee relations with colleagues, clients, superiors),
- individual (physical and mental predispositions, expectations and attitude towards achieving professional success),
- organizational (workplace conditions).

The determination of individual group of factors shows the complexity of burnout (Litzke and Schuh, 2007), hence this phenomenon is perceived as a slow process, where the initial stages are often overlooked or misinterpreted (Karpeta, 2008; Maslach et al., 1986; Maslach et al., 1997; Maslach and Jackson, 1984). It has to be mentioned that the probability of professional burnout increases if there is a mismatch between the employee and the organization (Maslach and Leiter, 2008). Because of the accelerated organizational development and the growing expectations of superiors, the criteria for employee evaluation (Maslach, 2011) are being reinforced which determines the frequency of burnout occurrence, although it does not cover all the employees of the organization (Melchers et al., 2015; Mierzwa et al., 2019; Mosadegh and Yarmohammadian, 2006). However, the frequent occurrence of burnout syndromes, a sense of loss of security, interpersonal relations or the sense of belonging, an increase in the time and energy required to perform a task effectively as well as limitations of one's own development indicate a full-blown burnout (Ogungbamila et al., 2019; Oliveiraa et al., 2016). Professional burnout is not only the problem of an employee as it directly affects the entire environment, which includes the implementation of detailed plans for professional, family and personal development (Perrewé et al., 2002).

3. Material and methods

The subject of this paper is the issue of occupational burnout. The aim of this publication is to show how the phenomenon of professional burnout determines the management of an organization. An attempt was also made to illustrate, through the course of research, to what extend does the correlation between management and occupational burnout influence work efficiency. The studied professional group in this article is an important factor of this research, as a judiciary profession is considered to be burdened with high social trust and has not yet been

studied in this subject area (the authors have not been able to find any publications). The rationale for conducting research among this social group resulted from the noticeable public pressure, taking responsibility by the judges for their decision-making, organizational pressure (the necessity to quickly resolve proceedings) as well as the management and the general view on professional burnout in Poland. The following hypothesis was stated as a part of the research: H1: *Occupational burnout among the employees of the District Court in Koszalin is at an average level and strongly determines the management method and their work efficiency.*

The employee opinion poll was conducted with the use of a questionnaire, which consisted of 25 correct questions and 7 identification questions. The proper questions were closed, single-choice, on a 5-point Likert scale. The study was conducted in April 2020 and included an analysis of the organization's management in the years 2019-2020 because in this period of time a number of changes were adopted (3,358 legal acts from 2019 to May 2, 2020 were published), among others, to ensure a stable development of the judiciary system and to increase the efficiency in which Polish courts operate. The significant changes that were introduced to better support clients did not change the judicial structure, but greatly limited the professional development of some of its employees, the freedom of expression, the sense of security when giving a judgement, etc., which had a substantial impact on the economy of Poland.

The development of the history of the Court of Koszalin to its present legal status is quite interesting, as it resulted from the country's development plan. Up until 1949, The District Court in Koszalin was subordinated to the Court of Appeal in Gdańsk. From 1949 to the present day, the court is subjected to the Appellate Court in Szczecin. In 1951 the court in Koszalin became the Provincial Court. In 1998, due to the law on the three-tier territorial division resulting in the reduction of the number of provinces from 49 to 16, the Koszalin Province was removed from the map and under the new resolution, regional courts were to replace provincial courts. The District Court in Koszalin was established on January 1, 1999.

A questionnaire method carried out among the employees of the Court was used as a part of the research. The values of the analysed indicators were calculated in the Microsoft Excel programme, and the results were presented in the form of tables and graphs. There were 84 respondents among the Court's staff, which is 47% of the total number of employees, of whom 84.5% are women.

Among the respondents, the most held position was a court secretary (63.1%), independent job positions (15.1%), managerial position (7.1%), judges (4.8%), an assistant to a judge (4.8%), aregistrar (4.8%), an inspector (3.6%) and a court usher (2.4%). The vast majority of the respondents, which amounted to 71 people (85%), were employed based on an employment contract. Only 7 people were employed on the basis of a mandate contract and 5 people on contract for replacement. One person was hired from the nomination. The age structure of the respondents is presented in Fig 1.

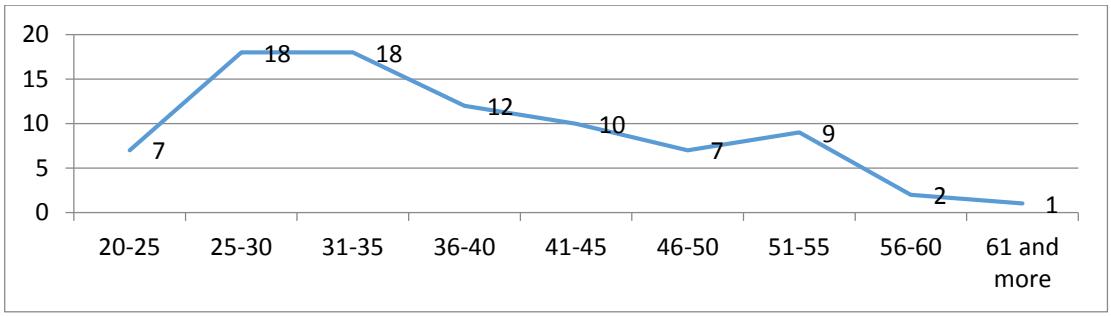

Figure 1. The age structure of the respondents. Source: own study.

The data shows that the most numerous group of respondents were people aged 25-30 and 31-35. Employees in the 25-45 age group were considered to be most effective with great development potential.

4. Results

Various areas have been analysed in the course of this study and it has been found out that 50% of the respondents were married and as much as 28% were single. The two previously mentioned factors (age, marital status) may be a result of limited possibilities of personal life development, i.e. establishing family security and supporting future family needs. Such concerns could form the basis for the symptoms of occupational burnout and are definitely determined by the amount of received remuneration (Fig. 2).

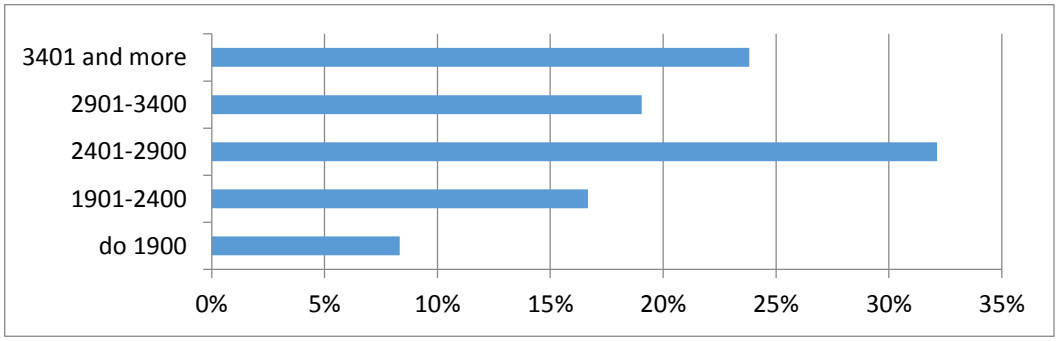

Figure 2. The average monthly net income. Source: own study.

Figure 2 shows that 32% of the respondents earned an average between PLN 2401,00-2900,00 net salary and only 8% received less than PLN 1,900. The level of remuneration is always essential in building personal stability in an organization. It is well-known that the higher the salary of employees' is, the better their quality of work and efficiency are. Such an assumption is used in commercial organizations and not in public benefit entities, where the amount of salary is imposed by the minister's order. It has to be mentioned that salary differs based on the position held but the majority of employees still work for the minimum wage, which has a significant impact on the service period of the Court's employees. The more years

of service, experience, qualifications and the employer's requirements, the more expectations towards remuneration the employee has. Unfortunately, low salary and limited career development prospects (promotions) result in job instability, as is depicted in Fig. 3.

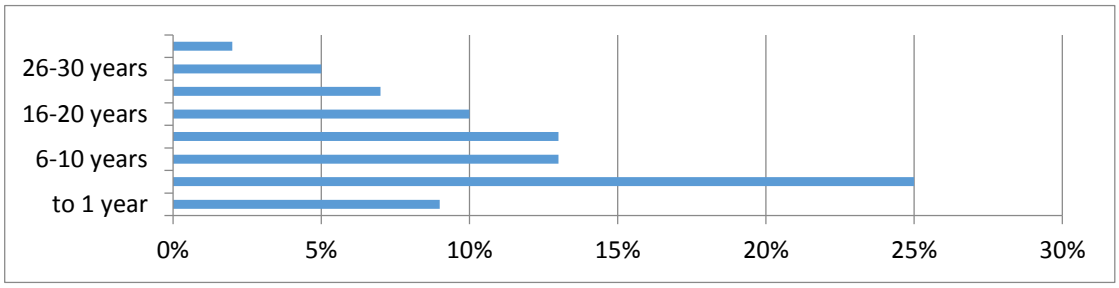

Figure 3. Years of service in the Court. Source: own study.

The most numerous group of employees are those with 1 to 5 years of service, constituting 25% of the respondents, with the smallest group of 2% being people with work experience of 31 years and more. This suggests that the dissatisfaction with the amount of remuneration, among others, deepens the occurrence of occupational burnout and, as a result, causes the high turnover of staff. This phenomenon has a strong impact on the way employees are being managed and on the entity itself. According to the respondents, this is especially true when management is all about supervision, because the majority of organizational matters in Court result from normative acts.

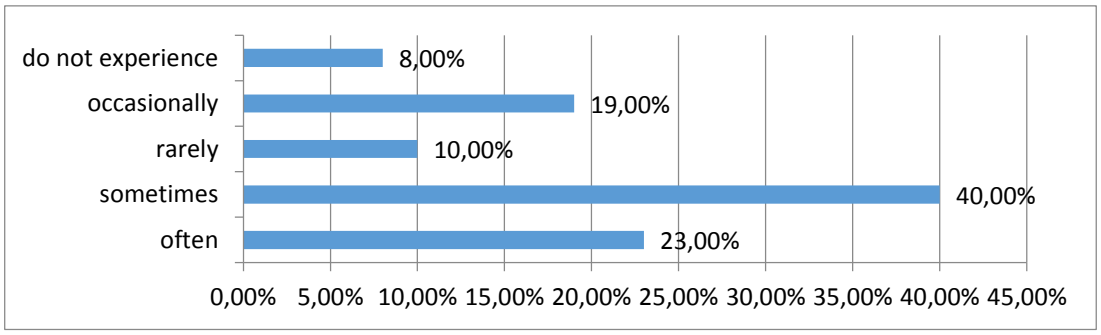

Figure 4. The frequency of experiencing unpleasant health conditions. Source: own study.

Prevalence of physical symptoms of burnout serve as a warning sign that something is wrong and the root of the problem should be found out as quickly as possible. Such numerous symptoms of burnout among the Court's staff may mean that the work is complex and burdened with great responsibility. The staff fluctuation may also be the result of overwork, i.e. excessive workload. A number of respondents (87%) stated that they have been exploited at work because of excessive workload without any additional remuneration (18% often, 32% sometimes and only 13% never).

In order to achieve high productivity level, employees often have to give up on their workers' rights and the specified working time. For example, research shows that by not taking statutory breaks, an employee is distracted, exhausted, and as a result, less effective. Hence, it was crucial to determine whether the management paid enough attention to the

workload of each individual employee and tried to limit the excessive workload. The survey confirmed the assumptions, however, that employers do not do it (Fig. 5).

Based on the data presented in Figure 5, more than half of the respondents were of an opinion that their superiors did not pay attention to the size of the workload, apart for four people who stated differently. A person who is physically and mentally exhausted because of work, feels reluctant to think about it and lacks willingness to return to it. The short amount of time spent outside of work does not allow to properly regenerate and distance oneself from too many responsibilities, and focus on own personal development. Limited promotion possibilities also have an impact on an (overworked) employee who immediately feels fatigue and lack of energy when thinking about work.

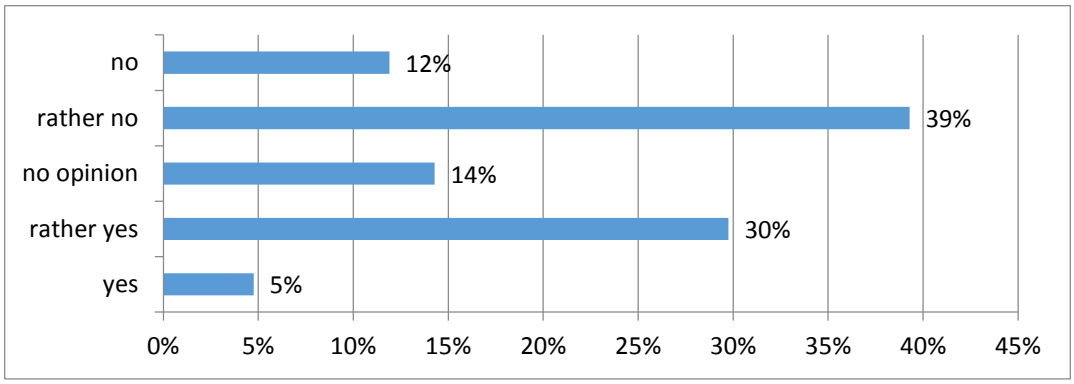

Figure 5. The employer's attention on the workers workload. Source: own study.

Emotional exhaustion, in particular a feeling of despondency, occurred among all of the respondents, however with different frequency (Fig. 6).

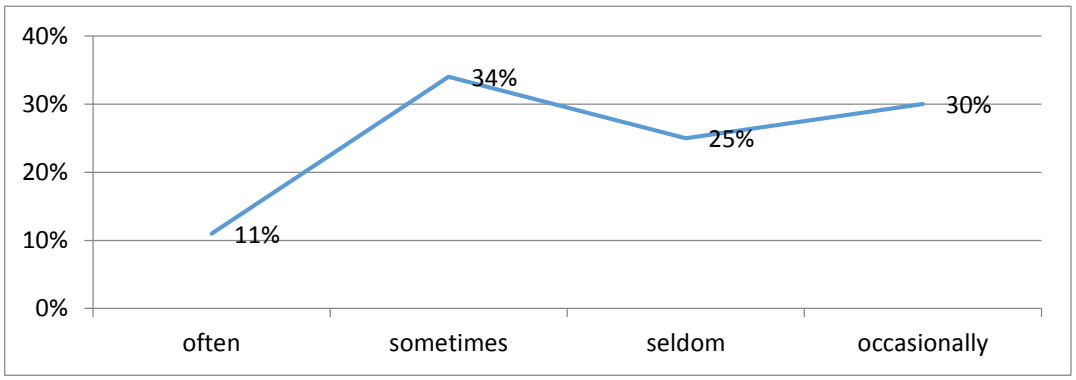

Figure 6. The frequency of experiencing despondency. Source: own study.

The results of the analysis were varied, but the scale of the problem is still notable. Emotional exhaustion occurring to such a large extent among the Court staff can mean that work in the Court is stressful and employees cannot cope with it. When a person is struggling with emotional exhaustion, it affects his relationships with other people and by trying to protect oneself against a strong emotional stimulation, the employee becomes cynical, lacks patience and creates conflicts. This influences depersonalization, as is presented in Tab. 1.

Table 1.
Evaluation of interpersonal relations

Answers / Questions	Often	Sometimes	Seldom	Occasionally	Never
Are you getting irritated by thinking about your colleagues or superiors?	(10%)	(36%)	(19%)	(26%)	(10%)
When someone asks you for something do you want to shout at this person?	(5%)	(13%)	(19%)	(27%)	(36%)
Do you find yourself treating people with contempt or indifference?	-	(20%)	(14%)	(26%)	(39%)
Do conflicts occur in your team?	(10%)	(32%)	(23%)	(29%)	(7%)

Source: own study.

The data in Table 1 shows that there were people with characteristics of depersonalization among the Court employees. However, it should be noted that positive relations between colleagues affect the atmosphere in the workplace. Both the managers and the staff should try to create good atmosphere, help and support each other instead of competing with one another and that would increase their commitment and enthusiast towards work. Unfortunately, the results were disappointing, because even though 99% of the respondents experienced, with varying frequency, enthusiasm for work, only 31% indicated "always" (Fig. 7).

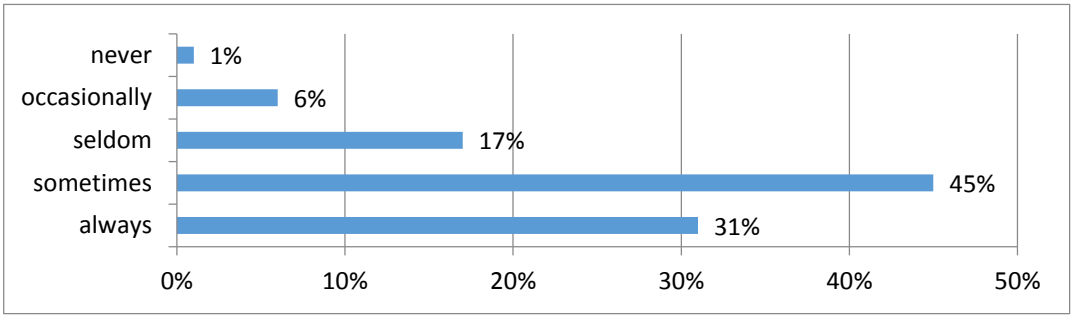

Figure 7. Commitment to work. Source: own study.

The presented data shows that the level of commitment is influenced by a number of factors including emotional and organizational ones. This, in turn, creates a feeling of uselessness, lack of self-confidence, lower self-esteem and the belief that one's own competences are too low, which are typical symptoms of burnout and reduced effectiveness at work. Figure 8 and 9 show that despite the disappointment with work and the low efficiency, it is still necessary to perform job (is justified) because simultaneously it comes hand in hand with boosting competences, experience and knowledge.

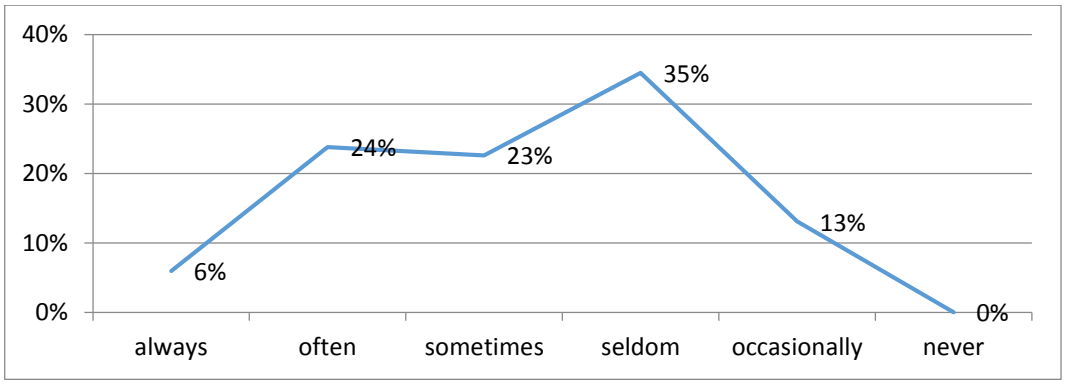

Figure 8. Feeling of disappointment with the efficiency of work. Source: own study.

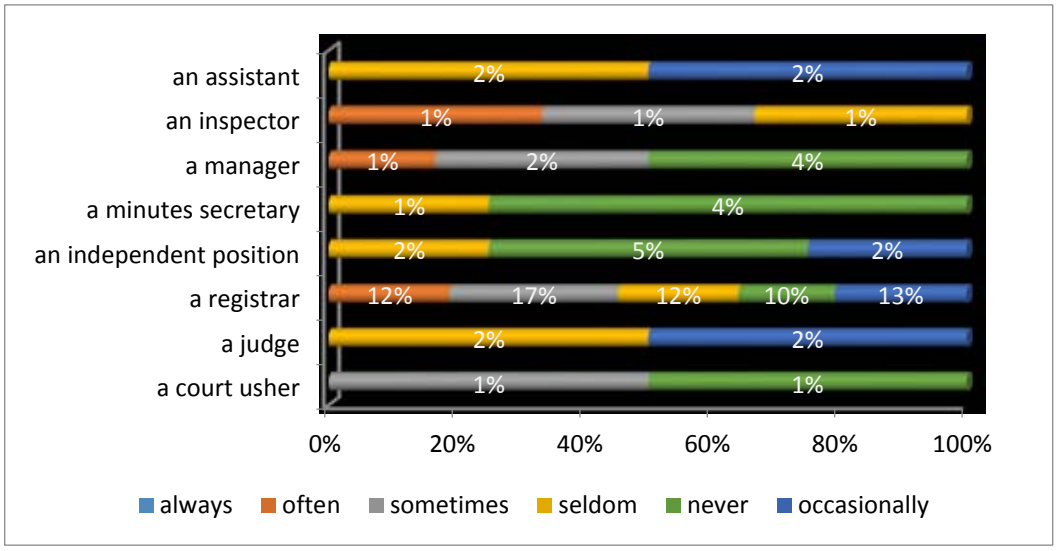

Figure 9. Disappointment with work at a given position. Source: own study.

An employee who is overloaded with work, is emotionally exhausted and has a sense of reduced personal accomplishments, may experience personal problems. The data presented in Figure 10 shows that only a few respondents experienced frequent problems in the private sphere caused by work.

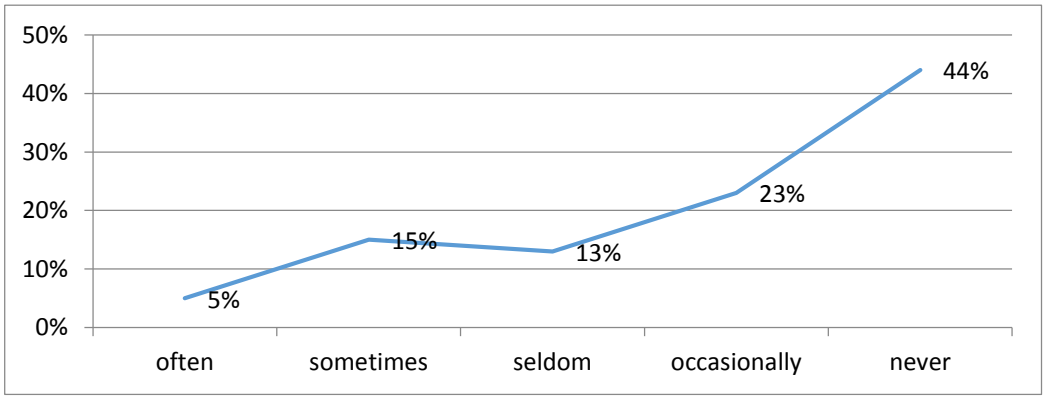

Figure 10. Occurrence of personal problems resulting from work. Source: own study.

As many as 44% of the respondents stated that work had no effect on their private life, and only every fourth person faced problems occasionally. These results may suggest that the Court staff was able to or made an effort to separate their professional and private life. If the

situation at work does not affect the private life of employees and they have the opportunity to distance themselves from their job, it is much easier for them to focus on the prospects and to enjoy their family life, as Figure 11 depicts.

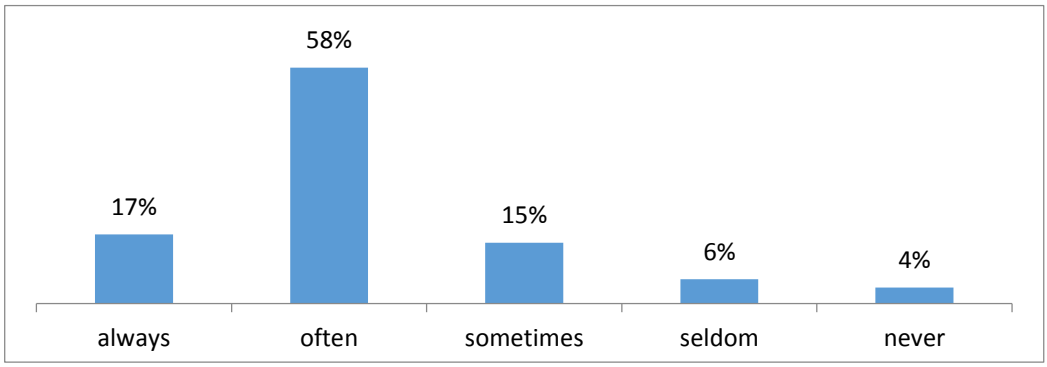

Figure 11. Assessment of the joy of life. Source: own study.

5. Discussion

Results of the research clearly indicate that the employees of the District Court in Koszalin suffered from occupational burnout, which is accompanied by physical symptoms. As many as 96% of the surveyed employees of the District Court in Koszalin had or is in contact with burnout. Only 2% of respondents stated that they had not had contact and 2% did not have an unambiguous opinion in this area. More than half of the respondents complained about various types of unpleasant health conditions, such as headache, stomach problems, nightmares, insomnia and others. The occurrence and the extent of burnout in the workplace depends whether the superiors care about their employees and how the organization is managed. (Koutsimani et al., 2019; Ramos et al., 2016; Saif et al., 2011; Roy and Avdija, 2012) Regrettably, the research shows that court employees felt that they were being exploited at the workplace, where 18% of the respondents indicated "often" and 32% "sometimes". Despite the feeling of being used, the respondents had no problem with fulfilling their duties at work. Thanks to their skills and experience, as much as 36% of the research group indicated that through an appropriate and individual organization of work, tasks can be implemented on time.

Even though the appropriate allocation of tasks at work allows for the employees to exercise in full their right to take breaks, there were some who had problems with both the workload and work organization (Salin, 2015). The disturbing thing, however, is that supervisors did not pay attention to workloads or overload during work. The only method used by the management to cope with this issue is by sending individual employees on training courses to develop professionally (Santana et al., 2012). Despite the fact that employees gain knowledge and skills, half of the respondents stated that the number of trainings provided by their employer was insufficient (Fig. 12).

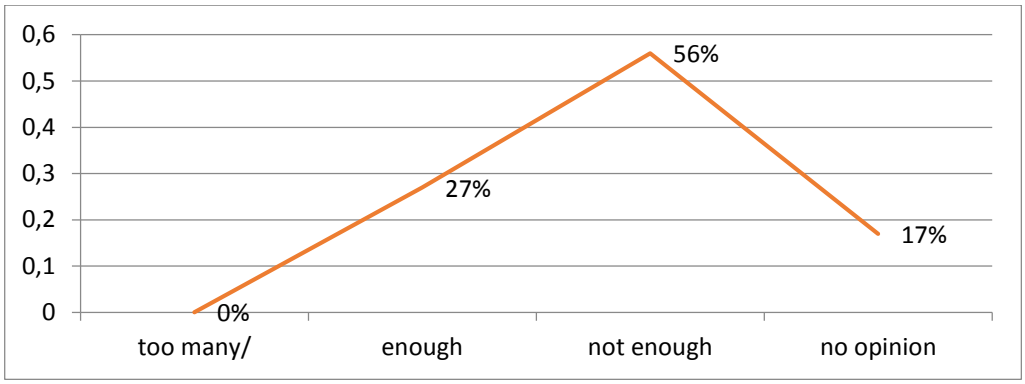

Figure 12. The amount of training courses. Source: own study.

The study shows that there is a need for the employees to take more targeted training courses. Also, more than half of the respondents (56%) stated that they did not feel sufficiently motivated at work. Problems also occurred in the area of emotional exhaustion, which according to Ch. Maslach (Ekore et al., 2020; Schröder, 2008), is one of the symptoms of occupational burnout. In the research group 40% of the respondents stated that they "sometimes" were lacking the will to work and felt overworked, whereas 16% of the respondents indicated "often" as their answer. Among the studied group, 38% of employees felt frustrated. Additionally, 35% of people who stated that they "sometimes" felt exhausted and were lacking energy when thinking about work. Surprisingly, seniority did not directly affect this result (Sidhu, 2016). Employees of the Court that had worked for less than 1 year were less likely to feel exhausted and lack energy when thinking about work. Hence, it was easier for them to plan their professional and personal development. A high level of emotional exhaustion among the Court's staff is similar to that of other public confidence professions. This may mean that these professions are burdened with, inter alia, high responsibility and stress. Unfortunately, respondents did not notice that they have been treating other people at work with contempt or indifference (Stephens et al., 2007).

Research results in the sphere of interpersonal relations and the level of depersonalization are slightly more optimistic. Even though, 32% of the respondents indicated that "sometimes" conflicts in teams did occur, and 36% felt irritated when thinking about their co-workers and superiors, 36% of the people in the studied group "never" wanted to shout at another person. Limited personal achievements are also a symptom of occupational burnout (Szostek, 2017). The respondents indicated that they were "occasionally" (35%) and "sometimes" (24%) disappointed with the effectiveness of their work. Low efficiency may be the result of the loss of sense of purpose in the work performed, which is most evident among court registrars and inspectors, and least among the minutes secretaries who have only began work. Another reason may be the lack of proper incentives (Wolniak and Szromek, 2020) (Fig. 13) and the amount of remuneration received (Fig. 14).

Superiors most often gave an explanation that their lack of possibility to use motivational tools resulted from the fact that their job consists in playing a supervisory role and not to manage the court. Employees, however, believed that people (managers) who demonstrate empathy can

manage and motivate their subordinate employees better. Research results indicate that seventeen employees have "never" had the feeling of being motivated at work and every tenth person "never" had the feeling of being appreciated by their employer.

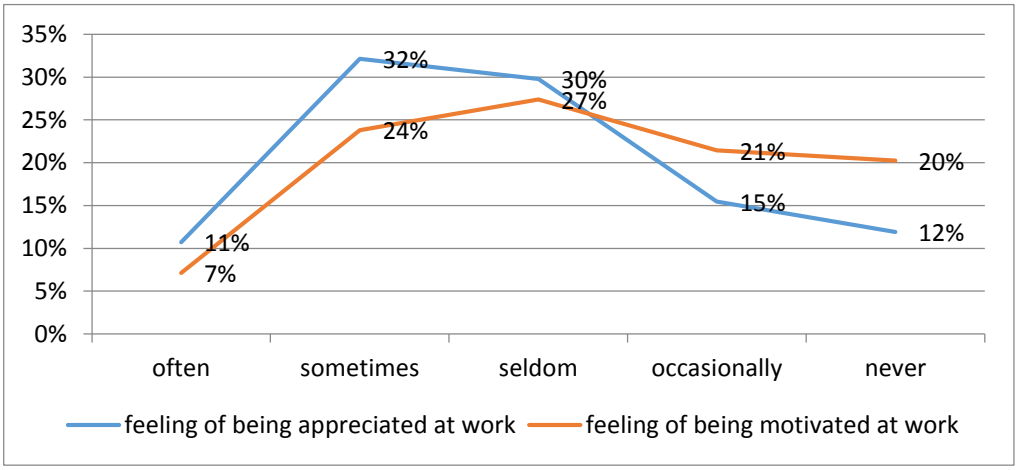

Figure 13. The use of motivational tools by the employer. Source: own study.

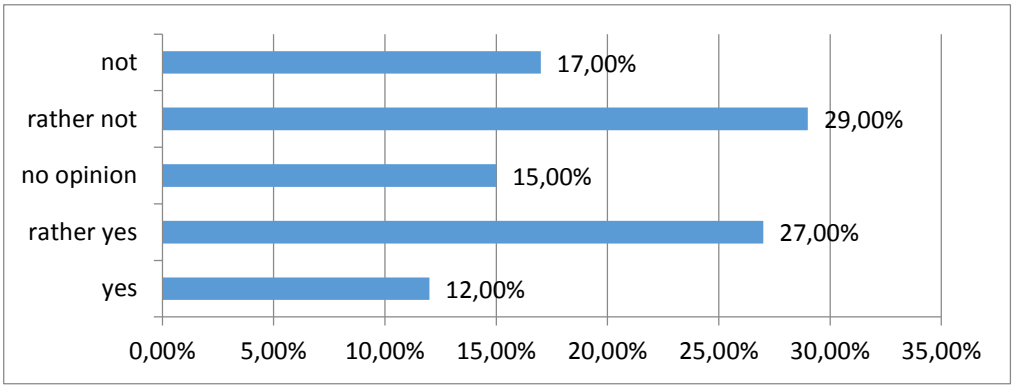

Figure 14. Level of satisfaction with remuneration. Source: own study.

This means that a poor result of work efficiency is determined by insufficient appreciation of employees for the effort they put into their work as well as limited opportunities for professional development (promotions).The lack of an adequate level of satisfaction also manifests itself through the level of remuneration, where 17% of the respondents declared "dissatisfaction" with the amount of salary they received in court and 29% stated that they were "rather" dissatisfied. This means that remuneration is not at the level for the employees to feel motivated enough. Only every tenth employee was satisfied with his salary, due to the discrepancy in salaries between people in the same position at work. Despite the many inconveniences at the workplace, limited perspectives for development and self-fulfilment, the respondents believed that their professional life did not significantly affect their private lives (WHO, 2014; WHO, 2003). Almost half of the surveyed people indicated that they "never" had any problems with their personal life caused by work and that they were "often" satisfied with their lives.

In conclusion, the conducted research showed that occupational burnout strongly determines the management of an entity. However, it is possible to improve the management of a court. The method requires, on one hand, to act in accordance with the law, and on the other hand, a softer rather than radical approach to changes. It is certainly worth focusing on the flexibility of management, in particular the following development processes:

- managerial – creating a court development strategy, particularly increasing motivational tools, e.g. introducing rewards for good work performance, badges, praises (oral and written), etc.;
- operational –e.g., related to the appropriate workload of employees (the number of duties should be planned in such a way so that the employee can easily keep pace with their implementation and at the same time have a feeling of fair-burden sharing);
- planning – through, inter alia, offering perspectives for individual career development of an employee; providing proper, dedicated training courses; increasing knowledge and developing personal skills.

6. Summary

Higher and higher demands and the number of duties imposed on an employee, as well as insufficient motivation and failure to meet the worker's basic needs, have become the pillars of professional burnout. It has been shown that this phenomenon was present among the employees of the District Court in Koszalin. The following hypothesis has also been confirmed: *Occupational burnout among the employees of the District Court in Koszalin is at an average level and strongly determines the management method and their work efficiency.*

According to the respondents, the main symptoms of professional burnout include both physical symptoms (such as insomnia and headache) and symptoms of emotional exhaustion (such as unwillingness to work, overwork, fatigue, lack of energy at a work, frustration or feeling tension at the very thought of having to come to work). Research results in the area of the level of depersonalization and the impact of work on personal life came as a positive surprise. The respondents did not show very negative emotions in their interpersonal relations and in the area of personal accomplishments.

There are other factors causing professional burnout among the employees of the Court that have not been included in this study. Hence, it seems necessary to conduct further, deeper and broader research to identify the environmental and psychological determinants of the complex phenomenon of professional burnout. The obtained research could be applied in the development and implementation of a strategy to prevent or limit the occurrence of occupational burnout in the District Court in Koszalin. However, it should be noted that during the process of conducting the study there had been limitations in the assessment of occupational

burnout by the superiors. There was also a noticeable sense of fear among the employees when they were filling in the questionnaire and especially when the results came in. This has proven the lack of job security and possible comments and reprisals from the superiors.

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INDUSTRY 4.0: SELECTED ASPECTS OF ALGORITHMIZATION OF WORK ENVIRONMENT

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Purpose: The aim of the article is to describe and forecast possible difficulties related to the development of cognitive technologies and the progressing of algorithmization of HRM processes as a part of Industry 4.0.
Design/methodology/approach: While most of the studies to date related to the phenomenon of Industry 4.0 and Big Data are concerned with the level of efficiency of cyber-physical systems and the improvement of algorithmic tools, this study proposes a different perspective. It is an attempt to foresee the possible difficulties connected with algorithmization HRM processes, 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 managing organizations, especially regarding human resources management, in era of Industry 4.0.
Findings: The research of cognitive technologies in the broadest sense is primarily associated with a focus of thinking on their effectiveness, which can result in a one-sided view and ultimately a lack of objective assessment of that effectiveness. Therefore, conducting a parallel critical reflection seems even necessary. This reflection has the potential to lead to a more balanced assessment of what is undoubtedly "for", but also of what may be "against". The proposed point of view may contribute to a more informed use of algorithm-based cognitive technologies in the human resource management process, and thus to improve their real-world effectiveness.
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: This article is addressed to all those who use algorithms and data-driven decision-making processes in HRM. Crucial in these considerations is the to draw attention to the dangers of unreflective use of technical solutions supporting HRM processes. The novelty of the proposed approach is the identification of three potential risk areas that may result in faulty HR decisions. These include the risk of "technological proof of equity", overconfidence in the objective character of algorithms and the existence of a real danger resulting from the so-called algorithm overfitting. Recognition of these difficulties ultimately contributed to real improvements in productivity by combining human performance with technology effectiveness.

Keywords: Industry 4.0, HRM, e-HRM, algorithmization, data mining, data science.

Category of the paper: conceptual work.

1. Introduction

The expression Industry 4.0 (I 4.0) was originally used as a "working title" to describe the strategy for the development of computerization, which was presented by the German government at the trade fair in Hannover in 2011. The main assumptions of this strategy concerned the attempt to implement digital technologies in real manufacturing processes, leading to the creation of what's colloquially known as a *Smart Factory* (*Smart Factory*) (Schwab, 2016, p. 12; Morrar et al., 2017, p. 17; Piccarozzi el al., 2018; Marr, 2018, p. 2). The entrenched concept of this strategy was to use intensively developing digital technology to increase production efficiency while reducing costs. Over time, it turned out that both the title of the project and its main assumptions were strong enough to evolve into the terms we use to describe contemporary economic realities, by identifying them with the fourth industrial revolution, or as defined by Erik Brynjolfsson and Andrew McAfee in *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies,* the second machine age, in which "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. They're allowing us to blow past previous limitations and taking us into new territory" (Brynjolfsson, and Mcafee, 2014, p. 10).

The issues that focus interest around Industry 4.0 most often relate to the proposed *smart factory* models (Kagerman, 2013; Bunse et al., 2014; MacDougall, 2014; Wang, and Wang, 2016; Schwab, 2016; Morrar, 2017; Piccarozzi et al., 2018; Stock, and Seliger, 2019), often also paying attention to the social consequences of automation (Manyika et al., 2011; Manyika, et al., 2013; Brynjolfsson, and Mcafee, 2014; Schwab, 2016; Manyika et al., 2017; Harari, 2018; Osika, 2019; 2020; 2021). Nevertheless, it is obvious for all researchers dealing with these issues, that regardless of the increasingly expanding areas of activity, that may be subject to automation in production processes, it is impossible to completely eliminate human labor. This realization means, that the emerging work environment will force the need to change human resources management, and its future form will require rethinking and the inclusion of new contexts (Zysman, and Kenney, 2018). Already, one can see growing trends in this regard, which relate to one of the many technical solutions that make up Industry 4.0: we are talking here about the computational potential of digitality, known as Big Data (Yin, and Kaynak, 2015; Wang, and Wang, 2016, p. 6; Structural transformation…, 2019, p. 6). With such solutions as: The Internet of Things, data mining, data science and deep machine learning, data analytics equips people with tools, allowing them to make more rational decisions and effectively solve problems, including those related to the work environment. Algorithms are key to these processes, as they create a methodical backup, facilitating transitions from dispersed, 'contaminated' data to an ordered set of specific steps that allow for obtaining optimized effects in virtually every field from which the data have been processed. In this respect, it seems

obvious that the availability of such tools is associated with their widespread use, leading to them developing into the dominant form of action, and this is how the concept of algorithmization should be understood. It is a progressive process of assigning specific tasks to digital tools, which are algorithms. As Pedro Domingos notes, „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), this trend is confirmed by many researchers (Mayer-Schönberger, and Cukier, 2013; O'Neil, and Schutt, 2014; O'Neil, 2016; Harari, 2018; Kwilinski et al., 2019, Kuzior et al., 2019).

On the other hand, we must be aware that the algorithms under development are derived from models that, contrary to the mathematical – or objective – nature of the tools, are not neutral, as they contain hidden assumptions of their designers, elements of their culture, their cognitive schemes and prejudices, etc. Therefore, in view of the intensifying tendency to algorithmize social life, it seems necessary to conduct analyzes to better understand the extent of the impact of this form of "entrusted thinking". Obviously, it is not possible to analyse all aspects related to the widespread implementation of cognitive solutions within HRM, so it is proposed to pay attention to three main research problems and consequent questions, namely: What if we stop critically refer to algorithmically developed conclusions? What if we do not understand that algorithmic models are only the opinions of people written in the language of mathematics? What if we don't understand that, each algorithm can "over-fitted"?

The purpose of the discussion is a preliminary description of the risk consequences that we have to face when algorithmizing the work environment, i.e. identifying areas of influence of mathematical tools and indicating possible negative consequences resulting from their use. Understanding these issues requires a general recognition of the role an analyst can play in Industry 4.0, while it is also necessary to specify in more detail the activities related to human resource management, in which Big Data can be used, and to realize potential problems arising therefrom.

Emphatically, considerations are not about building a technophobic attitude, but rather about discovering possible "system gaps" causing that the system would, contrary to expectations, not fulfill its optimizing function, primarily in order to be able to eliminate them before they become common practice.

2. Methods

The study makes use quality content analysis (Berlson, 1952; Flick, 2010; Mayring, 2014) and critical analysis (Jakkola, 2020). To assess the degree of algorithmization processes in HRM availed data harvested in *Global Human Capital Trends 2019* (Volini el al., 2019), which is the result of empirical research, published in 2019 year, the report covered 30 countries, surveyed 9453 people, employed in varied industries (Volini el al., 2019, pp. 14-16). The categorization uses in content analysis concerned only issues related to HR cloud, which the report by Deloitte places in the main HRM trend. The recognition made by Deloitte is crucial as it allowed predicting in which direction trends in HRM processes will develop, and the experience of the COVID 19 pandemic time confirmed their validity and intensified their implementation. However, from the point of view of the emergence of the trend itself in the HRM process, the report analyzed seems sufficient, and it has also been confirmed randomly in other Deloitte's reports (Global Human Capital Trends, 2020; Global Human Capital Trends, 2021). However, further reports focused on other aspects of HRM, so the one from 2019 that directly addresses the issues examined is use.

Second research was a critical analysis of a risk connected with algorithmization of work environment, to research used the cognitive mechanisms recognized by psychologists and accumulated experience of data scientist. Three types of risk are identified: technological proof of equity, simplifying of algorithms, and overfitting of algorithmic model. Three research questions were asked:

- What if we stop critically refer to algorithmically developed conclusions?

This question will allow to analyze the tendency, typical of the cognitive orientations, recognized by psychologists, to use intellectual shortcuts to offset a sense of uncertainty when faced with difficulties in assessing the reliability of information or making decisions. In this case, technology is to be the guarantor, so it is worth asking – is it justified?

- What if we do not understand that algorithmic models are only the opinions of people written in the language of mathematics?

The purpose of this question is to examine how far it is reasonable to understand algorithms as tools that objectively identify states of affairs.

- What if we don't understand that, each algorithm can "over-fitted"?

In a sense, this research question is a continuation of the previous one, because if we accept the partially subjective nature of algorithms, we must try to recognize what might influence their inadequacy resulting in ineffective performance. Such a factor may be the data scientist overfitting pointed out.

3. Results

3.1. Theoretical framework

3.1.1. Industry 4.0

As mentioned earlier, Industry 4.0 is considered to be the implementation of the concept of a smart factory, i.e. a form of production organization, in which complex cyber-physical systems control physical processes (MacDougall, 2014; Schwab, 2016; Morrar et al., 2017; Piccarozzi et al., 2018; Miśkiewicz, and Wolniak, 2020) and the production activities undertaken are automated, minimizing to a large extent the participation of people in production processes, thus allowing shortening of the production time and reduction of its cost. First and foremost, smart factory is based on various forms of connectivity, such as: Internet of People (social and business networks); Internet of Things (intelligent mobility and sensor data); Internet of Services (intelligent networks and logistics). Other applied solutions are robotization and automation of manufacturing processes, as well as the introduction of autonomous manufacturing and processing systems on production lines with full control of the process, while 3D printing allows the so-called additive manufacturing. An important supplement to the cyber-physical system being built is the use of cloud computing structures; creation of analytical and calculation systems, made possible by Big Data (BD), artificial intelligence, and deep machine learning. Innovative business models, such as *freeeconomics* or *sharing economy* are the culmination of these technological changes (Rifkin, 2015), because *mass customization*, i.e. the creation of custom-made products on a mass scale, is an important aspect of the functioning of smart factories. It is this factor, that is considered key in relation to Industry 4.0 – maintaining low costs with high individuality of product features, allowing to maximize the level of adaptation to market needs, while optimizing the consumption and reorganization of resources that the company already has. The combination of all these elements allows you to create „the embedded manufacturing systems […] vertically networked with business processes within factories and enterprises and horizontally connected to dispersed value networks that can be managed in real time – from the moment an order is placed right through to outbound logistics. In addition, they both enable and require end-to-end engineering across the entire value chain" (Kagerman et al., 2013, p. 5).

Naturally, all of the aforementioned technological solutions play a significant role, but it is BD analyzes that seem to be key in coordinating activities due to their potential for obtaining, storing, correlating and analyzing data that can also take place in real time (Lee, and Kao, 2014; Manyika et al., 2011; Henke, 2016; Wang, and Wang, 2016; Structural transformation…, 2019). As many authors point out, the use of Big Data is becoming a source of new values in business, mainly due to decisions that are more rational, because they are based on specific information (Yin, and Kaynak, 2015; Wang, and Wang, 2016; Alcacer, and Cruz-Machado, 2019). „Systematic guidance can be provided by BD for related production activities within

entire product lifecycle, achieving cost-efficient running of the process and fault-free, and help managers on decision-making and/or to solve problems related to operation" (Alcacer, and Cruz-Machado, 2019, p. 904). BD potential is characterized by dimensions that help to understand the wide application of digital operations in Industry 4.0, including, first of all, the possibility of working on a very large *volume* of data – expressed in many terabytes or even petabytes. Secondly, a wide *variety* of data (video, audio, texts, etc.) can be analyzed, generated by the multidimensional content of data fields, related to structural heterogeneity in the data set. Thirdly, the *velocity* of analysis regarding both the speed of their generation and their analysis. Fourthly, the *veracity* of data, which often comes from sources recorded in real time. Fifthly, the possibility of targeted data recording (*vision*), allowing to work on relatively "clean" data. Sixthly, data *verification* related to the data life cycle, which involves constant data updates. Seventhly, *validation*, i.e., testing the compliance of the data used with the estimation; in other words, testing whether the data "tells" us what is needed to make specific decisions, e.g. to eliminate the possibility of *overfitting* of the system or working on data that is no longer relevant to the analyzed phenomena. Eighthly, analysis of data *variability* in terms of its flow, where, due to the technical possibility of correlating dimensions, another category of data measurement is obtained. Ninthly, the *value*: this dimension relates to the assignment of a specific economic value to the analyzed data (Mayer-Schönberger, and Cukier, 2013; Yin, and Kaynak, 2015; Gandomi, and Haider, 2015; Alcacer, and Cruz-Machado, 2019; Gajdzik, and Wolniak, 2021). The afore-described dimensions show how broadly applicable BD analyzes can be in modern management. They also bring forward a new decision-making potential, where high-risk choices made as part of management activities are supported by information from data supplied and processed in real time. Moreover, these processes allow the development of operating procedures or algorithms that can be successfully used in similar situations. The strong advantage of Big Data-based tools is their universal use within all functions typical of the management process, i.e. planning, organizing, directing and controlling (Medina, 2006, p. 6). This applies to all stages of production, including those that belong to human resources management, i.e. „the process through which management builds the workforce and create the human performances that the organization needs" (Boxall, and Purcell, 2016, p. 7).

3.1.2. Human resources management

As part of HRM, more detailed, operational functions are implemented, which include: employment, human resource development, remuneration, human relations, working conditions, motivation and industrial relations (Boxall, 2007; Mwaniki, and Gathenya, 2015; Shrama, 2016). The employment is implemented through such activities as: job analysis, human resource planning, recruitment, selection, placement. Human resources development is a process of evaluation, training and career planning, while remuneration requires job evaluation, wage and salary administration and incentives. Human relations apply to such activities as motivating, developing leadership skills, improving quality of work life etc.

Working conditions concern care for measurable and immeasurable aspects of work, such as health, safety and comfort of employees. Actions taken in the area of working conditions refer directly to the sphere of motivation and a sense of job satisfaction. This is yet another very significant operational function implemented within HRM (Mwaniki, and Gathenya, 2015; Shrama, 2016, pp. 9-10). Given the point of view adopted in these considerations, it is important to recognize what scope of activities, described above and implemented under HRM, can be subjected to algorithmization processes, i.e. which can be covered by the so-called e-HRM, which is defined as planning, implementation and application of information technology for HRM (Strohmeier, 2007). These activities are closely related to human resources information systems (HRIS), which we can define as algorithmic procedures for collecting, storing, searching and validation of data relevant to HRM processes (Bondaruk, and Ruël, 2013; Stone et al., 2015; Angrave et al., 2016; Bondaruk, and Brewster, 2016; Marler, and Parry, 2016). The implementation of IT systems for HRM activities has been ongoing since the late 1990s and there are a number of studies dealing with this issue (Withers, 2010; Bondaruk, and Ruël, 2013; Bondaruk, and Brewster, 2016; Marler, and Parry, 2016; Eneizan et al., 2018; Zysman, and Kenney, 2018; Parry, and Battista, 2019), but it has now become clear that "information systems have a deep effect on HRM. IT transformed human resources processes and practices mainly in terms of how organizations collect, store, use, and disseminate information" (Silva, and Silva Lima, 2018, p. 114). This applies to all stages of production, including those that belong to human resources management, i.e. „the process through which management builds the workforce and create the human performances that the organization needs" (Boxall, and Purcell, 2016, p. 7).

Considering that HR activities shape the working environment in a given enterprise to the greatest extent, an important question arises in a given organization on how BD analytics and related algorithms are used in HRM, i.e. to what extent we can talk about the algorithmization of the human resource management process.

3.2. Quality content analysis

To assess the degree of algorithmization processes typical of HR activities, such as recruitment, selection, turnover and performance management used quality content analysis of main trends of HRM, harvested in *Global Human Capital Trends 2019* (Volini el al., 2019). Research published in this report covered 30 countries, in total 9453 people were surveyed, employed in industries such as: professional services, financial services; energy, resources & industrials; technology, media & telecom; government & public services; life sciences & health care; consumer and others (Volini el al., 2019, pp. 14-16). The categorization used in content analysis concerned only issues related to HR cloud, and it included: HR cloud – trend importance at all, trend importance by region, trend importance by industry; shift toward becoming a strategic HR function; better data and workforce insights report by Deloitte places informatization in the main HRM trend. HR cloud in report is defined as: "HR technology […],

considering cloud as a foundation and exploring innovative new platforms, automation, and AI-based tools" (Volini el al., 2019, p. 7), therefore directly refers to processes associated with algorithmization. Figure 1 below shows the rated of the importance of this issues all respondents.

Figure 1. HR cloud importance by all respondents. Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

In *Global Human Capital Trends 2019* 74% of respondents assess HR cloud as important and very important, 21% called it one of the tree most urgent topics (Volini el al., 2019, p. 13). Table 1 and 2 below shows the rated of the importance of this problem by region and by industry.

Table 1.
Trend importance by region

	Africa	Asia	Central and Eastern Europe	Latin and South America	Middle East	Nordic countries	North America	Oceania	Western Europe
HR cloud	82%	75%	71%	78%	85%	68%	75%	77%	68%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 2.
Trend importance by industry

	Professional services	Financial services	Energy, resources & industrials	Technology, media & telecom	Government & public services	Life sciences & health care	Consumer
HR cloud	73%	79%	74%	76%	72%	70%	76%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Research shows that the dominant trend in HR activities in 2019 should be considered the spread of subscription-based standardized BD platforms in HR systems, also made available by such technology giants as Google, Microsoft, IBM and LinkedIn (Cheng, and Hackett, 2019). These platforms allowed to integrate various forms of HR software, thus ensuring an improvement in data handling and their "functionality" resulting from the wider potential of data mining available to the organization. With them, it became possible to optimally manage vacation reserves, create consistent and comprehensive employment histories, ensure optimal staffing, match competences to new company strategies, plan training, analyze training effectiveness, identify areas that require additional training, correlate competences and test the effectiveness of incentive programs that allow maximum matching of motivators, creating

employee benefit reports, managing recruitment projects, monitoring employee behavior, algorithmizing employee profiles and assessing the effectiveness of standard employee behavior – to mention only some of the most significant changes. Therefore, the organization's expectations towards HR cloud systems also increased. Selected indicators regarding these expectations are shown below.

Table 3.
Shift toward becoming a strategic HR function

Actual	Expected
44%	61%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 4.
Better data and workforce insights

Actual	Expected
40%	60%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 5.
Easier to use, less training needed

Actual	Expected
35%	59%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 6.
Increased HR tech innovation

Actual	Expected
32%	59%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 7.
Ease of updates and new releases

Actual	Expected
38%	59%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 8.
Lower cost of ownership

Actual	Expected
33%	59%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

Table 9.
Consolidated view

Actual	Expected
48%	57%

Source: Own elaboration on the *Deloitte Global Human Capital Trends 2019*.

The presented results help to realize what role in HRM practice begins to be attributed to BD analytics and how significant the parameters typical for its "logic" are becoming, i.e. collecting, storing and processing data based on the use of algorithms, including predictive and prescriptive ones, probabilistic rather than deterministic, as we want to see them (Cheng, and Hackett, 2019). Naturally, the main motive of these activities is the optimization of decisions, but shouldn't we consider whether the hopes placed in these tools are too optimistic, despite the growing market for these services (Cheng, and Hackett, 2019)? This is one of the issues worth analyzing, also to understand "what sort of world will we build with platforms, data, and intelligent tools?" (Zysman, and Kenney, 2018, p. 57). There are also purely pragmatic considerations, such as whether there are rational premises for the fact that "entrusted thinking" will allow us to optimize our actions? This is all the more important, especially in the context of the implementation of Industry 4.0, which is intended to automate production and management processes.

3.3. Critical analysis

Victor Mayer-Schönberger and Kenneth Cukier, in *Big Data: A Revolution That Will Transform How We Live, Work, and Think* (2013), try to convince us how BD and the algorithmization of many aspects of our life are an opportunity to improve its quality (McAfee, Brynjolfsson, 2013). However, HRM researchers often question the value of analytics-driven software for decision making or warn that using analytical models is only a management fad (Angrave et al., 2016; Cheng, and Hackett, 2019). Similar cautions are formulated by researchers dealing with BD issues (O'Neil, and Schutt, 2014; O'Neil, 2016). A possible problem is worth investigating. Naturally, this critical analysis will be anticipatory, as verification requires empirical research, and consequently, a longer process of use that allows assessing the possible impact. However, in forecasting, we can use the knowledge we already have, wherein cognitive mechanisms recognized by psychologists will be used. We can also use the accumulated experience of researchers in the field of data analytics, such as those who can extract significant formulas from data, but also verify the correctness of tools used for prediction (Schutt, and O'Neil, 2014, p. 16). But first, we need to provide an concept of model for knowledge discovery from data, we use basis description of this process, understanding it as an iterative sequence of the following steps: raw data taking; data cleaning; data integration; data selection; data transformation; data mining; pattern evaluation; knowledge presentation (Han et al., 2012, pp. 6-8). Figure 2 below illustrate this model.

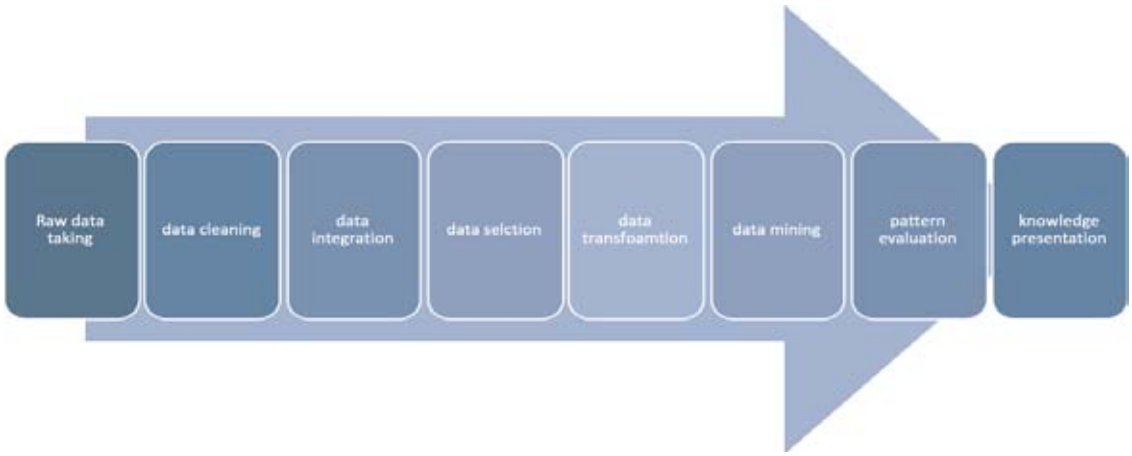

Figure 2. Model knowledge discovery from data. Source: Own elaboration on the Han J., Kamber M., Pei J. (2012), *Data Mining: Concepts and Techniques*. Amsterdam, Boston, Heidelberg, London, New York, Oxford, Paris, San Diego, San Francisco, Singapore, Sydney, Tokyo: Elsevier.

The steps of Knowledge Discovery in Databases, short KDD, in many models is similar and, because of systematic structure of method, they give very strong suggestion to be objective, create the "aura of objectivity" (Reynolds, 2016; Jons, 2019) which seems helpful for each process of decision. In spite of this, some threads may give rise to doubts, in this analysis selected three, these are cognitive patterns guiding our mode of action, the potential risk of using technological support in decision-making processes and possible consequences limiting the system's innovation and the resulting lack of adaptation of the strategy to changing environmental conditions. Secondly, the limited potential of the algorithmic models themselves (Mauboussin, 2012; Schutt, and O'Neil, 2014; O'Neil, 2016) and, thirdly, the susceptibility of the models to "excessive learning", known as overfitting, or a situation in which, after using a certain set of data to estimate the model, the resulting model does not reflect reality and becomes useless as a decision support tool (Griffiths, and Christian, 2016; Schutt, and O'Neil, 2014; Domingos, 2015).

Table 10.
Critical analysis – potential risks

Question	Description	Potential risk
What if we stop critically refer to algorithmically developed conclusions?	Psychological tendency to using heuristic cognitive mechanisms as the strategy of handling information overload (Kaneman, 2011; Kenrick et al., 2014; Aronson et al., 2014).	Using "technological proof of equity" in decision-making process in HRM – uncritical trust in algorithms
What if we don't understand that, algorithmic models are only the opinions of people written in the language of mathematics?	All algorithmic models are only simplifying the real world (Mauboussin, 2012; Schutt, and O'Neil, 2014; O'Neil, 2016).	Using inadequate data to predict and incorrect decision-making process in HRM
What if we don't understand that, each algorithm can "over-fitted"?	All algorithmic models have tendencies to over-fitted, it means that "model does not generalize well from observed data" (Ying, 2018), because of using the detail and noise data (Griffiths, and Christian, 2016; Schutt, and O'Neil, 2014; Domingos, 2015).	Using inadequate algorithmic model to predict and inefficient decision-making process in HRM

Source: Own elaboration.

3.3.1. Technological proof of equity

Psychologists dealing with perception issues have long recognized the entire spectrum of heuristic cognitive mechanisms that help people cope with information overload, which, as confirmed by our limited mental capabilities, create the need for simplifying, effortless strategies (Kaneman, 2011; Kenrick et al., 2014; Aronson et al., 2014), to make observations and make sufficiently accurate decisions. It seems obvious, that when we get tools in the form of algorithmic models that help supplement our deficiencies, we will be happy to use them, and we will gladly give them priority in assessing the accuracy of decisions as "technological proof of equity" (Osika, 2019; 2021). The same sources also tell us that there is a strong cognitive tendency to consolidate patterns, hence such emphasis is placed on developing critical thinking skills (Nussbaum, 2010). Can we, therefore, expect that, despite some natural tendencies, we will be able to critically refer to algorithmically developed conclusions? We already hear rumors that it is necessary.

3.3.2. Simplifying of algorithms

In *Weapons of Math Destruction. How Big Data Increases Inequality and Threatens Democracy,* American mathematician Cathy O'Neil analyzes the impact of algorithmic models on various aspects of social life, including restrictions on access to work or the dissemination of harmful HR practices. She recalls the obvious truth for the creators of algorithmic models – „no model can include 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). But whether users of predestination models have this awareness is a rhetorical question. What makes algorithmic models so unreliable, according to O'Neil, is the quality of the data used, which very often is only indirect in nature, that is, there is no direct result relation between the data, but the relation is "implicit". Because algorithmic models are the opinions of people written in the language of mathematics, who are backed by motives of specific people and the goals of specific organizations, they cannot be considered universal (O'Neil, 2016).

3.3.3. Overfitting of algorithmic model

Another difficulty is the lack of feedback in the evaluation of the algorithm's effectiveness, and since the models relate to changing reality, they should also be dynamic, i.e. they must be subject to constant verification. Data scientists point out one of the basic threats of "overfitting the model" when it no longer reflects the estimated relationships due to the change in reality (Griffiths, and Christian, 2016, pp. 155-159; Ying, 2019). For example, employees adapt to procedures, but these do not optimize work efficiency and, instead of being eliminated, persist. Considering the above, algorithmization of the work environment should not be treated as a tendency that allows to fully automate activities undertaken within HRM as a supplement to

Industry 4.0. Dedicated HR applications, using estimation models used in BD exploration, provide valuable assistance in tedious and routine processes, such as collecting basic data in recruitment or creating employment history of employees, as well as sorting this data, but these systems must be supported by the expert knowledge of HR specialists to the effects of data mining, actually, allowing making the most optimal decisions, and in this sense the human factor from HRM processes seems indelible. We will not lose control if we employ greater awareness to create the algorithms that serve us (Krauss, 2015; Kleppman, 2017; Osika 2020; 2021).

4. Discussion

Since the 1980s, we have been dealing with the intensive development of both theoretical reflection and practical activities under Human Resource Management (HRM) (Boxall, 2007, p. 50; Kaufman, 2007, p. 34; Cowling, 2011; Mwaniki, and Gathenya, 2015; O'Riordan, 2017, p. 7), which in the „broadest sense it may be taken to denote all aspects of recruitment and hiring, planning, development and reward, the human side of the organization of work and of the employment contract, HRM has also been taken to incorporate a strategic dimension" (Cowling, 2011; Collings et al., 2019, p. 2). As Michael Armstrong points out – "human resource management is a strategic, integrated and coherent approach to the employment, development and well-being of the people working in organizations" (Armstrong, 2016, p. 7). At the same time, many researchers paid attention to the fact, that this reflection and applied practices are embedded in specific social, economic and technological contexts, and therefore require continuous updating (Kaufman, 2007; Withers et al., 2010; Bondaruk, and Brewster, 2016; Johanson, and Szamosi, 2019, p. 27). The algorithmization of work environment and changes made in this respect within HRM were accepted as one of such contexts in these considerations. According to the assumptions made earlier it is a matter of recognizing the degree of use of BD analytics in the human resources management process, but also highlight potential risk of this trend such as technological proof of equity, simplifying made by algorithms and overfitting of algorithmic model. This reflection is to be a support for understanding and solution of HR problems associated with the implementation of HR cloud, and in the future that issues requires in-depth and more empirical research (Cheng, and Hackett, 2019; Osika, 2020). It should be stressed that this reflection has become particularly important in view of the very strong acceleration of the trends described here, forced by the Covid-19 pandemic and the implementation of HRM process automation related to remote working, therefore the subject matter undertaken in the article is a practical necessity and not a theoretical quibble.

The significant threads in the discussion on e-HRM in the context of Industry 4.0, which have been described in this article, should be considered to diagnose the areas of potential risk of the impact of technological solutions on the human way of using them, which is largely the result of, on the one hand, our mental limitations (Kaneman, 2011; Kenrick et al., 2014; Aronson et al., 2014) – technological proof of equity (Osika, 2019; 2020; 2021), but also the limitations of technology, which, contrary to our hopes, has areas of imperfection (Griffiths and Christian, 2016; Schutt, and O'Neil, 2014; Domingos, 2015; O'Neil, 2016; Krauss, 2015; Kleppman, 2017; Ying, 2019; Osika, 2021).

5. Summary

Klaus Schwab in *The Fourth Industrial Revolution* pointed that "we must have a comprehensive and globally scared view of how technology is changing our lives and those of future generation, and how it is reshaping the economic, social, cultural and human context in which we live" (Schwab, 2016, p. 8). It was recognized, that Industry 4.0 and the automation processes associated with it would not fulfill their effective function, unless they were supplemented with "human" support in decision-making processes. Technical solutions, such as: the Internet of Things, data mining, data science and deep machine learning, form the core of cyber-physical systems, allowing us to coordinate their activities, but, at the same time, complete automation of processes can create distortions in achieving goals that are assumed by people and for the people. The purpose of the discussion was to describe the role of BD analytics in Industry 4.0 and the scope of HRM algorithmization. t was important because the most of the researchers focus on the positive application of e-HRM tools. The present discussion had the opportunity to objectify the view by also highlighting areas of risk. The analysis noted several consequences associated with the use of mathematical tools for HRM processes, while it included potential negative aspects, such as: the impact of technological proof of equity, succumbing to the subjectivism "sewn" into algorithms by its designers, or the overfitting of the algorithms. As it seems, this reflection should be considered particularly important in the context of the changes in the HRM process that had to take place in the face of the Covid-19 pandemic, which is why this issue has gained currency. However, the risk areas identified in this consideration should be thoroughly investigated, for example: what extent is the support of e-HRM systems widely used?: are the results recognized indiscriminately, is their effectiveness evaluated? What is the human versus algorithmic involvement in decision making? Only by obtaining answers in the course of research will it be possible to assess to what extent the identified risks affect the effectiveness of HRM activities.

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ERASMUS+ PROJECT LEADERS' LEARNING POTENTIAL AS A SUSTAINABILITY FACILITATOR IN THE TIMES OF COVID-19 PANDEMIC

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Purpose: The aim of the article is to answer the question if Erasmus+ project leaders' organizational learning potential can support them in sustaining their transnational cooperation during turbulent and challenging times of the COVID-19 pandemic.
Design/methodology/approach: The research uses a composite index to define Erasmus+ project leaders' learning potential and seeks the relations between the results from this index and the sustainability of Erasmus+ projects. Additionally, predictive analysis in the form of logistic regression in relation to Erasmus+ project leaders' proactiveness, innovation and openness is carried out.
Findings: The obtained results prove that Erasmus+ project leaders' learning potential, their pro-activeness and the ability to adapt to new conditions facilitate the sustainability of Erasmus+ projects in the times of COVID-19 pandemic.
Research limitations/implications: The research is based on a large sample of Erasmus+ leaders but the researched group is very specific. The research sheds a new light on Erasmus+ projects' organizational potential.
Practical implications: The research proves useful for practitioners who manage European educational cooperation projects.
Social implications: The research proves the importance of learning potential within networks.
Originality/value: The discussion is placed in the broader context of relational and network approach to management of modern organizations. The discussion fills in a research gap in the research on organizational aspects of Erasmus+ projects.

Keywords: Erasmus+, project leaders, COVID-19, learning organizations, relational paradigm, network paradigm.

Category of the paper: Research paper.

1. Introduction and the context

The aim of the article is to answer the question if Erasmus+ project leaders' organizational learning potential can support them in sustaining their transnational cooperation during turbulent and challenging times of the COVID-19 pandemic. The research concentrates on the group of 990 Erasmus+ project leaders from Poland who realized their transnational cooperation projects in the times of the pandemic. The discussion takes into consideration the broader context of relational and network paradigms to management of modern organizations. Before concentrating on the clue of this research, namely: learning potential of Erasmus+ projects in the times of COVID-19 pandemic, two fundamental background issues have to be explained. The first one: why Erasmus+ projects are treated here as a researched target group and the second one: why the COVID-19 pandemic is a proper period of time for such a research. First of all, Erasmus+ projects, which are by their nature transnational innovative cooperation projects realized by schools, universities, NGOs and business sector, fulfil all criteria of being temporary organizations functioning within international networks. Having stated this, it is fully plausible to confront the nature of Erasmus+ projects with the characteristics of modern organizations as perceived from the point of view of relational and network paradigms in management. These characteristic features have been broadly discussed in the literature and they most often include the following elements: (i) horizontal relations between geographically dispersed partners forming different organizational units; (ii) communicating via information and communication technologies due to these geographic distances between partners; (iii) configuration of partners being an original combination of key competences that these partners contribute. And it is the last element, namely: the competences that make the organization or partnership stronger, more flexible and efficient than each individual partner. Additionally, this type of organization fosters the processes of adaptability to new conditions of the environment they exist in (Stead, J.G. and Stead, W.E., 2008; Woźniak-Sobczak, 2015). By no means do Erasmus+ projects perfectly match these features. Accordingly, the aspect of learning and adaptability potential is the main focus of this research. Furthermore, the research is placed in the context of COVID-19 pandemic which in this case constitutes specific training grounds to test the validity of main assumptions underlying the rationale for relational and network paradigms in management. According to vast literature on the subject, relational and network paradigms embodied in practice mainly by strategic management are a response to turbulent and unstable environments in which modern organizations function since relational and networking character give these organization a competitive advantage (Dyer, and Singh, 1998; Borgatti, and Foster, 2003; Czakon, 2011; 2012; Stańczyk-Hugiet, 2012; Woźniak-Sobczak, 2015). Thus, the relational and network approach to management postulates knowledge sharing within units of an organization and building relations in order to enhance competitive potential and effectiveness (Wieland, and Wallenburg, 2013; Szczepańska-

Woszczyna, 2020). In the light of gaining a competitive advantage, other researchers also point out that access to information, expertise, and knowledge resources that could be difficult to obtain outside of the alliance of organizational units foster performance and innovation in different sorts of businesses and undertakings (Anand, and Khanna, 2000; Ilinitch, D'Aveni, and Lewin, 1996; Kale, Singh, and Perlmutter, 2000; Kogut, 2000; Kraatz, 1998; Oliver, 2001; Powell, Koput, and Smith-Doerr, 1996; Rindfleisch, and Moorman, 2001; Rosenkopf, and Nerkar, 2001; Zabolotniaia, Cheng, and Dacko-Pikiewicz, 2019). Consequently, the times of COVID-19 pandemic, when due to obvious reasons supply chains in production sector are broken and violated, are a proper period to check if organizational learning potential can protect institutions functioning in non-productive sectors of economy from disrupting and breaking up their cooperation.

Having explained the context and the rationale for the research in question, it must be also noted that the research described below consist of two main areas which have already been discussed and published separately within two individual research activities although based on the same data retrieved through vast survey carried out in 2021 among 990 Erasmus+ project leaders in Poland. The aim of this publication is to put these two researching threads together in order to get a broader picture of the phenomenon in question. This is especially important since bibliometric analysis shows that there are not currently any studies researching the links between Erasmus+ projects' sustainability and their learning potential in the times of COVID-19 pandemic. However, there is vast research and literature on how knowledge and innovation is generated within networks giving them a competitive advantage and strength, which will be referenced in the concluding part of this article.

2. Research methodology

The main research tool was a questionnaire consisting of 70 questions carried out during the period of COVID-19 pandemic and was responded by 990 Erasmus+ project leaders in Poland. The questions mainly focused on the assessment of respondents' digital, managerial, social and cognitive competences in relation to the sustainability of their projects, which was the primary goal of the research. However, the questionnaire also included questions with regard to Erasmus+ project leaders' motivation, engagement, experience, sex, age, institutional affiliation and to some of their projects' characteristic features such as budget and the number of project partners as contextual factors for this study. Accordingly, data collected also give the opportunity to make an additional analysis about the links between learning potential of Erasmus+ projects as organizations and their sustainability, which this article focuses on. The questions in the questionnaire fall into the following categories: (i) questions on the Likert's scale (from 1 to 5) – mainly concerning the assessment of Erasmus+ project leaders'

competences; (ii) contextual questions concerning the realization of projects and metric ones relating to age, sex, etc.; (iii) indicator questions – a set of questions defining one characteristic feature – in the case of this analysis it is a lifelong learning aspect as Erasmus+ project leaders' feature reflected in the composite indicator composed of a set of relevant questions in the questionnaire that is used here. **Yet, it must be noted at this stage that the research questionnaire is based on declarative replies of the respondents on how they perceive their own competences, which for obvious reasons constitutes a certain sort of limitation of the research in reference to its validity. However, since this is the first attempt to research on possible links between Erasmus+ project leaders' learning potential and the sustainability of their projects, such an approach is fully acceptable and plausible from the validity point of view.**

Consequently, as already mentioned, this research embraces two areas, namely: (1) analysis of lifelong learning potential of Erasmus+ project leaders in relation to their projects' sustainability in the times of COVID-19 pandemic including such elements as adaptability, proactiveness, or the development of human capital in its broad sense based on the study described in Poszytek (2021a), and (2) predictive analysis on the chances for sustaining or suspending Erasmus+ projects in the times of the pandemic carried out in the form of logistic regression in relation to Erasmus+ project leaders' proactiveness, innovation and openness based on the study described in Poszytek (2021b). Data analysis for both research areas was carried out with the use of Statistical Package of Social Sciences (SPSS). In the case of the former research area, the lifelong learning composite indicator was constructed with the use of individual indicators that are compiled into a single index. Such an index can measure multi-dimensional concepts, like the lifelong learning dimension in this case, that cannot be captured by a single indicator, or a variable (OECD, 2004). Accordingly, the lifelong learning composite index used here is a single combined measure constituted by separate, independent on one another and individual measures. In the case of the latter research area, apart from SPSS's functionalities, additional statistical tools, such as (1) U Mann-Whitney test to assess the significance of Erasmus+ project leaders' cognitive competences as a predictor and (2) the parameter Exp(B) to calculate possible decrease of chances to suspend projects if cognitive competences of their leaders rose by one on Likert scale (1-5) were used. Full description of procedures and tools used for logistic regression can be found in Poszytek (2021b).

3. Results and discussion

As regards, the first area of research, Table 1 shows the scales used for individual variables constituting the lifelong learning index and it is followed by Table 2 presenting the obtained results in relation to Erasmus+ project leaders' ability to learn within an organization.

Table 1.
Lifelong learning index: Erasmus+ project leaders' learning potential

Questionnaire item or question	Scale type	Index points (min)	Index points (max)
Every crisis situation can teach you something	Likert 1–5	1	5
I like to bring ideas to life	Likert 1–5	1	5
Implementing project activities during the pandemic allowed me to test myself in completely new circumstances	Likert 1–5	1	5
How important is it for you to introduce elements of interdisciplinarity or combining disciplines and fields when implementing a European project?	Likert 1–5	1	5
I like to explore new things	Likert 1–5	1	5
I analyse my failures and setbacks	Likert 1–5	1	5
I need to know all the pros and cons before making an important decision	Likert 1–5	1	5
I can apply innovative solutions in my work	Likert 1–5	1	5
Recognise areas for change that will help to better implement the project	Likert 1–5	1	5
Identify my own strengths and weaknesses	Likert 1–5	1	5
I am aware of my own strengths and weaknesses	Likert 1–5	1	5
In connection with the ongoing pandemic, are you familiar with the frequently changing regulations and recommendations concerning work and social functioning?	Likert 1–5	1	5
The pandemic period forced me to start using new tools/software	Likert 1–5	1	5
Please rate how up-to-date you are with modern ICT solutions that can be used in your work?	Likert 1–5	1	5
Have you participated in any training courses (class-based or online) on the use of modern technology in the last 6 months?	Binary 0–1	1	5
How often do you participate in training courses to improve competences used at work?	Binary 0–1	1	5
Due to the Covid-19 pandemic, did you attend any training courses that would be useful in carrying out your tasks as a project leader at these unusual times?	Binary 0–1	1	5
Have you conducted any training courses in the past year?	Binary 0–1	1	5
With regard to yourself, do you have a sense of continuous learning, or do you tend to rely on previously acquired knowledge and skills?	Binary 0–1	1	5
Do you have a planned path for your own development career?	Binary 0–1	1	5
TOTAL		20	100

Table 2.
Lifelong learning index: general statistics

No. of respondents (*N*)		990
Mean		82.61
Minimum		61
Maximum		100
Percentile	25	78.00 (*N* = 232)
	50	83.00 (*N* = 485)
	75	88.00 (*N* = 273)

As Table 1 presents, the lifelong learning index values extend from 20 (min) to 100 (max) points. At the same time the higher the value of the index, the higher the level of Erasmus+ project leaders' learning potential. With the obtained standard deviation value of 7.415 as far as the distribution of results is concerned, the first percentile of worst lifelong learning performers and the third percentile of best lifelong learning performers are similar in numbers, namely: 232 for worst performers and 273 for best performers with lifelong learning index value of 78 and 88 points respectively. The lack of strong discrimination with regard to the

obtained results does not come as a surprise if one takes into consideration the fact that even within such a large sample of Erasmus+ project leaders, these leaders are a highly homogenous group by their nature. This, in turn, results from the fact that before getting European grants for their projects, they undergo a thorough scrutiny in reference to their capability to run innovative projects. In other words, it means that they must have certain features, qualities and competences highly developed including the ability to learn and adapt in case something goes wrong with their projects. Yet, still some differences can be observed and it enables further analysis connected directly with establishing the links between Erasmus+ project leader's learning potential and the sustainability of their projects in the times of the COVID-19 pandemic, which is presented in Table 3.

Table 3.
Projects' status in relation to Erasmus+ project leaders' lifelong learning index

Lifelong learning index (LLL Index)	**Project status**	**N**	**%**
LLL Index below 1st quartile – less than 78 points ($N = 232$)	Project finished or ongoing	161	69.4
	Project suspended or prolonged	71	30.6
LLL Index over 3rd quartile – more than 88 points ($N = 273$)	Project finished or ongoing	218	79.9
	Project suspended or prolonged	55	20.1

Table 3 shows that in the group of Erasmus+ project leaders with lowest lifelong learning index value, 30.6% of projects were suspended or prolonged whereas in the group of highest lifelong learning index value it was only 20.1%. This means that Erasmus+ project leaders with high learning potential suspended or prolonged their projects more seldomly in the period of COVID-19 pandemic.

The second research area dealt with predictive analysis on the chances for sustaining or suspending Erasmus+ projects in the times of the pandemic. It was carried out in the form of logistic regression in relation to Erasmus+ project leaders' proactiveness, innovation and openness. Additionally, this analysis was carried out in order to see if Erasmus+ project leaders' learning potential could possibly have any influence on their projects' sustainability. Consequently, the analysis at this stage sought possible observable relationships between a dependent binary variable meaning a successful continuation of a project or its suspension and an independent variable, which in this case are Erasmus+ project leaders' cognitive competences in their dimension of pro-activeness, innovation and openness to challenges. In practical terms it means checking by how many per cent the chances of project continuation or suspension decrease or increase if the value of Erasmus+ project leaders' cognitive competences increases by one – which in this case means reaching the value of 4,96 on the used Likert scale from 1 to 5. This value derives from the fact that the level of Erasmus+ project leaders' cognitive competences was established with the result of 3.96 as declared by the project leaders themselves in the questionnaire. Prior to this, the analysis at this stage was also based on the analysis of extracting factors and the analysis of the reliability of scales which in the case

of Erasmus+ cognitive competences reached the Cronbach's Alpha value of 0.77 meaning that the reliability of scale in this case is guaranteed (more details in: Poszytek, 2021b).

However, coming back to predictive analysis itself, first, non-parametric U Mann-Whitney test was used to assess the significance of Erasmus+ project leaders' cognitive competences as a predictor. The obtained result reached the value of 0.004. This means that Erasmus+ project leaders' cognitive competences in their dimension of pro-activeness, innovation and openness to challenges turned out to be significant since the significance value is below 0.05. Accordingly, the parameter Exp(B), the exponentiation of the coefficients that shows the odds ratios for a given predictor could be calculated and it reached the value of 0.628. This, in turn, means that the chances to suspend a project would decrease by 37% if the level of Erasmus+ project leaders' cognitive competences rose by one on the used Likert scale (1-5) reaching the value of 4.96 instead of the actual obtained average value of 3.96 mentioned above.

4. Conclusions

Obtained data and the subsequent analysis depicted above prove that organizational learning potential within Erasmus+ projects manifested by the activities and attitudes of their leaders is an influential factor contributing to the sustainability of Erasmus+ projects in the times of the COVID-19 pandemic. This also means that the obtained results already in the first area of this research demonstrate and are fully in line with the quoted assumptions of various research in the Introduction to this article, namely that functioning within relational and network mode of work, which is an evident case of Erasmus+ projects, fosters the organizational ability to learn. This also applies to the vice-versa situation meaning that turbulent and unstable conditions caused by the COVID-19 pandemic also motivate organizations and their leaders to learn in order to sustain their networks whose functioning was threatened by the pandemic causing possible communication and cooperation breakdowns and disruptions. Additionally, the second area of this research also demonstrates and the obtained results prove that the learning potential of Erasmus+ project leaders manifested by their cognitive competence in the dimension of pro-activeness, innovation and openness is also a considerable factor influencing the sustainability of Erasmus+ projects in the times of the COVID-19 pandemic.

To sum up, it must be stressed that the research in question proves that the demonstrated and proven level of the organizational learning potential within Erasmus+ projects constitute a specific set of antibodies that form a protective shield for these projects against ill effects of the COVID-19 pandemic. Thus, the research question if Erasmus+ project leaders' organizational learning potential can support them in sustaining their transnational cooperation during turbulent and challenging times of the COVID-19 pandemic has been answered positively. However, it is still worth adding that although the COVID-19 pandemic is

an unexpected event that has created extreme conditions for business, social, academic and educational activities and operations, already known and vastly researched concept of communities of practice with their learning potential finds its reflection here. Such communities – Erasmus+ projects in this case – give organizations a competitive advantage and resilience and for many researchers this phenomenon is manifested by the very need to learn and develop within networks which consist of partners who are usually homogenous as far as their beliefs, practices and attitudes are concerned (Brown, and Duguid, 1991; Rice, and Aydin, 1991; Lave, and Wenger, 1991; Rogers, 1995; Orr, 1996; Tyre, and von Hippel, 1997; Wenger, 1998; Friedkin, and Johnsen, 1999). By no means do Erasmus+ projects as organizations match this description and embody the phenomenon in question. The research presented in this article and its results are in line with these references and it demonstrates that learning potential within Erasmus+ networks give Erasmus+ projects strength and resilience. It also proves again, on the basis of a specific target group, the importance of this issue in the sciences of management and quality. And even if the target group used for this research is specific, this analysis can contribute significantly to the broader discussion in the field to see how various target groups in different professions tackle the challenges of organizational cooperation in the times of COVID-19 pandemic.

The results of this research should also prove useful to all practitioners in the field of European educational cooperation and contribute to the discussions on project management as such within a broader area of strategic management, **especially that this research made the first attempt to explore organizational aspects of Erasmus+ projects with the use of predictive statistical tools**. In the case of Erasmus+ Programme this discussion is relevant since as proved by Poszytek (2021b) there is a research gap in reference to managerial, organizational and sustainability aspects of the functioning of Erasmus+ projects. Accordingly, further longitudinal research is planned by the author of this article in this respect.

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APPROACH TO PREDICT PRODUCT QUALITY CONSIDERING CURRENT CUSTOMERS' EXPECTATIONS

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Purpose: The purpose was to develop an approach to predict product quality considering current customers' expectations.
Design/methodology/approach: The approach includes integrated techniques, i.e.: SMART(-ER) method, a questionnaire with the Likert scale, brainstorming (B&M), WSM method, and Naïve Bayes Classifier. This approach refers to obtaining customers' expectations for satisfaction from the current quality of products and the importance of these criteria. Based on the satisfaction of customers, the quality of the product was estimated and classified. Then, the quality of the product was predicted for current customers.
Findings: It was shown that it is possible to predict product quality based on current customer expectations, and so based on the current existing product.
Research limitations/implications: The proposed approach does not include the possibilities of determining the expected quality of the product. The approach focuses on predicting customers' satisfaction with the current quality of the product. Therefore, if there is a need for improvement actions, further analyzes should be carried out to determine which criteria should be modified and how.
Practical implications: The presented approach can be used for any product. Therefore, it is a useful tool for any kind of organization, which strives to meet customer satisfaction. Despite the possibility to predict the quality of the product, the proposed approach can indicate at an early stage to the organization that it is necessary to make improvement actions.
Social implications: It is possible to reduce the waste of resources by predicting that improvement actions are necessary. Moreover, the approach supports an entity (e.g., expert, enterprise, interested parties) in predicting current customers' satisfaction.
Originality/value: Originality is predicting product quality based on current customers' expectations. A new combination of quality management techniques, decision support, and machine learning was implemented.

Keywords: predict, product quality, decision support, Naïve Bayesian Classifier, Weighted Sum Model, customer expectations.

Category of the paper: research paper.

1. Introduction

Dynamical customer expectations make it difficult to effectively improve the product (Pacana, and Siwiec, 2021). The main problem is that products improve with right way. It refers to predicting which changes are expected by customers. In this way, organizations can prepare to take improvement actions, and then implement them at the right time (Ulewicz et al., 2021; Siwiec, and Pacana, 2021). Thus, the position of the organization on the market becomes more competitive. In modern organizations, they are using different instruments to support this process. The based techniques were questionnaires (surveys) to obtain customers' expectations. Additionally, the popular and often used method is the QFD method (Quality Function Deployment) (Hauser, 1993), which has application to design and improve products considering Voice of Customer (VoC) (Siwiec, and Pacana, 2021). Another example is the FAHP method (Fuzzy Analytic Hierarchy Process) (Geng, and Geng, 2018), which mainly been used to precise customer expectations (Siwiec, and Pacana, 2021). Despite that, we are still searching for different methods to predict product quality.

The literature review shows that quality of product was improved by integrated methods, i.e., QFD and AHP (Analytic Hierarchy Process). The idea of this combination was to process customer expectations into technical criteria, where the importance of these criteria was determined by the AHP method (Erkarslan, and Yilmaz, 2011). In a similar context, this method was used to exact customer requirements, i.e. by the authors (Ellman, Wendrich, and Tiainen, 2014; Geng, and Geng, 2018; Li, Chin, and Luo, 2012). Additionally, these methods were integrated with the Kano model as part of determining customer satisfaction (Sun, Mei, and Zhang, 2009; Yamagishi, Seki, and Nishimura, 2018). The mathematical models with ordinal scales were used, i.e. the LGP model LGP (Wang, and Chin, 2011). In turn, the authors of the work (Franceschini, Maisano, and Mastrogiacomo, 2015), the Yager algorithm was used to determine the importance of customer expectations. Furthermore, for improving product quality, the TRIZ method (Theory of Innovative Problems Solving) was used (Ding, Yang, and Bao, 2012; Melemez et al., 2014; Wang et al., 2014). Whereas, in the context of predicting product quality, the Bayesian network (Naïve Bayesian Classifier) was used. It consisted mainly of verified quality for possible product changes of product (Wang, and Tseng, 2014; Jiao, Yang, Zhong, and Zhang, 2015; Yang, Bian, Stark, Fresemann, and Song, 2019; Jiao, Yang, and Zhang, 2017). For this purpose, the Markov chain was used relatively often used (Shi, and Peng, 2020; Wu, and Shieh, 2006; Song, Ming, and Xu, 2013). In this view, customer expectations were analyzed according to probability. However, a single and consistent approach to predicting product quality is still needed, taking into account customer expectations.

Therefore, the objective was to develop an approach to predict the quality of the product quality considering current customers. A test of the approach was performed for the domestic vacuum cleaner.

2. Approach

In the proposed approach, it was assumed to predict product was predicted considering current customers. To this aim, the combined techniques were used, i.e. SMART(-ER) method (Lawlor, and Hornyak, 2012), questionnaire with the Likert scale (Alexandrov, 2010), brainstorming (BM) (Samarraire, and Hurmuzan, 2018), Weighted Sum Model (WSM) (Vilutiene, and Zavadskas, 2003; Supriyono, and Sari, 1977), Naïve Bayesian Classifier (Yang, Bian, Stark, Fresemann, and Song, 2019; Jiao, Yang, and Zhang, 2017). The idea of the approach relies on obtaining customers' expectations. These expectations refer to customers' satisfaction with the quality of the current product, quality and importance (weights) of the product criteria. Then, according to customer satisfaction, was estimated and product quality was classified. The WSM method was used for that. Then, the Naïve Bayesian Classifier was applied to predict product quality from current customers' expectations. The scheme of implementing the proposed approach is shown in Figure 1.

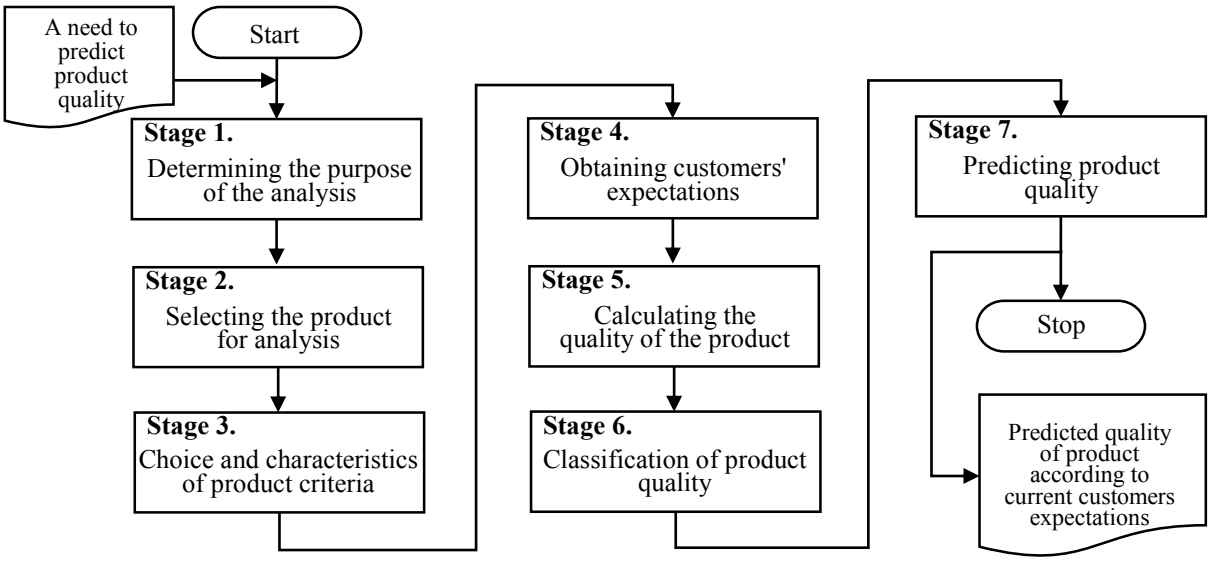

Figure 1. Scheme of realizing the proposed approach to predict product quality.

The short characteristic of the stages of the method is shown in the next part of the study.

Stage 1. Determining the purpose of the analysis. It was assumed that the aim is determined by the entity (expert). In the proposed approach, the purpose is to predict the quality of the product considering current customers. As part of determining the aim, it is adequate to use the SMART(-ER) method (Lawlor, and Hornyak, 2012).

Stage 2. Selecting the product for analysis. The product is selected by the entity (expert). It was assumed that the product can be an existing (produced) product and should be known by customers. The product may be in decline or in maturity, where it is recommended to take improvement actions (Siwiec, and Pacana, 2021).

Stage 3. Choice and characteristics of product criteria. It is necessary to choose criteria (attributes) of the product that generate the quality of the product. It is recommended to select technical criteria (quantitative, measurable), because for these criteria the measure of customers satisfaction is more effective. These criteria are determined by an entity or group of experts during brainstorming (BM) (Putman, and Paulus, 2011). During determining, the criteria will be useful catalogs of product. Following the authors (Siwiec, and Pacana, 2021; Ulewicz et al., 2021), it was assumed that the number of all criteria should be equal from 10 to 25 criteria. Then, all criteria should be characterized, i.e., described by parameter, value or range of values. It refers to marking each of the criteria by the current parameter according to the specification of product.

Stage 4. Obtaining customers' expectations. The purpose is to obtain customers' expectations about product quality. In the proposed approach, it refers to determining customers' satisfaction with current product criteria. In addition, it was assumed to determine the importance (weights) of these criteria for customers. The number of customers (sample size) should be calculated according to the method to determine the number of customers to predict product quality, that is, as shown in work (Siwiec, and Pacana, 2021). According to (Muttaqi'in, and Katias, 2021), to obtain customers' expectations, it is effective to use a survey with the Likert scale. The first stage of the survey includes assesses of the current quality of product criteria, where 1 – criterion is practically unsatisfactory and 5 – criterion is very satisfactory. It is necessary to assess all the criteria selected in the third stage of the approach. The second stage of the survey includes assessing the importance of importance under these criteria. It relies on assessing all criteria selected at the third stage of the approach, where 1 – criterion is practically unimportant, and 5 – criterion is essential. The customer expectations are used in the next part of the analysis.

Stage 5. Calculating the quality of the product. It refers to calculating the quality of the analysis product considering current customers' expectations. This relies on the estimated quality of the product according to customers' satisfaction from the quality of the current criteria and the weights of these criteria. In this aim, it is effective to use the Weighted Sum Model (Siwiec, and Pacana, 2021; Kumar, et al., 2021; Keshavarz-Ghorabaee, 2021), which allows estimating quality of the product without normalization of customers' assesses. In the proposed approach, it is necessary to separately estimate the quality of the product for each customer. The formula (1) is used for this:

$$A_i^{WSM} = \sum_{i=2}^{n} w_j^t x_{ij} = Q_i \tag{1}$$

where:

w – assess the importance (weight) the criterion,

x – assess of satisfaction from quality of the criterion,

i – customer, i, j = 1, 2, …, n.

According to the assumed concept, the number of product quality levels (Q) is equal to the number of customers who participated in the survey.

Stage 6. Classification of product quality. The classification of product quality refers to determining initial customers' satisfaction with the current product quality. It is necessary to classify all the quality levels estimated at the fifth stage of the approach. In this aim, the product quality level (Q_i) is processed into decimal value (Q_i^p) according to formula (2):

$$Q_i^p = \frac{Q_i}{1000} \tag{2}$$

where:

Q – product quality,

i – customer,

i – 1, 2, …, n.

It is necessary to process all the product quality levels calculated in the fifth stage of the model. Then, the state of customer satisfaction is noted for each value. The state is determined based on the maximum and minimum value of product quality, where the maximum value is the high satisfaction, and the minimum value is the lower satisfaction. The average value of the maximum and minimum values of product quality levels is little satisfaction. The product quality levels that were classified in this way are used to predict the current quality of products. It is shown in the next stage of the approach.

Stage 7. Predicting product quality. The idea is to predict the quality of product according to the satisfaction of current customers with the initial classified current customers' satisfaction. The purpose is to generalize individual satisfaction as part of the predicting the quality of product for the general customer community. Machine learning was assumed applied, i.e., Naïve Bayesian Classifier (Piątkowski, 2014; Jiao, Yang, and Zhang, 2017). It was assumed that data representing customers' expectations are considered vector $x = [x_1, x_2, \ldots, x_r]$, where its components are attributes (x_k), where r – number of attributes. In the case where k is contractual nature, it is assumed that l_k has different values. The sets of customers' expectations (i.e. vectors) are separated into classes, which are disjoint, and their sum is equal to the whole space. Each point belongs exactly to a single class (subset), where C – subset of all classes, c – a single class, and $c \in C$. The Bayes formula includes conditional probability, where A and B – observation of random events, P(A) – probability of event A, where $P(A|B)$ – probability of A occurrence provided that B has occurred (3) (Wang, and Tseng, 2014; Jiao, Yang, Zhong, and Zhang, 2015):

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \tag{3}$$

where: $A \cap B$ – simultaneously occurs A and B , therefore the probability is determined as (4) (Piątkiwski, 20214):

$$P(A|B) = \frac{P(B|A)P(B)}{P(A)} \tag{4}$$

The Bayes formulas (5-6) allow identifying the most probability class (*np*): (Wang, and Tseng, 2014; Yang, Bian, Stark, Fresemann, and Song, 2019; Jiao, Yang, and Zhang, 2017):

$$c_{np} = arg \max_{c \in C} P(c \mid x_1, x_2, \ldots, x_r) \tag{5}$$

$$c_{np} = arg \max_{c \in C} \frac{P(x_1, x_2, \ldots, x_r \mid c)\, P(c)}{P(x_1, x_2, \ldots, x_r)} \tag{6}$$

The elements included in the denominator do not depend on the class. Therefore it does not change the result of the classification (7) (Jiao, Yang, and Zhang, 2017):

$$c_{np} = arg \max_{c \in C} P(x_1, x_2, \ldots, x_r \mid c)\, P(c) \tag{7}$$

When the probability in formula (7) is known or possible to estimate, it should be used directly to the classification. The optimal Bayes Classifier is achieved. On the basis of that classifier, it is possible to predict product quality. The maximum value of the probability is determined as the predicted product quality according to current customer expectations.

3. Test of approach

The proposed approach was tested as part of the initial research. This research was carried out in 2020 on a sample of 24 customers. The domestic vacuum cleaner was verified.

As part of the first stage, the purpose of the analysis was assumed. The purpose was to predict the quality of the vacuum cleaner considering current customers.

At the second stage, the product for analysis was selected. It was a vacuum cleaner, which was produced in the Podkarpacie enterprise. This vacuum cleaner was in the maturity phase. Until now, little improvement measures have been taken for this type of vacuum cleaner, e.g., changing colour of the product.

According to the third stage, the vacuum cleaner criteria were selected and then characterized. In accordance with the proposed approach, ten technical criteria were determined. These criteria were determined and characterized by brainstorming (BM) and based on a catalogue (specification). These criteria were: bag type, width of the suction hose, length of the suction hose, controllable of the working handle, rubber protectors to protect against knocking, road wheel type, on/off type, overheating or failure indication, electric brush socket and number of accessories included.

At the fourth stage, the customers' expectations were obtained. The survey with the Likert scale was used for that. The survey was carried out in 2020 by an initial sample obtained sample equal to 24 customers. In the survey, the stage of customer satisfaction from the quality of the current criteria of the vacuum cleaner and the evaluations of the importance of these criteria

were included. Customers' expectations were obtained for all criteria selected in the third stage of the approach. These customer evaluations were used to calculate the quality of the vacuum cleaner, as is shown in the next stage.

According to the fifth stage, the quality of the vacuum cleaner was calculated. The WSM method was used for that, including assessments of satisfaction from current criteria and weights of these criteria. The levels of the quality of vacuum cleaner were calculated separately for each customer.

According to the quality sixth stage, the classification of vacuum cleaner was done. As was assumed, three states of customer satisfaction from the current quality of the vacuum cleaner were determined. The limit values of the quality of the vacuum cleaner quality defined as the state of satisfaction, i.e., high satisfaction (maximum value equal to 0,15), little satisfaction (average value equal to 0,11) and low satisfaction (minimum value equal to 0,06).

The results of the implementation of the fifth and sixth stages of the proposed approach are shown in Table 1.

Table 1.
Fragment of estimated and classified current quality of vacuum cleaner

Customer (i)	Quality of vacuum cleaner (Q_i)	Quality of vacuum cleaner (Q_i^p)	Classification of quality of vacuum cleaner according to customer satisfaction
1	144	0,14	high satisfaction
2	65	0,07	low satisfaction
3	119	0,12	a little satisfaction
4	99	0,10	a little satisfaction
5	94	0,09	a little satisfaction
6	75	0,08	low satisfaction
…	…	…	…
24	105	0,11	a little satisfaction

The last stage of the approach was concerned with predicting the quality of the vacuum cleaner according to the satisfaction of current customers' satisfaction. This meant processing the results obtained (from the fifth stage) to predict the current quality for the general customer population. For this purpose, the Naïve Bayesian Classifier supported in STATISTICA 13.3 was used. The estimated and classified quality of vacuum cleaners was used for that. As qualitative dependent variables, states of customers' satisfaction were assumed. In turn, the quantitative predictor was the values of vacuum cleaner quality level. The Naïve Bayesian Classifier results are shown in Table 2.

Table 2.
Predicting quality of vacuum cleaner according to current customers' satisfaction

Class	A priori value	Quality level - average	Quality level - standard deviation
a little satisfaction	0,360000	0,106556	0,000100
low satisfaction	0,280000	0,072857	0,000073
high satisfaction	0,360000	0,1342222	0,000078

After analysis, it was predicted that the current vacuum cleaner quality allowed a high customer satisfaction. It was evidenced by the maximum average value of product quality (0,13), which was determined the state of customer satisfaction. However, the result is the effect of initial research. Therefore, it is appropriate to obtain expectations from a larger number of customers and verify the results.

4. Discussion and Conclusions

Improving the quality of products considering customers' expectations is still a challenge. Therefore, modern enterprises try to predict customers satisfaction from products to make decisions about improving products. Hence, there is still a search for effective instruments supporting this process. Therefore, the objective was to develop an approach to predict the quality of the product quality considering current customers. In this aim, the combined techniques were used, i.e. SMART(-ER), a questionnaire with the Likert scale, brainstorming (BM), WSM method, and Naïve Bayesian Classifier. A test of the approach was performed for the domestic vacuum cleaner. The verified vacuum cleaner criteria were: bag type, width of the suction hose, length of the suction hose, controllable on the working handle, rubber protectors to protect against knocking, road wheel type, on/off type, overheating or failure indication, electric brush socket, and number of accessories included. The customers' expectations were obtained in 2020 from 24 customers. These expectations concerned customer satisfaction with the quality of the current product, quality and the importance (weighting) of the criteria. Then, according to customers' satisfaction, the quality of the product was estimated and classified. The WSM method was used for that. Next, the Naïve Bayesian Classifier was used to predict the quality of the product for current customers. After the analysis, the current quality of the vacuum cleaner was of high satisfaction to the customers. This is evidenced by the maximum average value of quality levels (0,13), which determines the state of customer satisfaction.

Main benefits of the proposed approach, e.g.:

- estimated product quality by simultaneously considering assessments of customer satisfaction with product criteria and assessments of importance of these criteria for customers,
- initial determination satisfaction of individual customers on product quality,
- generalization of customer a small number of expectations of customers to predict quality for general customers,
- predicting the quality of product according to current customers' expectations,
- possibilities of making decisions about necessity and implement improvement actions.

In turn, the disadvantage of the proposed approach is the lack of possibilities of determining the expected quality of the product. The approach focuses on predicting customers' satisfaction with the current quality of the product. Therefore, if there is a need for improvement actions, further analyzes should be carried out to determine which criteria should be modified and how.

Therefore, future research will focus on extending the proposed approach to include the possibility of verifying the expected changes in product criteria. It is also planned to implement an approach in computer software that will support the organization in predicting and subsequently improving product quality.

The presented approach can be used for any product. Therefore, it is a useful tool for any kind of organization, which strives to meet customer satisfaction. Despite the possibility to predict the quality of the product, the proposed approach can indicate at an early stage to the organization that it is necessary to make improvement actions.

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APPLICATION OF THE BALANCED SCORECARD IN A SELECTED MINING SERVICES COMPANY

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Purpose: The paper aims to show the application of the Balanced Scorecard in a mining services company as a tool enabling the implementation of the company's strategy.
Design/methodology/approach: The aim of the paper will be achieved through web/desk research, critical analysis of literature on the topic of the paper and case study.
Findings: The article contains a literature study of the Balanced Scorecard and indicates how important the development and implementation of the strategy is in the activities of mining services companies. The process of developing the strategy and its implementation is shown on the example of a mining services company (Polish abbreviation p.u.g.), existing on the mining industry market for more than twenty years, employing from 300 to 500 employees, depending on the situation in the market, with a defined mission and vision. The Balanced Scorecard (BSC) was used as a tool for translating the company's strategy into its operations. The strategic objectives and their measures, as well as the conditions for adopting BSC into the operations of a mining services company, are presented.
Originality/value: The example of the application of the Balanced Scorecard in the selected mining services company presented in the article may serve as an example for other mining companies.
Keywords: Balanced Scorecard, strategy, strategic management, mining services company.

Category of the paper: Literature review and Case study.

1. Introduction

Today's market economy is subject to continuous and dynamic changes. Organisations operating in such an environment are forced to seek effective ways of management as well as methods and tools to support the process. Only effective management of a business entity allows a company to exist and grow in the long term. Effective business management should be understood primarily as an optimisation of the use of the company's resources and carrying

out continuous activities aimed at achieving further goals. Therefore, each business entity whose goal is to gain and maintain a strong position in the market should have an established action plan that will determine the company's direction for development as well as precise strategic objectives and the manner of their implementation.

There are many various concepts related to strategic management. This article presents one of them, i.e. the Balanced Scorecard. This concept enables and facilitates simultaneous activities focused on four basic perspectives: financial, customer, internal processes, and learning and growth (Szymańska, 2014, p. 79). The predicted efficiency of a business entity will largely depend on the ability to coordinate the above perspectives.

The current situation faced by service companies in the mining industry requires achieving and maintaining competitiveness.

The Council of Ministers adopted the Programme for the Coal Mining Industry in Poland on 23 January 2018. The programme consists of the diagnostic and analytical parts as well as implementation. In addition, there is a social agreement pending notification by the European Commission (an agreement between trade unions and government representatives) signed on 25 September 2020 that envisages the closure of mines by 2049. Consequently, a systematic year-on-year reduction in the level of extraction is to be expected. It will be pursued by extinguishing mining regions until the complete closure of mining plants. Mining services companies, which until recently were an important part of the coal companies' business, are the first to feel the effects of this policy. In previous years, the proportion of corridor excavations carried out by service companies compared to total preparatory works reached up to 40%. The situation is similar in works related to the modernisation of excavations, operation and maintenance of machinery and equipment, including in particular excavation haulage equipment, reinforcement and decommissioning works, shaft works, etc. In 2021, following the decision to phase out coal as the primary energy carrier, the amount of demand for external parties to run projects for coal companies has decreased by several tens of per cent. As a result, a large number of service companies have applied for the few published restricted or open tendering procedures.

When analysing the current year, the number of potential external applicants per tender ranges from four to a dozen. To illustrate the scale of the problem, one can go back to the years 2010-2015 where the number of service companies entering per tender advertised was two on average. It was not at all uncommon for tenders issued by coal companies not to be carried out due to the lack of applicants.

The management of companies must operate under the threat of emergencies, in the changing and competitive environment. Hence, it becomes crucial for the company to have a strategy and effective strategic management to be able to operate. This article, based on a literature study, will present an example of strategy implementation in a selected mining services company through the use of the Balanced Scorecard. In the literature on the subject, and more specifically in the works of such authors as, i.a., Kowal. B., Karkula, M., Kowal, D.,

Wodarski K., Karbownik A., Sierpińska M., Emerling I. and others, there are many examples of the application of the Balanced Scorecard in mining companies. In their work, the authors present an attempt to adapt this concept to the specifics of the mining industry in order to ensure the development of the industry and improve competitiveness and operational efficiency. They show the application of the Balanced Scorecard concept in relation to large economic entities, i.e. mining companies, or present its application in a general way, showing directions rather than effects. Mining service companies are usually smaller, privately owned entities with relatively little capital where, unlike state-owned mining companies, they cannot expect state support. Hence, the application of the Balanced Scorecard as a tool for the strategy and possible measurable effects may help the company to stay afloat in such a volatile and unpredictable market as the mining industry (fluctuation of coal prices, changing government policies in different periods).

2. The role of the strategy in the strategic management of a company

Formalised strategy is nowadays the basis for managing a company focused on growth and value increase. The literature review shows that there are many definitions of the term strategy and derived terms such as strategic planning, strategic management, long-term planning. Corporate strategy in the literature is interpreted differently and considerations in this regard are presented in the works of Wodarski K. (2019), Kowal B. (2010). According to P. Drucker (2005), the strategy involves analysis of the current situation and changing it if needed. A. Chandler defines strategy as "establishing of the principal long-term objectives of a business and the adoption of such courses of action and such allocation of resources as are necessary to realise the objectives. Porter (1980), on the other hand, defined a company's strategy as the specifying how a company should operate in order to be competitive with others, setting objectives (company mission or specific goals) and the rules necessary for its operation to achieve these objectives. A properly developed strategy allows the company to find answers to the fundamental strategic questions, the sensitive nature of which determines the performance of certain analyses of strategic nature that are key to proper management (Wysocki, 2016, p. 55). The major importance of strategy in the management process of a company results primarily from the fact that nowadays strategy is not only a long-term plan for the functioning of an organisation, to which many entities owe their market success and survival in the market but also a tool that can explain the reasons for failures resulting from errors committed during its formulation and implementation (Koźmiński, Piotrowski, 2013, p. 123; Berliński, Penc-Pietrzak, 2004, p. 37).

The cited definitions indicate a lack of consistency and unambiguity in defining a complete theory of strategy. One of the Canadian scientists, H. Mintzberg, put the strategy in the form of 5 P's, presenting a very universal approach (Drążęk, Niemczynowicz, 2003):

- P for *plan* or type of deliberate action,
- P for *pattern*, which is a model of formalised action.
- P for *play*, or control, or actions aimed at achieving a specific goal.
- P for *position*, understood as seeking and achieving a favourable position in the environment.
- P for *perspective* as a perception of one's position in the future.

K. Obłój, on the other hand, proposes dividing the various approaches and concepts into four groups, namely:

- The first approach represents those ideas that are the most popular, i.e. it views strategy as the creation and implementation of a company's action plan.
- The second approach views strategy as the organisation's position in relation to its environment.
- The third approach defines a strategy as a permanent pattern of action constituting a set of rules and ways of reacting.
- The fourth approach defines strategy as emphasising the importance of the process of self-identification of the company, shaping its identity (Obłoj, 2001).

In Polish mining companies, the understanding of strategy is based on a synthesis of the majority of presented approaches, but primarily on the results of ideas created by representatives of one of the schools of though concerning the strategic management – the planning approach (Wodarski, 2019).

Strategic management is considered a way of understanding and analysing the organisation, or as a philosophy of the organisation, enabling it to adapt to the turbulent environment, that is, to the rapidly changing environment in which the organisation functions (Szymańska, 2014, p. 80). With proper strategic management, a company can understand the reality of the organisation and determine the development directions and ways of action. Many definitions of strategic management can be found in the literature. According to R.W. Griffin, it is "a management process aimed at the formulation and implementation of strategies that ensure a proper alignment between the organisation and its environment, and the achievement of its strategic objectives" (Griffin, 1996). Preparation of a strategy for a modern company is a complex process. It is necessary to conduct in-depth analyses, in particular regarding the availability of resources and competencies of the company, the idea that is the subject of the strategy, the risks associated with its formulation and implementation, the costs of its implementation and the possibility of success (Koźmiński, Piotrowski, 2013; Berliński, Penc-Pietrzak, 2004, p. 37).

A comprehensive concept of strategic management was presented by M. Romanowska, who described it as a process consisting of three stages (Gierszewska, Romanowska, 1997). The first stage – the strategic analysis of the enterprise – is a set of activities diagnosing the enterprise and its environment, enabling the determination of current and future opportunities and threats, as well as strengths and weaknesses, and the assessment of the strategic position of the enterprise. The second and third stages are the development of the strategic plan and its implementation.

The literature on strategic management schools of thought distinguishes the following ways of defining strategy formulation (Mintzberg, Ahlstrand, Laampel, 2004, p. 14):

- the classic planning approach, understood as a process of formulating the strategy in stages, known as the top-down approach. This means that projects are derived from structured and formalised processes at board and management level,
- an instrumental approach, where the strategy process is illustrated by "muddling through". Project ideas in this case are generated decentrally in the business units, while management limits itself to general guidelines for a specific process.

In the classical approach to strategy formulation, the process can be divided into two phases: the analysis phase and the decision phase. Particular stages correspond to each of the individual phases. The stages, in turn, require performing specific actions, which include: analysing the company's environment, formulating the strategy, choosing the organisation's strategy, choosing competitive strategies, creating plans, implementing the strategy and monitoring it (Pomykalski, 2001, p. 289-291). The process of strategy formulation and selection can be more or less formalised but appropriate methods of strategic analysis are always used. The use of strategic analysis methods (Griffin, 2017) can even be considered a prerequisite for the adoption of strategic management concepts. In a strategic analysis simple as well as more complex methods with varying degrees of complexity are adopted. Strategic management deals with the important intended and disclosed initiatives taken by the management boards of companies on behalf of their owners, using the resources at their disposal, in order to strengthen the functioning and performance of companies in their external environment (Polowczyk, 2012).

3. Balanced Scorecard as a strategic management tool

The company's strategy alone will not be sufficient until it is translated into the company's operating activities. A tool that enables translating the organisation's strategy into its operating activities is a management concept developed by R. Kaplan and P. Norton referred to as the Balanced Scorecard. The Balanced Scorecard is considered one of the most interesting business concepts. It enables the solution of key performance measurement problems. BSC identifies the factors on which the future performance of the company depends, allowing focus on key

resources. The use of BSC makes it possible to translate the results obtained from intangible resources into measurable indicators that reflect the level of the strategy. The Balanced Scorecard is a system for measuring the company's efficiency from a multi-perspective point of view, useful in translating the organisation's vision and strategy into measurable goals (Cholewicka, Goździk, 2002, pp. 6-9; Kaplan, Norton, 2001). The basis for creating the Balanced Scorecard is the organisation's mission and strategies (Fig. 1).

A company's mission is the specific reason for a company's existence, distinguishing it from others (Drążek, Niemczycki, 2003, p. 31). It is a desired, clear and convincing picture that describes the future of the company in terms of aspirations (Urbanowicz-Sojkin, Banaszyk, Witczak, 2007, p. 236).

A company's vision, on the other hand, describes the aspirations of the company and constitutes its image (Drążek, Niemczynowicz, 2000, p. 31). It also serves as the most general guideline for all activities it conducts (Urbanowicz-Sojkin, Banaszyk, Witczak, 2007, p. 237).

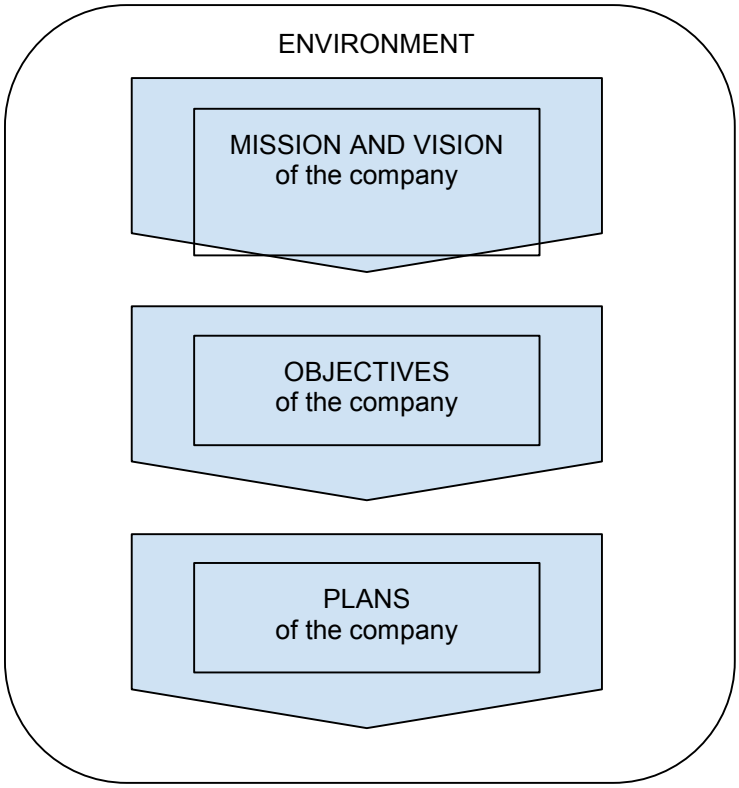

Figure 1. The essence of planning in a company in general. Source: Wodarski, 2019, p. 2.

The Balanced Scorecard, then, is a tool used to illustrate the cause-and-effect relationships to compare financial ratios from past activities with ratios that stimulate future activities of the organisation. It combines short- and long-term ratios concerning both financial and non-financial perspectives into a single evaluation system. This allows BSC to establish a long-term strategy with current operations and financial results (Bukh, Molni, 2005).

The Balanced Scorecard is a multidimensional structure based on four perspectives, i.e.: financial, customer, internal processes and learning and growth perspective. (Brzóska, Karbownik, Kruczek, Szmal, Żebrucki, 2012). Table 1 shows the characteristics of each perspective in BSC and Fig. 2 illustrates them.

Table 1.
Characteristics of perspectives in BSC

Perspective	**Characteristics**
Financial	Assesses how the organisation is perceived by its customers. Financial ratios indicate whether the implementation and realisation of the strategy improves the company's economic performance. Examples of financial objectives may include operating profit, rate of return, and Economic Value Added.
Customer	It shows how an organisation creates value for its customers. Management staff identify the customers and market segments in which the company will compete as well as the organisation's performance ratios related to them. Correctly formulated strategy allows to isolate the ratios i.e. satisfaction, retention, profitability and acquisition of customers, volume and value target market share.
Internal processes	Defines priorities from the perspective of delivering value to owners and customers, as well as internal processes in the company. The company's staff identify key internal processes in which the organisation must excel. Such processes must enable the organisation to create value that will attract and retain customers of the target market segment and meet shareholder expectations for financial performance.
Learning and growth	Assesses the growth of employees and their satisfaction with the performed tasks. Identifies resources the organisation is developing to lay the foundation for long-term growth and improvement. A company's source for learning and growth is people, systems, procedures. The organisation must invest in retraining human resources, improving technology and information systems, and adjusting organisational procedures.

Source: own study based on Brzóska J., Karbownik A., Kruczek M., Szmal A., Żebrucki Z., 2012.

A strategy map is the first activity to be carried out when implementing the Balanced Scorecard. It describes how a business entity intends to pursue its mission and vision and consequently achieve its main strategic objective. A strategy map is thus a description of the cause-and-effect relationship between the strategic main objective and the formulated strategic objectives, which are defined in the individual perspectives of the Balanced Scorecard. It is therefore an extension of the four-perspective Balanced Scorecard model, further supplemented by detailed subgroups representing the dynamics of the strategy, which improves clarity and focus. The strategy map allows employees to see the links between goals and their corresponding measures. It is a visual presentation of a company's strategy, which is the principle of combining objectives in four perspectives to promote a better understanding of the strategy and greater commitment to it (Kaplan, Norton, 2004, p. 25).

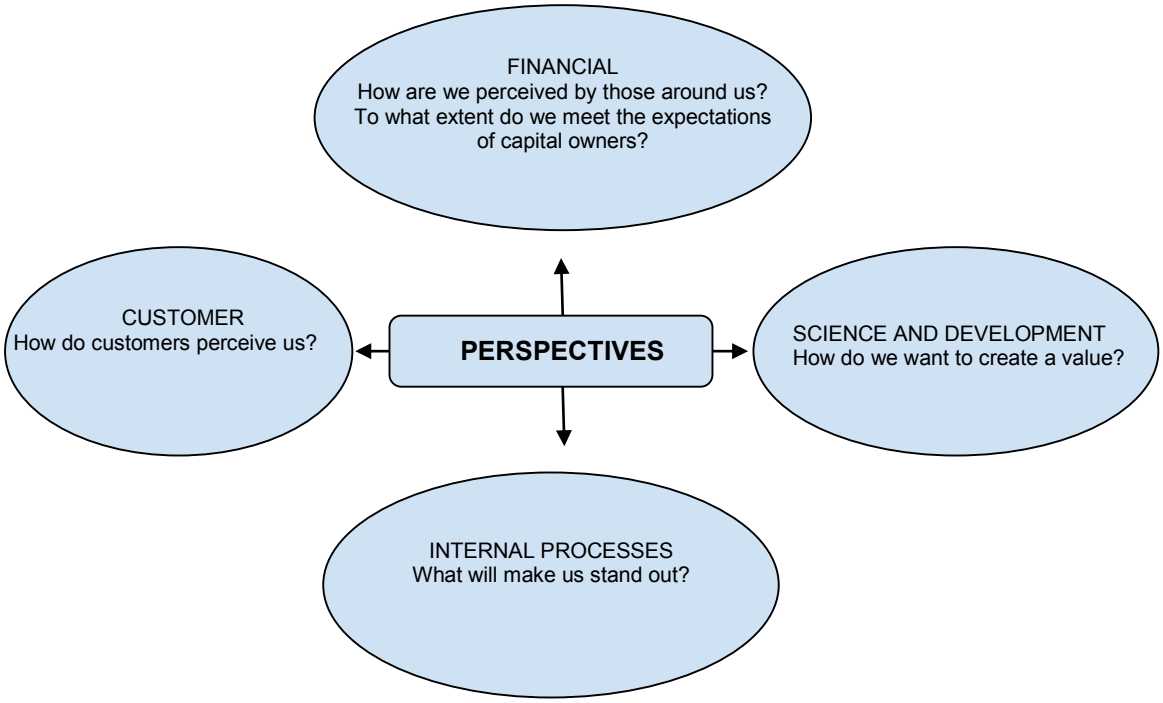

Figure 2. Perspectives in the Balanced Scorecard Source: Kaplan, Norton, 1992, p. 72.

4. Applying the Balanced Scorecard in a selected mining services company

Based on the conducted literature study, the implementation of mining services company strategy through the concept of a Balanced Scorecard was proposed.

The mining services company under review has been in business for 20 years. It carries out mining projects concerning:

- complex drilling of coal, coal and stone and stone excavations,
- modernisation of mine excavations,
- construction, operation of conveyor belts, scraper conveyors,
- bottom rocks collection,
- making belt conveyors by cold method, vulcanisation.

The company has its own repair and service facilities. In addition, the assets include mining machinery such as roadheaders, dinting loaders, lightweight type conveyors and machines making belt conveyors.

During its existence, the level of employment in the company under review has varied between 350 and 700 employees. On average, four mining projects and two in making conveyor belts are executed per year, generating revenue of PLN 35-45 million on average. The organisational chart of the company under study is shown in Fig. 3.

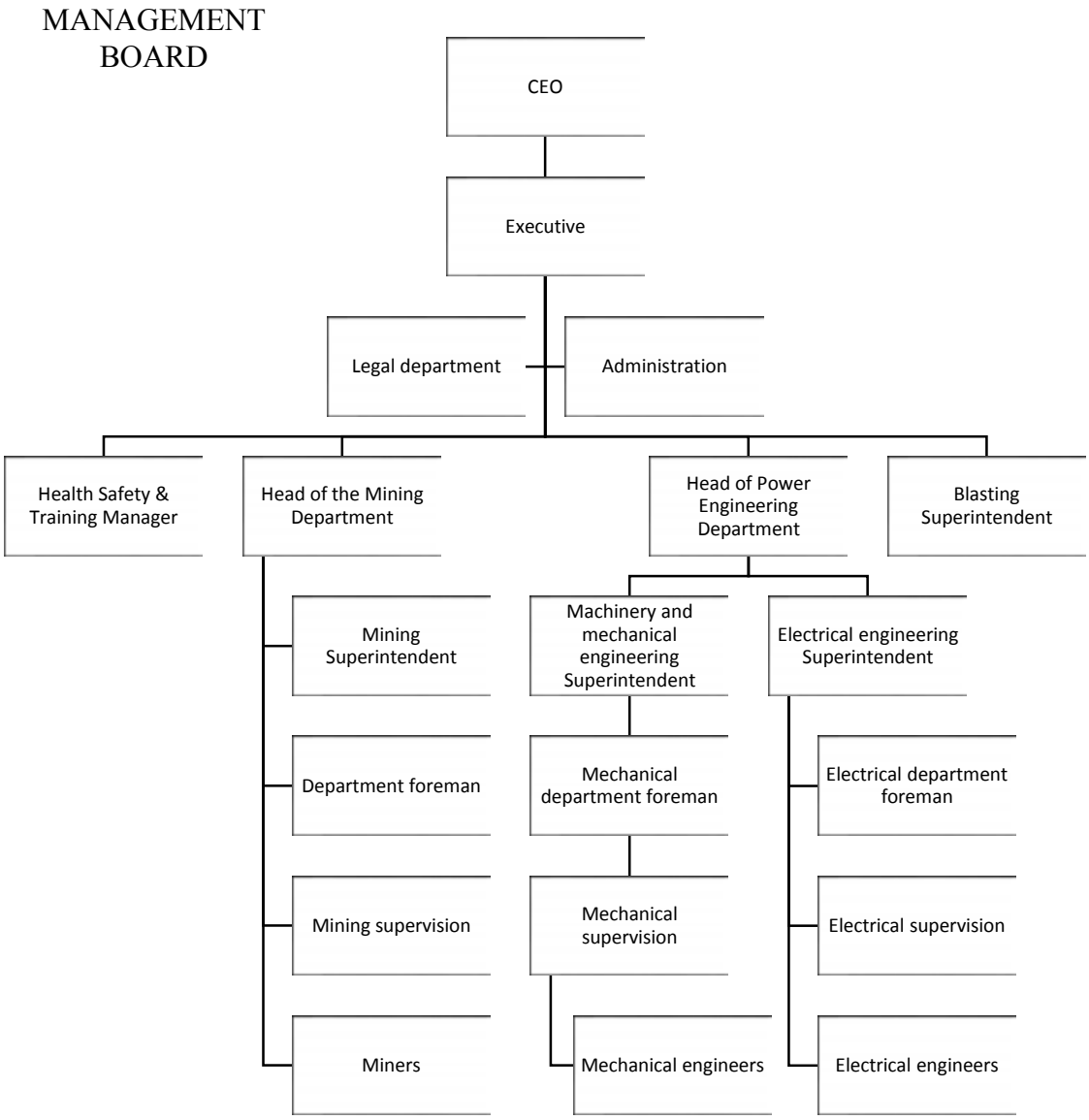

Figure 3. Organisation chart of the mining services company under review. Source: Author's own elaboration.

The company under review has a vision and mission formulated as follows.

The mission of the mining services company under review is to provide services and technical solutions to clients (mining companies) to strengthen their market position.

The mining services company meets the needs of its customers with its skills, experience and knowledge. The mission of the mining services company is to carry out projects for mining companies in the area of drilling, modernisation of underground excavations and making conveyor belt connections.

The company's vision is to achieve a significant position in the underground mining services segment. Achieving a leading position among mining services companies employing more than 500 employees in the execution of projects related to drilling, modernisation of underground excavations and achieving a leading position in the segment of performing conveyor belt connections performed for the benefit of the mining industry.

The strategic objectives of the mining services company were formulated based on the four balanced scorecard perspectives are presented in Tables 2, 3, 4 and 5. In addition, the tables set out measures whose values will be monitorable from year to year, at the same time indicating the degree of achievement of each of the strategic objectives. Each measure for assessing the degree of achievement of the strategic objectives has been defined with identification of unit, has a brief description, the source of the information, the frequency of monitoring the measurement and the expected values.

Table 2.
Strategic objectives of the mining services company in the financial perspective

No.	Strategic objective	Unit
1.	Obtaining a projected financial result	1. Net financial result per project, project portfolios 2. Unit result per project or unit result per 1mb of progress(drilling or modernisation)
2.	Maintaining financial liquidity	1. Current financial liquidity indicator
3.	Increase in return on assets	Return on assets
4.	Completion of financial restructuring by 2022	1. Restructured liabilities repayment rate

Source: Author's own elaboration.

The financial perspective presented includes objectives such as: financial result, profitability, financial liquidity. The objectives set out in this way are influenced by macroeconomic conditions such as state and European Union policy towards mining sector. The volatility and necessity of mining restructuring forces mining companies to operate through the lens of recognized performance criteria and value paradigm. The best example is the current situation in which mining service companies operate.

Table 3.
Strategic objectives of a mining services company from a customer perspective

No.	Strategic objective	Unit
1.	Gaining a strong position in the aspect of drilling, modernisation and in the performance (cold technology and vulcanisation) of conveyor belts in mining plants and outside them.	1. Share in projects dedicated to external entities by mining companies. 2. Share in linear metres performed in the extractive industry by external parties. 3. Share in the orders of belt conveyors for mining and non-mining. 4. The number of conveyor belts made for the extractive industry and beyond.
2.	Increased customer satisfaction (coal companies)	1. The customer satisfaction indicator (number of comments in work acceptance protocols, completion of tasks according to schedule)
3.	Improving the quality of project execution	1. The indicator of contractual penalties

Source: Author's own elaboration.

The customer perspective in the current period primarily refers to the definition of direct competitiveness objectives, an orientation towards more efficient service in the market, including the analysis of customer satisfaction of mines and coal companies.

Table 4.
Strategic objectives of a mining services company in the internal process perspective

No.	Strategic objective	Unit
1.	Adjusting the level of employment to the level of projects carried out	1. Labor productivity: overall, underground, annual. 2. Employment structure: underground (85%), surface (15%) 3. Employment level
2.	Reducing operating costs	1. The level of costs involved in executing the project. 2. The level of average unit costs for the execution of 1 linear metre of a mine working.
3.	Increasing the efficiency of investment outlays.	1. The indicator of the amount of investment outlay per project. Net present value (NPV) of the investment programme for a mining services company
4.	Adapting preparatory work capacity to the needs of coal companies Adapting capacity to implement conveyor belts to the needs of coal companies and other branches of industry.	1. Mining services company capacity to execute preparatory works 2. Mining services company capacity to implement belt conveyors.

Source: Author's own elaboration.

The objectives in the internal process perspective result from the specific conditions of a company operating in the underground mining industry, particularly in the coal extraction process. Operating in the mining sector generates high labour costs. Hence, the efficiency and competitiveness of an enterprise depend to a large extent on the structure and level of employment.

Table 5.
Strategic objectives of a mining services company in a perspective of learning and development

No.	Strategic objective	Unit
1.	Ensuring an adequate level of competence of managerial staff	1. The indicator of annual expenditure on managerial staff training. 2. The number of mining approvals obtained.
2.	Ensuring an adequate level of employee satisfaction	1.Employee satisfaction index
3.	Standardisation and modernisation of the IT systems used	1. The share of standardised IT systems

Source: Author's own elaboration.

The objectives of the learning and development perspective include management systems as well as human resources development.

A strategy map was developed for the selected company to verify the efficiency of its operation, which is presented in Fig. 4

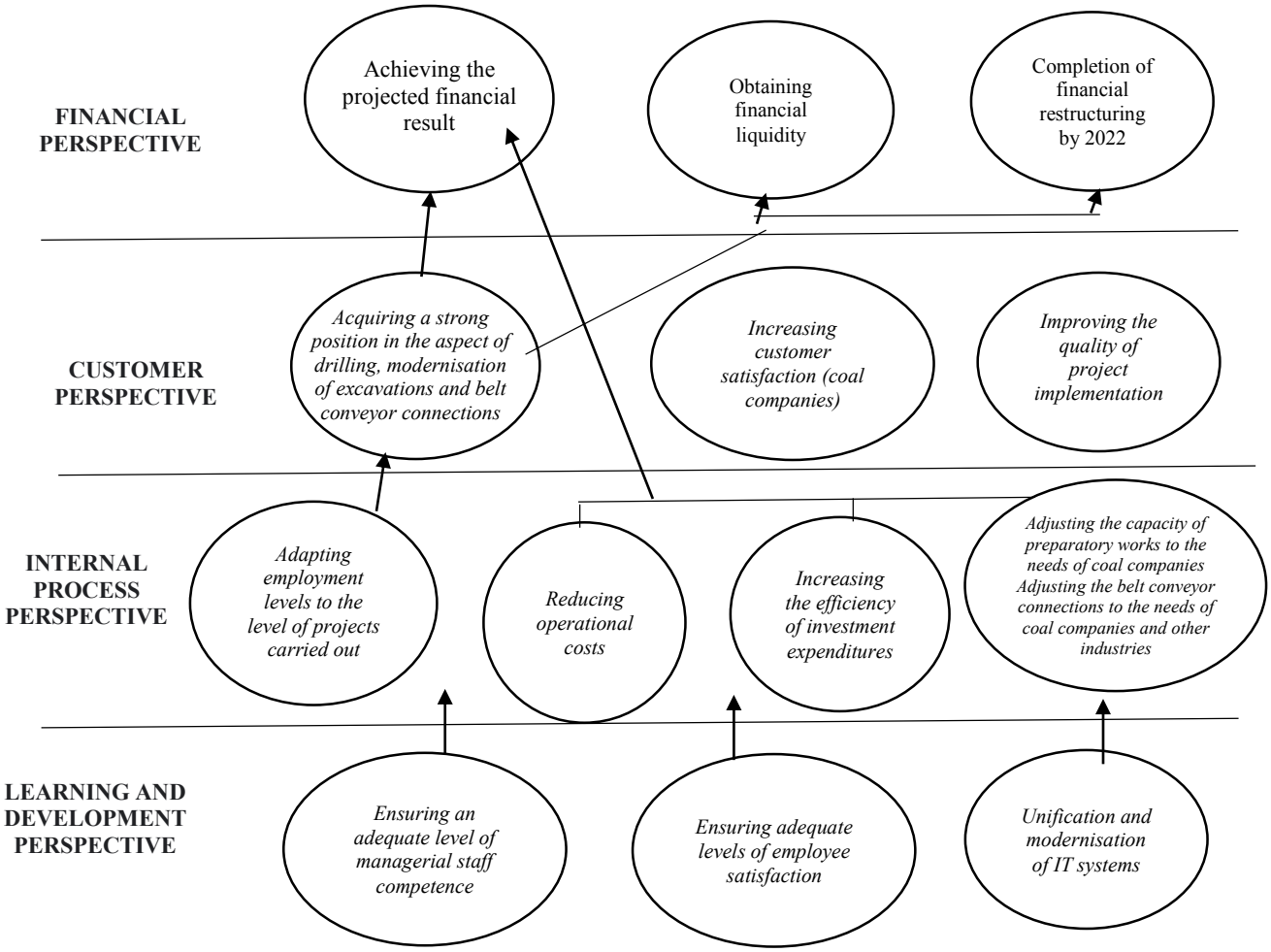

Figure 4. Strategy map in a mining services company. Source: Author's own elaboration.

The analysed company, based on a definition of strategic objectives contained in Tables 2-5, adopted the achievement of the predicted net financial result as the dominant strategic objective. The purpose of the individual indicators presented is only to provide information regarding the extent to which the objective has been achieved. To achieve the strategic objectives, it becomes necessary to determine the actions to be taken for each objective. To achieve the strategic objective, it is, therefore, necessary to achieve other objectives. An overview of links between the objectives referred to below for achieving the projected net financial result as the dominant and long-term strategic objective is shown in Fig. 5.

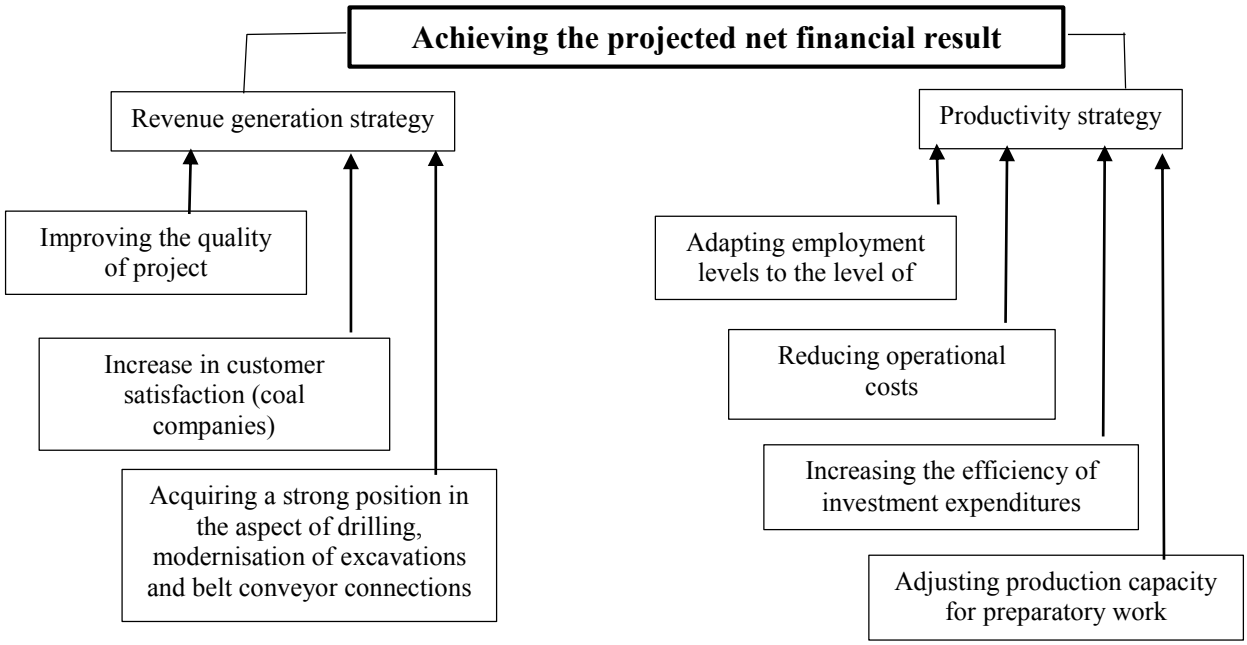

Figure 5. Links between specific objectives to achieve the expected net financial result as the dominant and long-term strategic objective. Source: Author's own elaboration.

5. Effects of the Balanced Scorecard application

The implementation of the Balanced Scorecard in a mining services company has brought certain results. The first noticeable effect after applying the balanced scorecard was the showcasing of cause-and-effect relationships that lead to the achievement of the intended objectives. The mining services company learnt to measure their performance in terms of the objectives set. The tangible benefits of using the balanced scorecard in the context of four perspectives are presented below.

a. The effects of implementing the balanced scorecard in the financial perspective
   As defined in paragraph 4 of the article hereby, the dominant strategic objective is to achieve a positive net financial result. The results are obtained by analysing the return on equity (ROE). After introducing the balanced scorecard, the mining services company obtained:
   - an increase in ROE of 0.4 percentage points compared to the previous year when the balanced scorecard was not used,
   - an increase in the profit of 6% year-on-year (the year without the balanced scorecard to the year with the balanced scorecard),
   - an increase in the annual sales revenue by 4%,
   - reducing operational costs by 8%.

The implementation of the described objectives resulted in a significant improvement in the situation of the entire company despite the difficult situation of the external business environment (restrictions on business activities in the shrinking hard coal market). The higher profit resulted in greater opportunities in investment activities. The mining services companies under review used the generated resources to finance development activities, which resulted in a partial change of the business profile from typical mining services to mining and tunnelling services.

b. The results of implementing the balanced scorecard from the customer's perspective

Creating a positive public image among customers of a mining services company has been identified as a key objective in this perspective. Customers are understood to be individual coal companies and their constituent mining companies. In this regard, it was assumed that the best way to satisfy the customer was to complete the mining projects within the timeframes contained in the detailed requirements of the orders and the defect-free partial and total acceptances. Table 6 presents a comparison of the years in which the balanced scorecard was used and the years in which it was not used.

Table 6.
Problems in the course of project implementation occurring in years with the use of the balanced scorecard up to the year when it was not used

Problems in the course of project implementation	The year without the balanced scorecard application	The year with the balanced scorecard application
Failure to issue an invoice due to defects in sub-commissioning, i.e. monthly on time. (the client makes a positive acceptance after the removal of defects following a protocol acceptance)	6	2
Contract withdrawal for reasons attributable to the Contractor	1	0
For delays in the removal of defects identified at the acceptance of the subject of the contract or during its warranty period	2	0
In the event of delay in performing the subject of the contract	2	1
In the case of not employing persons indicated in the named l list of persons	5	0
Other (taking property, coming to work under the influence of alcohol, etc.)	3	0

Source: Author's own elaboration.

The achievement of the set objective is directly reflected in the number of contractual penalties. In the year in which the company implemented strategic management using the balanced scorecard, it achieved savings of PLN 1.2 million, i.e. much less was spent on paying contractual penalties.

c. The effects of implementing the Balanced Scorecard in the perspective of internal processes

In the context of this process, the company has restructured its workforce. Table 7 shows employment before the introduction of the balanced scorecard as a strategic management tool up to a year when the balanced scorecard was used.

Table 7.
Employment before the introduction of the balanced scorecard as a strategic management tool up to one year with the application of balanced scorecard

Employment ratio of administrative and office employees to employees working in production (underground)	30-70	18-82
Total number of employees for a similar number of projects (Execution of 3 projects at the same time)	500	420

Source: Author's own elaboration.

The reduction in the number of full-time and production jobs has resulted in higher productivity, i.e:

- overall productivity by 5%,
- underground productivity by 3.4%,
- annual productivity by 4.6%.

The application of the balanced scorecard made it possible to reduce the costs of the company's activities in terms of project-specific disbursement of supplies. Savings on this account reached 8.4%.

d. The effects of implementing the Balanced Scorecard in a development perspective

The main objective in terms of the development perspective was to ensure comprehensive development in particular of human resources and subsequently of intangible resources. With this aim in mind, the number of courses and training for physical workers as well as managers has been increased compared to previous years where no balanced scorecard experience was used. Table 8 provides an overview of the course (training), approvals with annual growth after applying the balanced scorecard (%).

Table 8.
Overview of the course (training), approvals with annual increase after applying the balanced scorecard (%)

The name of course (training), approval	Annual growth after implementing balanced scorecard (%)
Approval for a person responsible for senior supervision (mining, power machinery blasting)	50
Basic specialist course in blasting methods	120
Scraper conveyor operating course	45
Self-propelled face machine operating course	50
Self-propelled face machine drilling trucks operating course	0
Self-propelled face machine roadheader operating course	80
Course for operators of stationary and mobile winches and hoists controlled from the working level	120
Crane rigger course	60
Diesel driven mine suspended monorails handling course	200
Ward orderly course	20

Source: Author's own elaboration.

The presented specific objectives for the development of human resources have been oriented towards raising professional qualifications and building highly motivated human potential. As regards the development of intangible resources, an integrated IT system has been implemented.

The proposed activity has allowed mining services company to be flexible in directing resources to individual projects and to adapt to a varying number of projects.

6. Conclusions

The implementation of the Balanced Scorecard in mining service companies should result in the completion of the following actions:

1. Establishing a strategic management system consisting of:
   - Strategy implementation monitoring,
   - adapting the company's organisational structure to the needs of strategy implementation and monitoring,
   - appointing a leader of changes, who will at act as a strategic management system manager at the same time,
   - launching projects within the project management system for the implementation of one-off tasks.
2. Developing a Balanced Scorecard for the implementation of mining projects (excavation, modernisation, etc.) and projects concerning conveyor belts, which must coincide with the established strategic objectives of the entire company.
3. Creating a system for monitoring the implementation of the strategy by monitoring the adopted metrics, within which the following activities should be carried out:
   - monthly operational reviews to compare short-term results with the targets set in the annual Technical and Economic Plan,
   - quarterly strategic reviews analysing the annual trend of metrics,
   - annual strategic reviews analysing long-term trends in the development of metrics to assess the achievement of strategic objectives.
4. Updating the strategy and Balanced Scorecard as a result of annual strategic reviews.

The literature research carried out and the example presented show that the SKW concept is a tool used not only to monitor company management processes, but above all it is a tool aimed at implementing the company's strategy. The answer to the need for continuous improvement of management processes in mining service companies, adapting to the changing environment with limited financial and human resources, may be the transformation of the strategy into an appropriate set of projects and programmes. The starting point for this process

is the SKW, which shows what actions (initiatives, undertakings) should be taken to achieve the strategic goals. The example presented will be used for further research on project portfolio construction and management in mining service companies.

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PLACEMENT PROSPECTS OF THE BUSINESS IN TERMS OF PANDEMIC THREATS

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Purpose: The COVID-19 pandemic demonstrated that global production chains significantly reduce the security of states and companies: in the face of problems with the movement of goods and people, there have been disruptions in the supply of goods. States and companies should influence the location of safety-critical businesses by limiting their acceptable space. This means the need to form a list of businesses that are important to the security of the state or company and are sensitive to pandemic threats, as well as the need to establish acceptable placement for such businesses. To assess the prospects of business placement in terms of pandemic threats, it is necessary to improve theoretical approaches to the study of factors of business placement. On this basis, it is possible to conduct a qualitative study of pandemic threats as factors in the placement of businesses and to develop recommendations for states and companies to limit the space for the acceptable placement of relevant businesses.
Design/methodology/approach: Morphological analysis is used as the main research method.
Findings: It is advisable to divide the business placement factors into internal factors, which are generated by the "business" side and external generated by the "place" side, as well as for the past, present and future. Internal and external factors of business placement form complementary pairs of factors, which are characterized by the strength of the impact, as well as the possibility of artificial creation, cost and duration.
Originality/value: Business placement factors need to be investigated over time, for which it is advisable to use the term PPF-research (past-present-future-research). Pandemic threats were in the past, are now and, with a high probability, will be factors in the placement of many types of business in the future. Business placement under the influence of pandemic threat factors in targeting sales markets sharply increases the attractiveness of production using 3D printing technologies, the widespread and continuous improvement of which should become one of the priorities of the innovation policy of states and companies in Europe.

Keywords: business placement, pandemic, placement factors, safety, 3D printing.

Category of the paper: Research paper.

1. Introduction

The COVID-19 pandemic has demonstrated that global production chains significantly reduce the security of states and firms: in conditions of problems with the movement of benefits and people, there have been significant interruptions in the supply of important benefits (Nicola, 2020). At the beginning of the coronavirus epidemic, hospitals in European countries lacked masks, ventilators and disinfectant gel. Pharmaceutical wholesalers, like pharmacies, have continually worked to ensure widespread access to medicines, but this has not always been successful. Many of the active ingredients used in pharmaceutical factories in Europe are manufactured in China. For example, in France, paracetamol is no longer produced, and 97% of antibiotics for the US market are imported from China. There are many examples of the dependence of the markets of many countries on imports from distant countries, and this dependence is often characteristic of strategic benefits. The threat of disruptions in the functioning of global value chains was recognized earlier, but there was no impetus for decisive changes.

The epidemic may prompt multinational corporations not to concentrate too much production in one country or region. Moreover, the likelihood of future epidemics of communicable diseases may prompt countries to pursue policies of producing strategic benefits within their own borders. This idea, in general, is not new, since, for example, the concept of Autonomous Energy Regions has long existed, according to which certain regions of the state, for the purpose of energy security, should be self-sufficient in energy production. It is expected that along with ensuring energy security, this concept, which involves the active use of renewable energy sources, will stimulate ecologically safe local socio-economic development in energy, agriculture, transport, and construction.

From the point of view of taking into account pandemic threats, states and firms should influence the placement of business that are important to security, limiting the space for them to accept. This means the need to form a list of businesses that are important to the security of the state or company and are sensitive to pandemic threats, as well as the need to establish acceptable consumer accommodation spaces for such businesses.

Dividing benefits into categories, it will be necessary to remember not only about finite benefits, but also not completely (resources), which are necessary for the production of final benefits, and their category in terms of the boundaries of the placement space should be associated with the category of the corresponding final benefits. It is quite possible to produce strategic benefits and resources for their production within the respective clusters.

To assess the prospects for placing a business in conditions of pandemic threats, it is necessary to improve theoretical approaches to the study of factors of business placement. On this basis, it is possible to conduct a qualitative study of pandemic threats as factors in the placement of business and to develop recommendations for states and firms to limit the space for the permissible placement of relevant businesses.

2. Pandemic threats as a factor in business placement

In the process of scientific research of the existing or justification (forecasting) of the future placement of a business, it is indisputable that it is expedient to identify the factors of placement, that is, the reasons that need to be taken into account when justifying (predicting) future placement (answering the question "where?") or explaining the previous or existing placement (answering the question "why here?") business. The study of business placement factors was carried out from the beginning of the emergence of economics (Allen, 2014; Beckmann, 1968; Blaug, 1979, 2006; Brown, 1979; Fujita, 2004, 1999; Hirsch, 1967; Hoover, 1948; Isard, 1956; Krugman, 1995, 2010; Lejpras, 2012; Lloyd, 1977; Losch, 1954; Marshall, 1890; Moses, 1958; Perroux, 1950; Sheppard, 2017; Torre, 2005, 2000; Venables, 1996; Weber, 1929), however, along with the division of placement factors into internal (properties of the "business" side) and external (properties of the "place"), as well as for the past, present and future, it is advisable to consider them simultaneously in the space-time dimension (Table 1).

Table 1.
Dimensions of business placement factors

Spatial dimension of business placement factors	Time dimension of business placement factors		
	past	present	future
internal	inpa	inpr	infu
external	expa	expr	exfu

Source: own development.

The study of the former factors of business placement is important not only from a historical point of view (what were these factors and how correctly they were identified), but also from the point of view of the present and the future, since for this one can use the corresponding dependencies and trends from the past.

It is advisable to start the study of business placement factors with an analysis of the properties of the technology that is planned to be used for the production of benefits. Technology can be defined as a spatio-temporal system of a combination of resources for the production of benefits. It is the resources and their consumption rates that identify the technology, allocate it. It should be emphasized that in addition to the desired benefits, the result of the functioning of the technology is also the so-called undesirable benefits (waste), the use of which is technically impossible or economically inexpedient under existing conditions. Each technology will be characterized by the point in time and in what volumes during its operation which pollution will be formed. Obviously, information on pollution from the application of technology could be considered in terms of production costs by taking into account the costs of compliance with environmental regulations. However, the places may differ in the mechanism of environmental regulation, predetermine the need for the calculation of the corresponding costs tied to a specific place. Therefore, the component of production costs, which would take into account the costs of compliance with environmental standards in the relevant place, is advisable to consider separately.

Thus, the properties of the technology, which are at what time and in what volumes during the implementation of the corresponding technological process the resource should be used, as well as in what time and in what volumes which pollution will be formed, can be factors that should be taken into account when the choice of the place of production of the benefit. Compiling an ordered list of characteristics (properties) of technologies we will have: the moment of the emergence of the need for resources or the formation of pollution; the resource is required at the specified time; how much of the specified resource is required; which pollution is formed at a specified time; the amount of pollution generated.

This implies the need for information on the characteristics (properties) of the resources that are used in the course of the corresponding technological process, and the characteristics (properties) of the contaminants formed when applying the corresponding technology. Thus, after analyzing the characteristics (properties) of a technology, there is a need to analyze the characteristics (properties) of the resources and pollution corresponding to it.

A resource is everything that can be used in the technological process for the production of benefits. Obviously, the characteristics (properties) of resources are extremely diverse and each of them can be assessed from the point of view of the impact on placement. These properties, in particular, are: mobility; the physical state; safety (during storage, transportation, use) specific gravity and the like. It should be emphasized that labor resources (including the person who chooses the place for the business) with their specific properties also belong to resources. Resource properties can be factors in business placement.

The characteristics (properties) of the pollution are different, including: physical state; level of aggressiveness; toxicity level; duration of "life"; propagation distance, etc. The properties of the pollution can be factors in business placement.

Benefit is the result of the functioning of technology. The characteristics (properties) of benefits are extremely diverse, in particular: mobility or immobility; the physical state; safety (during storage, transportation, use) specific gravity; malleability and the like. The properties of benefits can also be factors in the placement of the respective business.

The properties of technologies, corresponding resources, pollution and benefits form the properties of the "business" side. The properties of the "business" side determine the appropriateness of its orientation when placing in places that have the qualities of conformity to the specified properties. There is a relationship between the properties of a business and the properties of places, since some property of a place corresponds to each property of a business.

Let's focus on the properties of places. A place is a part of a space, somewhere or someone can be accommodated. Characteristics (properties) of places is extremely diverse, in particular: location relative to sales markets; availability; environmental quality; availability of resources; resource prices; bearing capacity of soils; geometric parameters; legal; neighborhood; compliance with the destructive influences of nature and the like. It is obvious that the properties of the place can be factors of the placement of the business.

Establishing a correspondence between the properties of the parties "business" and "placement" and the factors of placement, it should be emphasized that only some of the properties are factors of the placement of the business. That is, there are properties of the "business" side, some of which may be factors of placement. It depends on them what places it is advisable to look for for a business. Each property of the "business" side will correspond to a certain property of the "placement" side, which should also be considered a placement factor. Thus, in each case, answering the question "where?" or to the question "why here?", it is necessary to show not individual factors of placement, but their pairs: the factor of placement is internal – factor of placement is external.

It is obvious that each specific case of business will be characterized by a number of properties of the "business" side and the corresponding properties of the "place" side. Then it remains to find places with such a set, which will be considered places of possible business placement.

Both external and internal factors of business placement can be characterized by the force of action, as well as the possibility of artificial creation, cost and duration of this. The strength of the factors of business placement, obviously, is different for different combinations of the "business" side – the "place" side, and is determined by their influence on the indicator, which is taken as a criterion for choosing a placement. Here it is worth talking about three levels of impact – decisive (as is the case, for example, immobile resources or immobile benefits), important (25-75% influence on the criterion for choosing a place), usual (up to 25% influence).

Business placement factors need to be investigated over time, for which it is advisable to use the term PPF-research (past-present-future-research). It is clear that the factors of business placement in the PPF study will always relate to the places and technologies of production of specific benefits. Therefore, we can talk about PPF-research of places, PPF-research of technologies and, if necessary, PPF-research of industries (in the sense of producers of identical benefits within a certain spatial unit, for example, region, country, etc.). Since the production of identical benefits can occur with the help of different technologies, the PPF-research of the industry will simultaneously be the PPF-research of technologies used in the industry to produce the corresponding benefit.

Pandemic threats have been, are and will be factors of business placement. At the same time, the internal factor is the value of the benefit, the production of which is planned to be located for the state and firms, and the external factor is the space that is permissible for placement in terms of pandemic threats: the EU, a separate state or smaller spatial units within a separate state. Having established the value (category) of the benefit, we, thereby, establish the space for the permissible placement of its production, and within this space, focusing on the factors of placement of production; we establish the possible places of production of the benefit.

3. Formation of business placement factors

As for the artificial formation of business placement factors, a whole field for scientific activity opens up here. Firstly, not all factors of business placement are subject to such creation. Secondly, it is obvious that great opportunities for the artificial creation of business placement factors are on the "place" side, although the "business" side may have the potential for this and the actual use of this potential may give good non-obvious prospects in managing the placement process. Third, the artificial creation of business placement factors will require financial and time costs, and automatically form the need to justify the economic feasibility of this.

It is obvious that the experience of state influence on the activation of the economic development of regions gives many examples of factors of business placement of an artificial nature. According to the criterion of the object of state influence, measures to artificially create factors for the placement of a business can be divided into four groups: measures that would reduce the cost of producing benefits when placing a business in the places desired by the state; measures that would reduce the cost of transporting benefits to sales markets when placing a business in the places desired by the state; measures that would make it possible to sell benefits produced in the places desired by the state at prices higher than market ones; measures to reduce taxation of business profits when it is located in the places desired by the state.

Measures that would reduce the cost of manufacturing products when placing a business in the places desired by the state may relate to one-time (investment) and current costs. Reducing investment costs is possible with the help of: infrastructure development of the territory at the expense of the state; partial compensation by the state of investment costs (including the cost of acquiring a land plot necessary for business); reduction of taxable profit of business entities making investments in places desired by the state. Reducing operating costs can be achieved by lowering the prices of resources needed to produce benefits, as well as by reducing the costs associated with the delivery of these resources. The state can achieve lower prices for resources by partially compensating current costs. Reducing the costs associated with the delivery of resources concerns, first of all, transport and storage costs, as well as customs duties and value added tax. The state can reduce the costs associated with the delivery of resources by adopting an appropriate administrative decision (this concerns, first of all, customs payments and value added tax, but partly transport and storage costs) and through partial compensation of transport and storage costs.

Like the current cost of producing benefits, the state can reduce the costs of transporting benefits to consumers. This can happen both by making an appropriate administrative decision to reduce the prices for the transportation of benefits produced in the respective regions, and by partially compensating the state for the cost of transporting benefits. Taking into account the ambiguity of the policy of state intervention in pricing, especially in the form of making administrative decisions, these measures can be recommended only in cases when they concern

natural monopoly enterprises. This is a fairly large sphere of the economy, in which both the production of many important resources and the provision of various transport services are carried out.

An extremely important state measure to increase the attractiveness of places for business is the creation of a resource "qualified personnel" (through targeted training of specialists or their involvement from other regions and countries). Describing a business in terms of placement, we can talk about "business cats" and "business dogs". This name is a derivative of the long-established fact that "a cat gets used to a place, and a dog gets used to a person". Accordingly, "business cats" are more focused on immobile factors of placement (availability of a resource source, infrastructure, climate), and "business dogs" are not closely tied to a place, and their placement is highly dependent on skilled workers, who are a fairly mobile resource. ... It is with the attraction of highly qualified personnel that the expectations of the accelerated development of regions, devoid of other factors of business placement, are often associated. Places with a high quality of life attract highly skilled workers and thus become attractive to "business dogs".

As for the artificial creation of internal factors of business placement (technologies, resources, pollution, benefits), the possibilities are significantly less, but they also exist. The producer can go by changing the technology of production of benefits (for example, the production of cement by a dry, rather than wet, method, can neutralize the factor of cheap water resources during placement), replace certain resources (for example, use electricity instead of natural gas, which can neutralize the factor of cheap gas when placement), the use of environmentally friendly raw materials (for example, coal with a low sulfur content, can neutralize the factor of low costs of emissions prevention or the factor of low requirements for environmental impact), orientation to areas with a positive image for prospective consumers of benefits (for example, environmentally friendly regions for agricultural production, which can offset the factor of low production costs). Obviously, in order to make a decision on the feasibility of artificially creating an internal or external factor for placing a business, you will need to know the financial costs and duration, as well as the economic effect of this. At the same time, one should not expect to receive universal recommendations, since everything will depend on the specifics of the region and industry.

4. The need for government support for 3D printing

With the exacerbation of the requirements for the space for the permissible placement of strategic benefits in the context of pandemic threats, the state should support projects in various ways that facilitate the placement of production responses near sales markets. 3D printing technology is undoubtedly the most important of such projects, which necessitates the

introduction of a special program to support research in this area and stimulate the placement of production of benefits near sales markets. Organization of production of benefits using 3D printing technologies is associated with the need for such resources (Stadnicki, 2018):

1. printing devices – 3D printers,
2. electricity,
3. materials for 3D printing,
4. software,
5. work related to the maintenance of the 3D printing process,
6. technical infrastructure,
7. the space required to organize production.

The main factor in the spatial differentiation of production costs using 3D printing technology will be the spatial differentiation of the price of electricity and materials for 3D printing, since in different places the prices for 3D printers and software will be the same, and the cost of labor is associated with the direct maintenance of 3D printers. There will be little impact on total production costs. It follows from this that places (regions, countries) with a relatively low price of electricity and materials for 3D printing will be attractive for placing the production of benefits using 3D printing technology. However, it is worth noting that the advantage of low prices for electricity and materials for 3D printing can be offset by the difference between the cost of transporting benefits produced in a place with a lower price, and the cost of transporting resources to a place of production located near the sales market. Ready-made benefits, as a rule, are not adapted to the transport process; therefore, measures are applied to them aimed at increasing their transportability. For this reason, transporting resources for 3D printing will require fewer costs than transporting finished products. However, good transport infrastructure, lower logistics costs, can make places with relatively low prices for electricity and 3D printing materials more attractive for the production of benefits using 3D printing technology.

In a situation of relatively low spatial differentiation of production costs and taking into account the fact that materials for 3D printing will always be cheaper for transportation than finished products, the production of benefis using 3D printing in most cases will be advisable to be located near sales markets. However, in this case, it is necessary to assess the size of the sales market (in terms of area and demand for a specific product). There are many options, from the minimum size (production at the place of consumption, for example, in an apartment), to the maximum (production for the market of a territorial unit, such as a city). It can be assumed that it would be advisable to produce some benefits at the place of consumption (residence), but for economic reasons (small-scale production is not very effective) and because of safety conditions (noise, environmental pollution), in most cases production will take place in special premises and on a large scale. Then the factor of placement will be the corresponding amount of demand within the corresponding space.

The state, within the framework of supporting 3D printing technologies, should focus on supporting research on the development of these promising technologies (improving 3D typists, materials for 3D printing, software, technical infrastructure, improving the qualifications of technical personnel, improving the production space), as well as to reduce the cost of production as much as possible by eliminating import duties on 3D typists, materials for 3D printing, electricity, software. State support for the development of infrastructure for 3D printing, at least within the space of acceptable placement, will also be important.

The factor of the category of strategic benefits, that is, the factor of reliability of supply, can be taken into account in the matrix for the classification of benefits by factors of production placement (Stadnicki, 2020). It follows from this that the state only needs to correctly determine the category of the benefit from the point of view of the reliability of supply, and the space for the admissible placement of the search for optimal places for the production of this benefit will be determined automatically. Therefore, an important direction for further scientific research on the prospects for placing a business in the context of pandemic threats is to link the category of benefits from the point of view of security of supply with the space of an acceptable search for optimal places for producing benefits of the corresponding category.

5. Conclusions

The COVID-19 pandemic has demonstrated that global production chains significantly reduce the security of states and firms: in the face of problems with the movement of goods and people, there have been disruptions in the supply of important benefits.

From the point of view of taking into account pandemic threats, states and firms should influence the placement of business that is important to security, limiting the space for them to accept. This means the need to form a list of businesses that are important to the security of the state or company and are sensitive to pandemic threats, as well as the need to establish acceptable consumer accommodation spaces for such businesses.

To assess the prospects for placing a business in conditions of pandemic threats, it is necessary to improve theoretical approaches to the study of factors of business placement. On this basis, it is possible to conduct a qualitative study of pandemic threats as factors in the placement of business and to develop recommendations for states and firms to limit the space for the permissible placement of relevant businesses.

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it is necessary to show not separate factors of placement, but their pairs: the factor of placement is internal – factor of placement is external.

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As for the artificial creation of business placement factors, a whole field for scientific activity opens up here. Firstly, not all factors of business placement are subject to such creation. Secondly, it is obvious that great opportunities for the artificial creation of business placement factors are on the "placement" side, although the "business" side may have the potential for this and the actual use of this potential may give benefit non-obvious prospects when planning the placement process. Third, the artificial creation of business placement factors will require financial and time costs, and automatically form the need to justify the economic feasibility of this.

With the exacerbation of the requirements for the space for the permissible placement of strategic benefits in the context of pandemic threats, the state should in various ways support projects that facilitate the placement of production responses near sales markets. 3D printing technology is undoubtedly the most important of such projects, which necessitates the introduction of a special program to support research in this area and stimulate the placement of production of benefits near sales markets.

The state, within the framework of supporting 3D printing technologies, should focus on supporting research on the development of these promising technologies (improving 3D typists, materials for 3D printing, software, technical infrastructure, improving the qualifications of technical personnel, improving the production space), as well as to reduce the cost of production as much as possible by eliminating import duties on 3D typists, materials for 3D printing, electricity, software. State support for the development of infrastructure for 3D printing, at least within the space of acceptable placement, will also be important.

The state only needs to correctly determine the category of the benefit from the point of view of the reliability of supply, and the space for the permissible placement of the search for optimal places for the production of this benefit will be determined automatically. Therefore, an important direction for further scientific research on the prospects for placing a business in the context of pandemic threats is to link the category of benefit from the point of view of security of supply with the space of an acceptable search for optimal places for producing benefits of the corresponding category.

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ORGANIZATION AND MANAGEMENT SERIES NO. 155

IMPLEMENTATION OF SYNERGETIC PLANNING FOR FACTORY

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Purpose: This paper studies the role of the implementation of synergistic planning in manufacturing plants as a method for unifying in one system reorganization or re-planning processes. The higher quality of technological design is the more effective design of industrial plants can be. Performing the analysis of technological plans together with architectural and construction plans before construction starts enables achieving competitive advantage already at the design stage, what in consequence leads to the increase of design efficiency, costs reduction, and the improvement of cooperation within design teams.
Design/methodology/approach: The emphasis is placed on the joint design data for which the correct synergistic relationships between the projects arise. The existing synergy between technological planning and facility planning makes it possible to consider re-planning as a single system. The main contribution is detailed analysis of connections between synergetic planning phases. Rational re-planning is performed according to Layout Design Methods using CAD tools and BIM technology. The former is also used in factory planning as a combined design software. In the publication, the authors present an original 8E method as a framework for synergetic planning.
Findings: The paper provides an approach to synergetic planning, describes stages of synergetic design, functional and spatial scheme of the assumptions of the concept of 8E.
Practical implications: Due to the Synergetic Factory Planning, it is possible to generate a solution, which enables the implementation of the project in accordance with the requirements of each design area.
Originality/value: The contribution of this paper is an original OLESTR method which is based on synergistic planning and oriented towards practical aspects of planning. The OLESTR method can improve planning new industrial plants as well as redesigning existing ones.

Keywords: facility planning, technological planning, synergetic planning, technological and architectural design.

Category of the paper: Research paper.

1. Introduction

Nowadays, solutions using renewable energy sources (RES) – starting from solar and photovoltaic panels, through heat pumps, and ending with wind energy – get more and more frequently implemented in manufacturing plants. Manufacturers need to satisfy the requirements corresponding to the Technical Conditions for 2021 which not only allow the use of renewable energy sources but also reduce operating costs and investment costs. For that reason, it is necessary to implement "Intelligent Architecture in the Factory" – the concept focused maximizing synergy at every stage of design and planning processes. The distinguishing feature of intelligent architecture are great adaptability to factory reconstruction and ecological balance. Furthermore, this approach is in line isp smart factory concept which emphasizes variability and flexibility of a factory's functions, possible constant adaptation to the environment, and modularity. Contemporary approach to planning must include balance between the natural environment and a factory's needs, this is maximization of technological solutions affecting production quality is necessary (Hellmuth et al., 2020).

2. Synergetic Planning

The Intelligent Architecture focuses to the highest possible extent on the "3R" principle: reduction-revitalization-recycling. This concept refers to the priority for reconstruction and transformation of already used spaces instead of taking new pieces of land. A smart factory concept dictates innovative solutions in the context of global changes, transformations, and trends as well as alternative and pro-ecological solutions. Using natural resources during a factory construction and using renewable resources during the exploitation process are the key elements of synergy, so that the production environment can be attractive in terms of maintaining natural resources.

Furthermore, the construction project plays a key role in the search for synergies between projects run in parallel. Their execution takes place at the same time, so it can result in: the exchange of current information, the implementation of changes, the search for the optimal solution within a strictly defined period, and the synchronization of current project data. Therefore, close cooperation of project teams allows finding an individual approach to each implemented project and achieving the synergistic effect, which is expressed in effective control of the planning process. This approach helps avoid potential mistakes made when project teams work separately. From the perspective of processes, among the main components of concept formation may be listed: productivity, quality, production time, product life cycle, etc., while the spatial perspective concentrates on: ecology, energy, identity,

and communication. It should be noted that variability and ergonomics are common components of these two perspectives. It is generally assumed that synergy is the interaction of various areas/factors between which proper functional relations arise and their effect is greater than the sum of individual separate interactions (see Fig. 1).

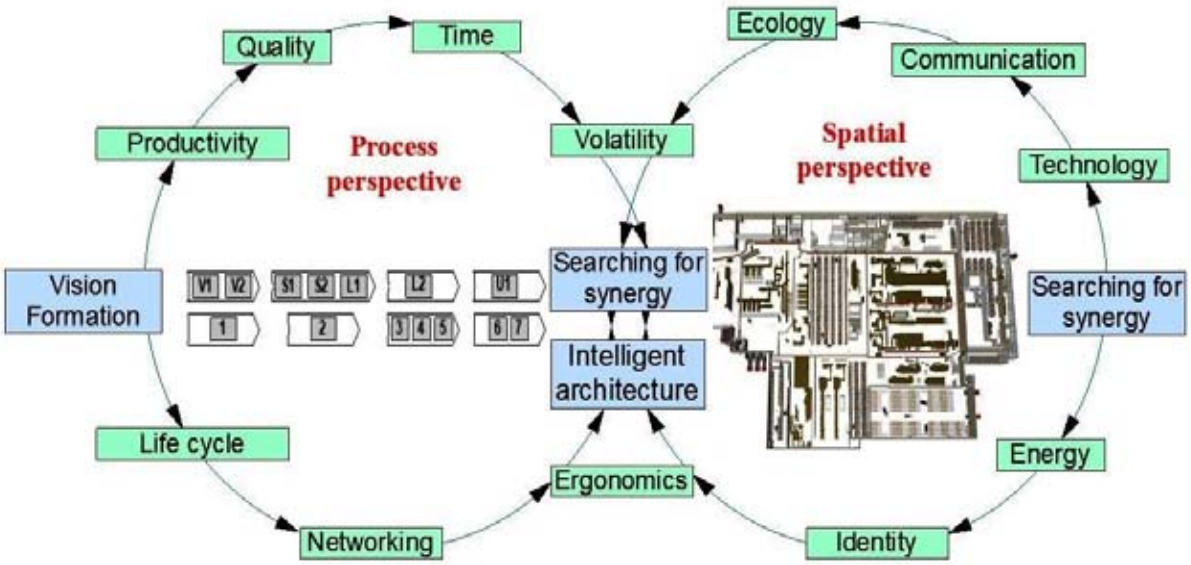

Figure 1. An approach to synergetic planning. Source: (Stryhunivska, Karkula, 2018; Stryhunivska, 2019; Wiendahl, Reichardt, Nyhuis, 2014).

For example, in order to start planning or redesigning a factory, it is needed to obtain primary information on at least the following issues: (1) company location, (2) master plan, (3) land development plan, (4) the layout of the factory's facilities, (5) the current spatial factory layout, (6) the layout of the existing production equipment. In addition, it is also necessary to obtain information about the availability of (1) utilities (water, gas and electricity supply, sewage and waste disposal, communication system), and (2) transport infrastructure and possible connections. The next group of needed information concerns the specific features of the factory with respect to: (1) production capacity, (2) assortment, products, and services, and (3) transportation means and logistics.

Above-mentioned pieces of information are utilized both when a facility is planned but also at every stages of design process. Technological planning covers production processes, whereas facility planning is focused on general design (architecture, installations, utilities, etc.).

3. Intelligent Architecture in an Industrial Environment

Economical, elastic, energy-saving, effective, ecological, ergonomic, efficient, enduring process (i.e. 8E) – these features constitute a genetic code of a planning process and without them the intelligent architecture cannot be user-friendly and rational. The 8E principle provides

a basis to which additional elements can be added if necessary. The 8E concept used in the study to which this paper refers was extended by adding modules representing location (including the climatic zone associated with the natural landscape), communication, and the management of intelligent systems in an industrial environment (see Fig. 2). The E8 modules should be identified to both a single factory as well as a set of factories combined together with manufacturing processes.

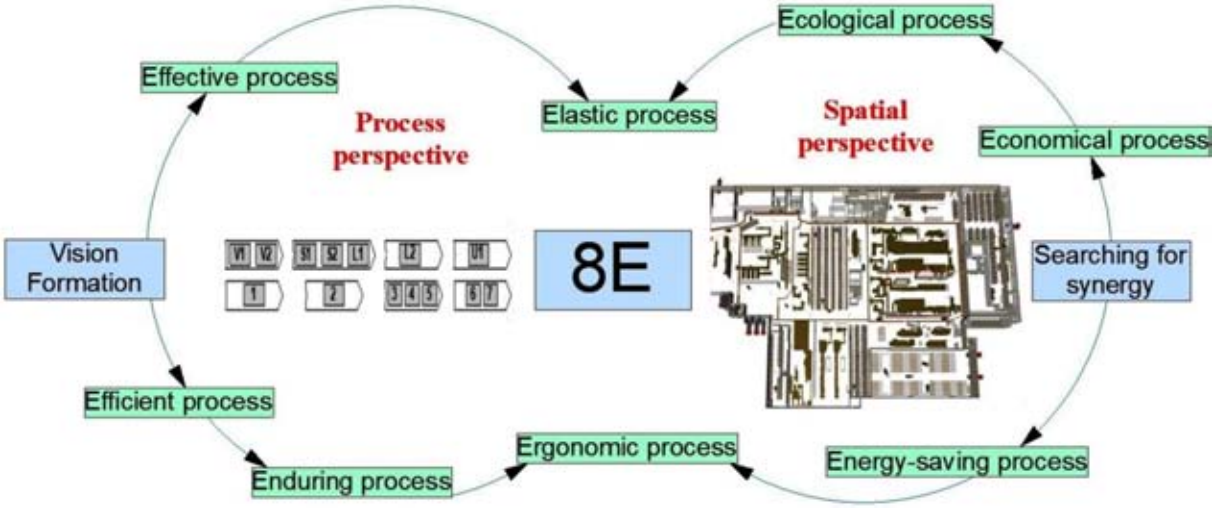

Figure 2. Functional and spatial scheme of the E8 concept. Source: own elaboration based on (Biskup, 2018).

E8 modules can be characterized in the following way:

1. Ecological process: the synergy of the industrial environment architecture with an innovative technological approach in the field of increasing the production capacity of equipment and in the field of technologies increasing Energy Efficiency (EE) or in the area of Renewable Energy Sources (RES) in the factory should be taken into account, and therefore should protect the natural environment in a manner, which emphasizes the selection of building materials; utilization of low built-in energy materials; utilization of natural and/or renewable energy sources (RES). For example, installations based on renewable energy technologies generate free energy (solar, wind, hydro, and geothermal energy).
2. Economic process: synergy in the context of rational solutions to technological processes considered during functional and spatial, as well as architectural and urban planning. Synergy aims at obtaining optimal parameters of financial outlays in the manufacturing process (construction process) and subsequent operation (production use process). Materials and construction solutions should be attractive in terms of economic analysis of utilized materials and construction solutions utilized.

3. Energy-saving process: synergy thanks to which the appropriate location, architectural form of the factory as well as material and technological solutions will contribute to the optimization of energy efficiency. The use of installation and technological solutions that obtain thermal energy from unconventional sources, but affect the saving of natural resources and the use of renewable energy sources.
4. Ergonomic process: synergy thanks to which the considered impact of design on the entire society in a way to increase security, carrying out an analysis of the social construction of value systems applied to diverse human and non-human work.
5. Enduring process: synergy influences the creation of an enduring process in production, in which technological tasks are closely intertwined with the tasks of spatial planning. All these tasks are subordinated to a single goal, to ensure an enduring process in the factory.
6. Efficient process: it is a synergy in the parallel development of architecture, technology, and production. An effective process covers the entire area of improving architectural planning and ensuring effective technological planning and is characterized by modern forms of their development.
7. Effective process: synergy further develops the 'Effective Process Time' modeling framework for the performance analysis of manufacturing systems and for the analysis of the efficiency of construction processes.
8. Elastic process – thanks to synergy, the idea was born to erect modular modeling, the so-called small repetitive blocks (modules) mapping simplified elements of an existing industrial plant into a certain logical whole, maintaining the relationship between production processes and applied technologies (Müller, 2012). With the modularity of the logistics area with all its components, the concept of flexibility was created, i.e., the ability to quickly adapt the production system within certain limits to changing factors with acceptable financial outlays. The presentation of changes could be visualized using a 2D layout and redesign of the modified area, as well as applying flexible, modular functional solutions of industrial space. Flexibility has been expressed in the factory's self-sufficiency process in terms of production (construction process) and use process (Biskup, 2018; Stryhunivska, 2019).

The components of a given module can be selected and blended according to the project requirements. Nevertheless, intelligent architecture does not exist only under the assumption that all selected technological criteria are met jointly. Its universal nature allows certain exclusions or individual extensions with additional parameters according to production processes.

4. Stages of Synergetic Design

As shown in Figure 3, the stages of production processes design (technological design) can be divided into the following phases: preparation, project structure, layout design, and implementation. Furthermore, the identification of technological substages is important. The first phase, 'preparation', consists of performing 'analyze of a company' (V1) and 'analysis of production processes' (V2). At this stage, the objective is to define the company's goals, to summarize information about the factors influencing design phases, to define the dynamics and structure of the implementation of changes, and to analyze the planning costs and project completion date. The next phase is about defining the structure of the project. The following substages of this phase can be distinguished: 'structure development planning' (S1) and 'design draft planning' (S2). They aim at determining the interrelationships between individual elements of the structure, so that the visual representation of these relations can be drawn using diagrams and sketches.

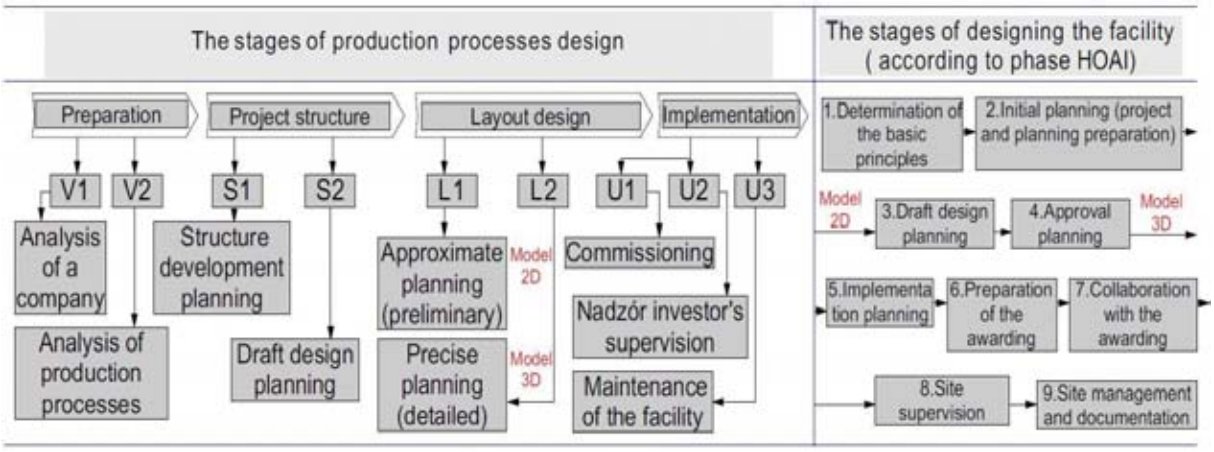

Figure 3. Stages of synergetic design. Source: (Stryhunivska, 2019; Synergetische Planung wandlungsfähiger Fabriken).

In addition, conceptual planning reproduced as simple outlines of the production hall highlights important planning aspects. Mapping both the space and the flow of materials which do not show any noticeable differences in relation to the design standards is possible during designing the layout. The following substages can be distinguished: 'approximate planning' (preliminary) (L1) and 'precise planning' (detailed) (L2), which are interdependent. The 2D spatial layout which duplicates the mapping of geometric dependencies in the form of approximate planning, does not include the requirements of the production process and spatial limitations. Moreover, it only presents an approximate estimation of investment costs, preliminary data, and design guidelines. Based on preliminary planning, a smooth move to the development of detailed plans in 2D and 3D (precise planning) can be done. At this stage, the infrastructure, technological machines, and all production processes are linked depending on the production areas. The final phase, implementation, consists of conducting

a commissioning, investor's supervision, and maintenance of the facility. Commissioning facilitates the handover of the plant and responsibility from construction to operations.

Analyzing the process of designing the facility according to the HOAI standards (German: Die Honorarordnung für Architekten und Ingenieure), resulted in identifying nine stages of this process, which can be gathered into three groups (HOAI, 2021):

Service phase HOAI 1-2: (1) determination of the basic principles, and (2) the initial planning (project and planning preparation).

Service phase HOAI 3-6: (3) design planning, (4) approval planning, (5) implementation planning, (6) preparation of the awarding.

Service phase HOAI 7-9: (7) collaboration with the awarding, (8) site supervision, (9) site management and documentation.

The course of creating the target system depends on updated information on the relation between technological design and changes in the spatial object design. Combining these two phases results in synergetic planning (Stryhunivska, 2019, Wiendahl, 2014). This approach allows planning production and spatial processes along with the life cycle of the facility. Note that synergy appears between technological and architectural designs due to the use of shared knowledge and the exchange of up-to-date information. Additionally, the active participation of project teams to create a ‘proper factory’ was conducive to coordinating the overall planning of the spatial layout according to the stages of the design of a synergetic industrial plant (Stryhunivska, 2019).

A sustainable future requires changes in both the approach to factory planning and the principles of designing the built environment. To create new concepts and solutions for a sustainable future, designers should derive knowledge and experience from the past, rely on the knowledge and technologies of the present, and introduce innovative systems and new methods in planning. Combining knowledge on factory design with technological processes run in it helps to rebuild synergy and obtain balance with the environment respecting natural conditions.

In the diagram shown in Figure 3, the steps: ‘analysis of a company’ (V1) and ‘analysis of a production process’ (V2) belong to the first stage of facility design: ‘determination of the basic principles’. ‘Project structure’ (S1, S2) and “approximate planning” (L1) correspond to the second stage of facility planning - ‘draft design planning’ and are mapped in the 2D model. Furthermore, ‘precise planning’ (L2) represents the third, fourth and fifth stage of designing an object which are mapped in 2D and 3D models. The above division seems to be the most important for obtaining a proper spatial arrangement with visualization. From the practical side, it would be advisable to conduct a study of appropriate methods that would allow quick and effective creation of a detailed layout considering the limitations, the possible implementing changes, and cost reduction. Another connection is represented by the ‘commissioning’ stage (U1) with the sixth and seventh phases of the facility design as ‘implementation planning. Finally, it is possible to find the combination of ‘author's supervision’ (U2) with the eighth and

ninth stages of facility planning into ‘implementation supervision’. Author supervision is an indispensable element of the service, which allows controlling the construction phase and compliance with the project (Neufert, 2012; Stryhunivska, 2019).

The last stage ‘maintenance of the facility’ (U3)/‘site management and documentation’ (the last stage of facility design) is visible in practice in the form of a 3D model as a functioning industrial plant. Combining the simulation of production processes and virtualization creates a model consistent with the synergetic factory planning concept.

It is worth highlighting that the use of digitization gives a chance to improve the process of designing an industrial plant. It also provides the possibility to optimize the selection of locations for the distribution of production lines with respect to manufacturing technology (Stryhunivska, 2017). Considering that the consumer with their needs should be placed first place at the center of implemented solutions, it is important to obtain the agility and flexibility of the industrial plant. It should be noted that digitization enables not only tracking of the production processes chain but also observing the processes from the moment when the raw material enters the warehouse through its processing until the preparation for shipment of the final product. Due to this fact, it is possible to analyze client's needs on an ongoing basis as well as predict future changes according to the client's vision. With the Synergetic Factory Planning concept, it is possible to come to a solution that enables making design changes even in the planning stage.

Therefore, Intelligent Architecture influences the optimization of functional and spatial solutions as well as the optimization of technological solutions in the factory; moreover, it focuses on synergetic, ecological, and sustainable design solutions. The following issues are important elements in the design process: economic and ecological aspects, energy efficiency, flexibility, location, management of intelligent systems in the factory, as well as communication. The implementation of synergetic planning within industrial plants serves as the use of ingenuity and technical knowledge to solve key aspects, including designing and building in harmony with the environment with respect to natural conditions. Finding a balance between environmental conditions and economic requirements is undoubtedly a challenge and proves a high ecological awareness.

5. Conclusions

In conclusion, the synergy between technological planning and plant facility planning enables perform it properly and to treat the reorganization processes or re-planning as a unified system. It should be emphasized that the factory design of the factory is based on the stages of synergetic planning with consideration of the spatial requirements of a tested plant and design standards. The prospects for further factory development of factories are based on the

integration of 3D visualization with modern design methods. Due to the visualization, it is possible to facilitate a 3D representation of the plant under examination and verify errors occurring during re-planning (Heragu, 2018).

This increases the agility of re-planning and enhances generation of correct decision variants. In order to present spatial planning processes in industrial plants in a systemic way, synergetic planning should be combined with modern design methods and their interdependence affecting the final result of replanning. One of such methods is the original OLESTR method which is closely related to synergetic planning and constitutes a practical approach to planning (Stryhunivska, 2019). Furthermore, the implementation of renewable energy sources during the design of the factory supports the transition to the concept of a "green factory". The transformation of a factory to use 100% renewable energy is a key step in development, as caring for sustainable development and local communities is a priority scribed in a long-term strategy of each enterprise. Furthermore, the purchase of clean energy is another element of the sustainable development policy in a factory.

It is worth mentioning that intelligent architecture in an industrial environment uses the newest technologies to shape and develop the concept of technological space. It presents how the production environment can be positioned against the backdrop of new spatial experiences and ecological solutions. Intelligent architecture goes beyond the design framework, as technology is not only designed to automate everyday activities, but also linked to synergetic design. However, new technologies are to influence intelligent shaping of industrial space, contact with it, and its improvement, however, without detaching it from the factors determining the architecture of sustainable development and the symbiosis of the production environment with nature. The industrial space of intelligent architecture is to have a positive impact on the quality of production and propose comprehensive technological solutions. The latter would address the issue that constitutes the core of intelligent architecture in the industrial environment, namely, the balance between ecology, which is rational from the point of view of economic issues in connection with energy efficiency, aesthetics, location, and communication as well as the method of managing systems that support the maintenance of synergy in further changes in design.

Acknowledgements

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INTERNAL CONDITIONS OF PROFESSIONAL ASPIRATIONS

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Purpose: The aim of this paper is to outline the theoretical approach of internal conditions of professional aspirations. It is to describe the essence of aspirations and its internal conditions.
Design/methodology/approach: The aim of the article was to organize, systematize and describe the knowledge about the role and essence of professional aspirations and its internal determinants. Methods: analysis, synthesis, deduction and induction.
Findings: In the course of the work were found results, which show the important role of aspirations in the area of human resources management.
Social implications: Publication of the article may contribute to increasing social awareness of the essential role of professional aspirations in human resources management in the organization and in the armed forces.
Originality/value: The article organizes and systematizes the knowledge about the professional aspirations and its internal determinants. It is addressed to managers, human resources workers as well as academic lecturers and soldiers.

Keywords: Professional Aspirations, Human Resources Management, Determinants of Aspirations, Psychology of Motivation, Ambitions.

1. Introduction

Constant changes in the world, which are determined by the dynamics of the market and economy, bring a constant need for newer and more effective solutions in the field of broadly understood management. The growing role of human potential, managed with greater care, makes a person together with a team of competences, as well as their aspirations as a strategic resource of the organization. The higher level in the organization, the more important it is. A person with the required competences for a given position determine the human resources management of subordinates with different potential, both in terms of competences and the level of professional aspirations. Described situation is also reflected in the Armed Forces of the Republic of Poland, because human capital is an equally valuable resource in all these organizations. Managing soldiers' careers by senior superiors and commanders seems to be

more and more important nowadays. According to the l subordinates' leadership predispositions, competences and aspirations superiors should support them in the further development of this career. This is an important element of the functioning of an organization, especially a hierarchical one, in order to retain soldiers in professional service, with a parallel, competitive private sector offering attractive employment conditions. To a large extent, retaining soldiers in the professional service thanks to the functioning of an effective career management system in line with the aspirations of soldiers, may lead to higher efficiency of the organization, which is based on experience and stimulates continuous professional development of its employees. The position of Szczepański is also known, saying that individual aspirations are one of the key factors determining the development of society and its proper functioning, as well as the driving force of the economy, which is rationally used and shaped as the foundation for the development of the population (Syrek, 1986, p. 12).

2. The Essence of Aspirations

Aspirations is an interdisciplinary concept. Therefore, many researchers representing different scientific fields have attempted to define them in various ways and understandings. When analyzing the content of the literature on the subject, one can most often encounter the concept of aspirations in the field of psychological, sociological or pedagogical research. They are also an inseparable component of management sciences because of their correlation with the set closer or more distant goals and life desires, regardless of whether the goals are related to career, science, art or starting a family. The aspirations in a large extent, determine whether a person undertakes given actions or directions and determine their intensity. They influence short and long-term plans and activate the unit to act in. Broadly speaking, aspirations can be identified with desires, intentions or wishes that relating to the effects of undertaken or planned activities. For the purposes of the publication, the author adopted the definition of aspirations according to Kamiński: **aspirations move one step ahead of the needs, related to the motivations for the tasks that a person sets herself.**

3. Determinants of Aspirations

This part will present the determinants of professional aspirations in classification presented by different authors. It is worth to note that in the case of classification a given factor can be classified only into one class. That arranging and synthesizing the image of various conditions is a quite hard task. This is due to the fact that we still have incomplete knowledge in this field.

To be specific the different levels of generality and scopes of statements relating to these issues, different strategies of learning about human aspirations, and determinants shaping these aspirations, as well as the diversity of sources and formulated hypotheses.

As mentioned earlier, aspirations can be shaped by various factors. Often these conditions are not realized, and sometimes even unknown by people. The factors may also appear in some relationship with each other, so their interdependence further complicates attempts at synthetic classification.

Despite difficulties described above, researchers are still interested in the subject of aspirations. It is an interdisciplinary complex issue, and at the same time requiring multi-faceted research spread over time due to the continuous process of shaping aspirations. The literature of the subject adopted a consistent range of factors that determine aspirations. However, the discrepancy in the classification of the research subject results from the multidimensionality of the issue and the differences in relation to the level of aspiration and their content.

As a result of establishing the aspirations' determinants, it will be possible to shape, strengthen, develop, or extinguish them. This has a major impact on the individual's subsequent choice of occupation or the preferred type of career. The most important determinants of aspirations include personality, environmental and pedagogical ones. As it is emphasized by Sikorski, the division of the aspirations' determinants is a synthetic creation, because aspirations are conditioned by a diverse set of factors, and their importance changes during the person life. The division is presented on Figure 1 below.

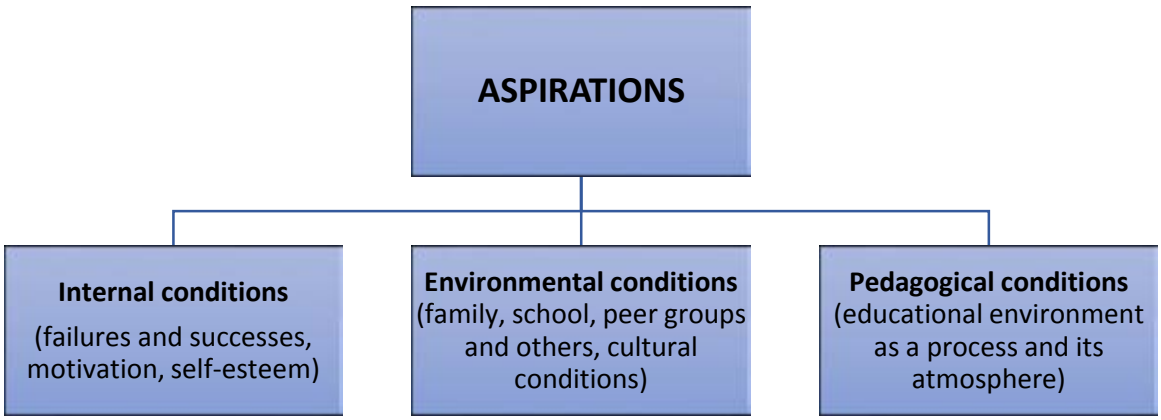

Figure 1. Division of determinants of aspirations according to Sikorski. Adapted from: „Aspiracje dzieci i młodzieży" by T. Lewowicki. Warsaw 1970 by PWN, 1970, pp. 28-39.

4. Internal (Personal) Conditions of Aspirations

People have different needs. These are mentioned as one of the many factors that determines aspirations. In sociology and psychology of motivation is written that the biological needs starting with the spiritual ones. Willingness to satisfy different types of aspirations is related to motivation. The willingness to satisfy their needs also stems from their exploratory and creative attitude towards the world (Janowski, 1977, p. 15).

A need for achievement is considered as a special kind of need. They are considered relatively constant properties that manifest themselves in different life situations. There are possible differences in the needs of achievements in relation to the field of activity, which affects the image of directional aspirations (types of aspirations). Regarding career aspirations, an elementary factor is the need for achievement, which is relatively permanent and typical of most personality types (Dyrda, 2009, p. 185). We will have to deal with professional aspirations in particular when the needs for achievements occur in the professional and educational sphere (due to the previously mentioned positive correlation) and the presence of such needs as: social recognition, security, self-fulfillment, affiliation and group membership. These factors determine the emergence of aspirations and their level (Skorny, 1980, p. 113).

According to Sikorski, among the personality determinants (otherwise psychological or subjective) of aspirations and their level it is distinguished: motivation, successes and failures, as well as self-esteem. In the 1930s and 1940s, studies were conducted which proved that there is a correlation between the level of aspiration and the successes and failures of the past. Successes increase, and failures decrease the level of aspiration. Based on the above, the individual assesses herself in terms of personality traits, predispositions and competences, which are psychological factors determining the occurrence of aspirations. A person's self-esteem is the result of ones life experiences, behavior, own and other people's opinions, as well as intelligence, physical conditions and, above all, personality traits (general and directional abilities, temperament and emotions) (Sikorski, 2005, pp. 11, 13).

The motivation process is an important element in creating aspirations. It directs human activities so that the intended goal is achieved. It is a process of mental regulation that energizes and directs human behavior; it can be conscious or unconscious (https://encyklopedia.pwn.pl…). This process depends on the usefulness of the target for the human and its probability – it must be greater than zero. According to Tomaszewski, the human motivation to act is zero when the probability of achieving the goal is zero (Tomaszewski, 1978, p. 182). There is a clear relationship between motivation and aspirations, because of the motive as the basis of the motivation process, which is the goal and a clear course of action where motivation is the source of that action (Dyrda, 2009, p. 182).

Delving into the theory of motivation (Feather, 1966, p. 13), we read that the level of aspiration depends on the following two motivational processes:

1. achievement motivation – the individual shows a tendency to take actions which, in her or his opinion, predict success,
2. avoidance motivation – no action is taken that is judged to be a condition for failure.

Achievement motivation undoubtedly influences the realistic assessment of human performance. Success determines the increase in the level of aspiration. It is associated with positive reinforcement, while failure similarly reduces the level of aspiration. People with strong achievement motivation are usually motivated to perform tasks of medium difficulty (probability of success 0.5 on a 0-1 scale). Success in this group of people determines the increase in the level of aspiration, failure similarly lowers this level. People who are weakly motivated undertake easy or very difficult tasks, where when the latter failure, it is easy to justify the cause of the failure. The above relationships have been demonstrated in numerous psychological studies. The above dependencies are explained in the so-called the first Yerkes-Dodson law, which says that the optimal level of motivation when performing tasks is motivation with a strength of about 0.5 (on a scale of 0-1) (Bednarczyk-Jama, 2008, p. 89), i.e. medium or slightly higher motivation (Buchodorska, 1972). These people are characterized by a low level of fear of failure, they are self-confident and persistent in achieving their goals, do not take risky actions and perceive their chances of success realistically. With regard to the high motivation of achievements, the aspirations of people who realistically assess their own abilities seem understandable, and undertaking medium-difficult tasks by them gives the chance of success and satisfaction with performing a task with an above-average degree of difficulty. Referring to the motivation of achievements, it can be assumed that people with high achievement motivation will show high professional aspirations, because, due to ambition, they will strive for the convergence of their profession and its level in the organizational hierarchy with their competences and professional qualifications (Skorny, 1980, p. 120).

Successes and failures are also important factors determining aspirations, especially their level. The increase in the level of aspiration in each behavior category after successful completion of a task is often used in teaching (Lewin, 1944). Professional aspirations will also be a balance of successes and failures during professional service, and they will shape the level of professional aspirations of soldiers.

A high or low level of (professional) task performance should always be assessed against an established frame of reference which, depending on the circumstances, may be (Skorny, 1980, pp. 70-75):

- a socially sanctioned norm that defines the expected results of an action (military norms),
- the performance previously achieved by the person,
- results achieved by other people (soldiers),
- subjective feelings of success and failure,

- significance of the goal in the hierarchy of human values (the higher the significance, the stronger the sense of success),
- the attractiveness and difficulty level of the task.

It should be noted that all relationships between the sense of success and the level of aspiration are very individual. They occur when carrying out tasks with an average level of difficulty, which is a specific reason for experiencing a given type of feeling success or failure (Hoppe, 1930).

Self-esteem is also a factor mentioned among the determinants of aspirations according to Sikorski. It favors a high level of aspiration while its index is also high and vice versa. This regularity applies to both different types of self-esteem and aspirations (Lewowicki, 1970, pp. 30-31). Self-image created by other people as a result of one's experiences and opinions, judgments, information about a given person plays an important role in the process of shaping self-esteem and aspirations (Łukaszewski, 1974). Self-esteem consists of evaluating judgments concerning oneself, one's physical and mental characteristics and relations with the environment (Mądrzycki, 1996, p. 179). As is commonly known, these judgments can be both positive and negative. It is self-esteem that influences our assessment of predispositions to perform a given profession or valuing our skills. According to Dyrda, the sources of self-esteem should be included as follows (Dyrda, 2009, p. 195):

- own achievements-implementation of tasks,
- achievements of people with similar abilities,
- opinions of people important to us,
- external signals of emotional arousal,
- previous negative experiences in achieving the goals.

Numerous studies have confirmed that people may differently perceive aspects of their personality. However, they tend to evaluate positively by focusing on dimensions that are important to them or considering as important those dimensions where their person fares better than other people (Kozielecki, 1981, pp. 156-180). The general tendency is the presence of positive self-esteem in almost all people. An exception from people with depression (Pyszczyński, 1987). People protect their positive self-esteem and try to strengthen or raise it. For this purpose, they use various types of defense mechanisms (Grzegołowska-Klarkowska, 1988), one of the less typical is the tendency to internal attribution of successes and external attribution of causes of failure (Mądrzycki, 1996, p. 179). A high level of intelligence is a factor conducive to a realistic attitude towards achieving life goals and self-esteem (and aspirations) adequate to intellectual abilities. On the other hand, neuroticism and strong timidity lower self-esteem and affect aspirations by underestimating one's own abilities (Lewowicki, 1970, p. 32).

Apart from the division of determinants of aspirations according to Sikorski, the systematics of Dyrda deserves attention. It is presented in Table 1 below, which the author adopted for the publication. It is a supplement and extension of the previously described classification according to Sikorski.

Table 1.
Typology of determinants of aspirations according to Dyrda

Aspirations	
Personal Determinants	**Social Determinants**
– needs, – motivation, – successes and failures, – self-esteem, – personal conditions, – life plans, – interests and hobbies, – abilities.	– the environment of organized educational activity (school, collage), – environment of natural educational activity (family, peer environment, orphanage, foster family), – further surroundings (local environment, national environment, religious, cultural environment).

Own study based on: Dyrda, M. (2009). Pedagogika społeczna. O aspiracjach, jakości i sensie życia. Warsaw: Wydawnictwo Oficyna Wydawnicza ASPRA-JR. p. 155.

It can be noticed that in the above systematics presented in Table 1 was extended by Dyrda with: personal conditions, life plan, interests and hobbies and abilities. In social conditions Dyrda distinguishes: the environment of organized educational activity, the environment of natural educational activity and other surroundings.

Personal conditions are another determinant influencing the development of professional aspirations. Within these conditions, we distinguish (Dyrda, 2009, pp. 179-180):

- physical conditions (health, body anthropometry, appearance, and beauty),
- mental dispositions (personality, value system, moral principles as well as temperament and way of thinking),
- social dispositions (individual properties of a given individual that determine the way of relating to other people) (Pieter, 1963, p. 216).

All the above personal conditions will have an impact on professional aspirations, in particular social dispositions, which determine the quality of interpersonal relations (Kuzior, 2017, pp. 235-236). These factors translate into teamwork, as well as psychological predispositions, such as: personality traits, attitudes, views, perceptions, as well as norms and values on the basis of which a soldier builds her or his relations with other soldiers and functions in the service environment.

It can be assumed that due to different male and female social roles (in different societies and cultures often based on stereotypes) (Szewczuk, 1998, pp. 860-864), aspirations may differ according to gender. Currently, the share of women in the labor market is equal to that of men, but their percentage in politics and in positions related to state security and defense is still very low. However, it is slowly and systematically growing. Currently, the quantitative share of female soldiers in the Armed Forces has exceeded 8,833.

Life plans in relation to professional aspirations define the closer and further goals of the activity as well as the outline of their implementation. Szewczuk was the first to introduce into Polish literature, who defines a life plan *as a system of goals to which an individual aims in his actions and general principles of their implementation* (Szewczuk, 1966, p. 391). According to the quoted definition, the life plan is built on the individual's view of the world and her or his emotional relationship to reality. Some authors argue that an individual may have many plans or life tasks. Regarding a task, it can be imposed on an individual, for example by a superior, while a life plan refers to a well-thought-out and intentional nature of the prepared or implemented activity (Mądrzycki, 1996, p. 111).

There is consensus scientific opinion that:

- the entity's life plan or tasks relate to matters of great importance to the entity,
- are implemented over a longer period,
- cover a significant part of the daily activities of the individual,
- they also reflect the individual's needs, values, and world view.

The possibilities of its implementation play an important role in creating a life plan, as noted by Dyrda. Undoubtedly, the professional plans of female soldiers, apart from education, skills improvement, and qualifications, would also include maternity ones. This is the more important as the period of maternity opportunities is limited at the time of the chance for a decisive promotion in the career ladder, statistically women decide to become a mother (Hewlett, 2016, p. 10), and colleagues who stay in the workplace receive a promotion. The components of the life plan for soldiers will be a military rank and a possible position (military specialization), as well as courses and training that will bring you closer to meeting your professional aspirations in service (e.g. a language course, a driving license course).

The next personality factor influencing the aspirations of soldiers are their **interests, abilities and hobbies**. They are an important component of internal motivation that favors the implementation of long-term plans, e.g. life plan. It is the interests that make the individual shape a positive emotional and cognitive attitude towards one and her or his social environment, which has a beneficial effect on a person's life plans and their aspirations for the future (Dyrda, 2009, p. 189). When an individual is interested in a certain object, he enjoys getting to know that object, which in turn favors the self-reinforcement of the subject's cognitive activity (Mądrzycki, 1996, p. 92). If the main interest of a person is his profession and the related implementation of professional aspirations, it will bring both pleasure and satisfaction to this individual, and will positively affect the implementation of his career. Therefore, such a person may not even be aware of the obvious connection of her or his actions aimed at developing ones abilities and self-education with the benefits that this brings to professional development and the fulfillment of aspirations. Abilities will also affect aspirations, as their condition the professional performance of tasks in everyday military service. Passions, unlike the interests of an individual, should be understood as a hobby (Dyrda, 2009, pp. 188-189).

Majewski rightly noticed that, apart from personality determinants of aspirations, **professional orientation** is of great importance. The classification proposed by him specifies the general determinants of aspirations, where a group of factors determining professional aspirations in the organization's environment has been particularly distinguished. These factors determine the level and type of professional aspirations of officers in the category of external and internal factors, as shown in Figure 2 below.

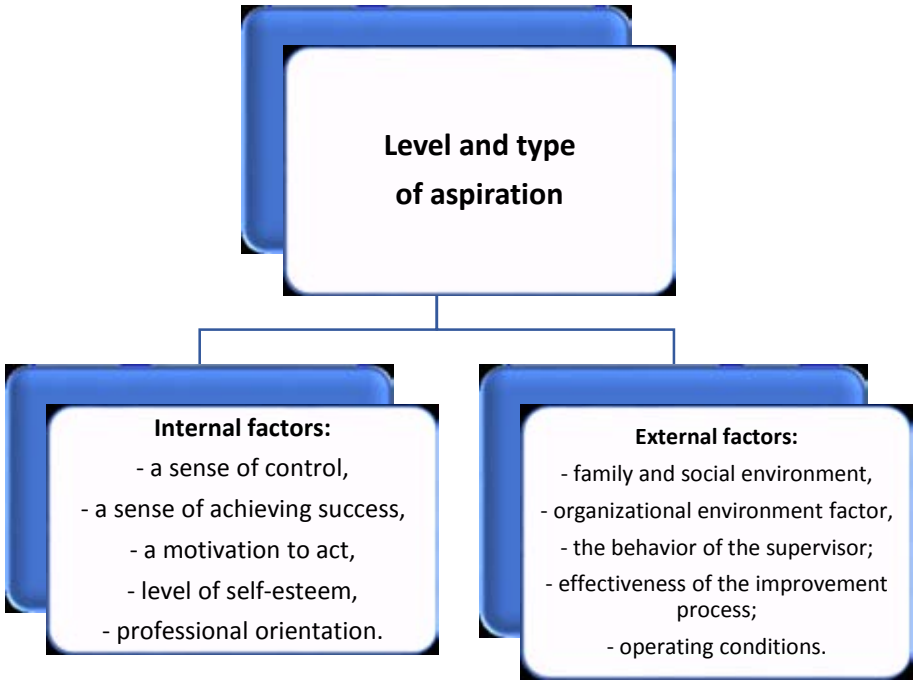

Figure 2. Factors determining the level and type of professional aspirations of officers. Own study based on Majewski, T. (2010). Aspiracje dowódcze oficerów na studiach Akademii Obrony Narodowej. Warsaw: AON, p. 22.

According to Edgar Schein's classification of professional orientations, *professional orientations are understood as permanent properties resulting from personality diversity and determining the choices of individual people. There are the following types of focus: management, technical, security, creative, autonomy and independence* (Majewski, 2016, p. 8). The above-mentioned directions are therefore the basis for the pursuit of careers of soldiers in the Armed Forces and they will be understood as a favorable personality type in the performance of a specific profession. Below, the author will describe individual types oriented according to the so-called Shein's anchors (Flamholtz, 2018).

Management-oriented. A professional goal is to gain new experience in management, develop the skills and abilities of personnel management, leadership and decision making. It will also be associated with increasing the scope of power and striving for financial success. It is an individual that feels good in the role of a leader, boss, supervisor or organizer and will be fulfilled in a managerial or leadership career (Kuzior, 2021, p. 101). A management-oriented person will:

- have interpersonal competences – the ability to lead, supervise, shape people's attitudes, and direct their activities towards the achievement of the organization's goals,
- have analytical skills, allowing for solving complex problems in conditions of uncertainty and having an incomplete range of information,
- show emotional balance that will not allow for disorganization of activities due to conflicts and interpersonal tensions occurring in the place of service, causing exhaustion.

Technical (functional) orientation. It is an interest in the technical side of the duties performed, without considering its managerial aspects. A person characterized by this type of orientation, at the time of promotion, will still focus the most on the professionalism of performing tasks and striving for mastery in her or his narrowly defined field of activity, and not on the managerial or organizational aspect of work.

Safety-oriented. This type of orientation determines the employee to strengthen their own position in the organization by being guided by the need for security and stability. He is emotionally attached to the organization, often for life. In return for the need for security, he loses the chance to face the challenges of a new job, the opportunity to test his skills in another organization or gain new experience. As a rule, he does not reach high management (command) levels because it involves taking risks that are unbearable by this type of employee.

Creative orientation. Employees with a creative focus show a strong need to invent or create something new. It is their basic motive of professional work. Such people are willing to acquire new knowledge about themselves and about the organization, they notice problems and show willingness to solve them, they are willing to introduce changes and innovations. Most often, they are mobile employees, with a positive attitude to raising qualifications and promotion in a horizontal structure. Most of them are satisfied with the advisory positions.

Focus on autonomy and independence. Employed people focused on autonomy and independence strive to expand the scope of their freedom. They do not like restrictions related to bureaucracy and autocratism of their superiors and direct their actions towards freeing themselves from such barriers. Despite the fact that these people are strongly oriented towards independence, they are characterized by a lack of seeking management positions.

In the Schein's statements we also read that people focused on independence and focused on creative activities feel the need for autonomy and the feeling that their achievements are the result of their own actions, dependent on their personal competences and work. The difference between them results, however, from the fact that the former strives primarily for freedom and the ability to rely only on themselves, while those focused on creativity show taking over and involvement in the undertaking or action being carried out (Schein, 2013).

5. Conclusions

The dynamics of the market and the constantly changing environmental conditions mean that today's organizations must be very flexible and ready for all kinds of turmoil and the changes that come with it. This applies to both the private sector and the Polish Armed Forces. Poland's geopolitical environment and its membership in NATO mobilize the military to constantly modernize and purchase modern equipment, as well as to constantly educate and improve the qualifications of soldiers. They are the strategic capital of the organization that is the army. Therefore, the more important element of management in the organization will be considering the professional aspirations of soldiers in the process of career management, so that they can satisfy them without leaving the service to the private sector. This will allow you to keep experienced and ambitious people in the service, who will be able to professionally perform their duties, fulfilling themselves in the service and at the same time implementing the training program.

Aspirations are synonymous with ambition and desires to be met by an individual in the near or distant future. They are very important as they condition the taking of an action or its omission. Aspirations are part of the personality of an individual, they are a relatively permanent creation. As the self-awareness of the individual increases and the factors influencing it, aspirations may strengthen, diminish, their level may increase or decrease, and their type may change due to the content.

Various types of aspirations are described in the typology of aspirations, and their content was adopted as a criterion. Thus, educational, professional, social, managerial, family and material aspirations and hobbies were distinguished. The typology of determinants of aspirations was adopted after Dyrda. The factors influencing the aspirations are divided into two main groups. The first are internal (personal) determinants and the second are external (social) determinants. As part of the internal determinants of aspirations related to the motivation of achievements, successes and failures, the following elements were distinguished and characterized: self-esteem, personality conditions, life plans, interests, abilities, and hobbies. This piece of paper was focused on personal conditions, however, in terms of external factors influencing professional aspirations, the following factors should be mentioned: school, peer group, organizational environment, and mass media. The career orientation was also characterized according to Schein, where the focus on management, safety, technical, creative, as well as autonomy and independence was distinguished.

All the above-mentioned factors, both internal and external, influencing the aspirations of soldiers will be important in relation to their career aspirations, some will have a greater impact, others less. They will also be able to influence their content. These determinants also remain in some correlation with each other, so it seems advisable to conduct a multifaceted study of factors that influence the career aspirations of female soldiers.

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PROJECT SUCCESS AND COMMUNICATION WITH STAKEHOLDERS

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Purpose: The aim of this paper is to analyze possibilities of using sentiment analysis in project management.
Design/methodology/approach: The research methods used in the article were desk research analysis of available source data on the success of project. Then additional research was done on methods of sentiment analysis.
Findings: During the course of this work was found a way of use sentiment analysis to improve project management.
Research limitations/implications: The proposed idea necessitates research on the verification of the usefulness of the proposed indicators.
Practical implications: The indicators proposed in the work have the potential to be used in the project management support application.
Originality/value: Novelty of proposed paper are idea of two indicators for improvement project management.

Keywords: Project management, Stekeholders analysis, Sentiment analysis.

Category of the paper: Conceptual paper.

1. Introduction

Meaning of the project success evolve in the time. It begins with classical meaning, where project should be finished in time, in budget and in scope. Today project evaluation by stakeholders, is one of the key elements of the project's success. The establishing new knowledge areas in the ISO 21500 standard (ISO, 2012) and also in fifth edition of PMBoK (Project Management Institute, 2013), dedicated only to the stakeholders, is the realization of this view.

As the importance of stakeholders in the project grows, so does the role of communication with them. Currently implemented projects are largely based on electronic communication. It is also related to the development of the COVID-19 pandemic, which limited the possibility

of face-to-face meetings. Increasing the amount of electronic communication makes it possible to analyze it automatically.

Computer methods of natural language processing (NLP) are currently being developed. Methods of opinion analysis, sentiment analysis have appeared. This gives the possibility to use these methods also in project management. This conceptual work hears the justification for this possibility. As contemporary views on the assessment of project success are based on managing stakeholder expectations, we can propose new tools to improve project management. Those new tools should be based on measurement stakeholders sentiment. Knowing the stakeholders attitude or change in attitude we can be more efficiently manage project.

The work is divided into the following parts. The next section presents the evolution of the concept of project success. The next section presents the growing role of communication in the project. The next part shows the methods of natural language analysis with particular emphasis on sentiment analysis. The next part tries to present the possibilities of using the above facts in improving project management. The paper ends, which present the directions of further research on the use of NLP in project management.

2. Evolution of project success

Project as a temporary endeavor, undertaken to create unique result (Project Management Institute, 2013), must have his own success criteria. Cooke-Davies (Cooke-Davies, 2002) distinguish the success of the project from the success of project management (case of the Sydney Opera House). This is an important distinction as it results in a breakdown between success criteria and success conditions. Jugdev and Muller (Jugdev, and Muller, 2005) presents project management history according to the way of understanding success. Paper presents history of project management into time periods.

- The period spanning the 1960s to 1980s was characterized by the implementation of projects in isolation from the client. The results were handed over after the end of the project. The most common measure of success during this period was the completion of the project on time, within budget and within the agreed specification.
- The next period covers the 1980s. It focuses on customer relations. As a result, critical lists of Critical Success Factors (CSFs) were defined.
- The period spanning the 90s of the twentieth century when it was understood that the success of the project depends on the interaction between all stakeholders. During this period, the CSF Frameworks are defined.
- Project management in 21st century (strategic) – a holistic view of the project and its results from the perspective of the stakeholders. The assessment covers the entire life cycle of the project as well as the product.

This evolution had influence on changes in project management standards. Underlining the role of stakeholders in the 5th edition of PMBoK standard (Project Management Institute, 2013), follows changes of the ISO21500 standard (ISO, 2012). In the Project Management Institute standard it manifested by adding a new knowledge area devoted to stakeholders.

In the presented evolution of the concept of project success, the growing importance of stakeholders is visible. From the initial omission of this aspect in the assessment to the contemporary inclusion of the stakeholder perspective.

3. Communication with stakeholders

The evolution of views on the success of the project presented in the previous section shows the growing role of stakeholders. We must consider who the stakeholders are.

The concept of stakeholders appeared in the management sciences related to project management. The term "stakeholder" was first used in 1963 in the Stanford Research Institute document to identify groups of entities before which business owners should be responsible and without which the organization would cease to exist (Freeman, 2010). Similar terms used in the literature and business practice are: "interested groups", "interest groups", "actors", "partners", "interested parties", "participants". Many publications on corporate planning (Ansoff, 1965), system theory (Churchman, 1979), organization theory (Rhenman, 1973) and corporate social responsibility (Preston, and Post, 1975; Votaw, and Sethi, 1973) referred to the concept of stakeholders (Freeman, 2010).

Freeman defines stakeholders as any individual or group that can interact with or be affected by the organization in pursuit of its goals (Freeman, 2010). In this definition, the relationship between stakeholders and the organization may be of a diverse nature, where both stakeholders and particular organization may influence each other.

In the literature, we can find the concept that the stakeholders are people or groups that have direct or indirect contracts with the organization (Donaldson, and Preston, 1995). Thus, a stakeholder can be virtually any element of the closer and more intimate environment, which is linked to the organization.

With a specific situational context it has great importance in analyzing the impact of the stakeholder on the organization. At this point, it should be emphasized that the organization is not always the subject of interaction of the stakeholders as a whole, it can often be a project alone.

Hierarchical dependencies in the organization, where the project is implemented, make the strength of the stakeholder influence dependent on the position in the hierarchy. It was especially noticed in IT projects. As the development of software products and systems generally requires collaboration of many individuals, groups, and organizations, it can be

modeled as networks of stakeholders (Fricker, 2009). Those networks constitute stakeholder structures. In Fricker paper (Fricker, 2009), it was considered in context of Requirements Analysis. There were attempts to quantify the strength of stakeholder influence on the project, taking into account their structure. In paper (Targiel, 2017) there was used AHP method to prioritize requirements. In other paper (Targiel, 2021), there was used DEMATEL method. There are also stakeholder modeling approaches such as the Onion model (Alexander, and Robertson, 2004) which ignore relationships between stakeholders, which are important to define communication channels.

Engagement stakeholders in project management is based on effective communication. Scholes and Clutterbuck (Scholes, and Clutterbuck, 1998) propose even Integrated Approach to stakeholders communication. Last step in this approach is "Making communication management a core competency". In contemporary projects, this communication is largely based on electronic means. This opens the possibility of using computer methods of text analysis. The problem of electronic communication in construction project was discussed in El-Saboni paper (El-Saboni et al., 2009).

4. Natural Language Processing

Recent years have seen a strong development of computer natural language processing methods. After the first periods of Symbolic NLP (1950s-early 1990s), and Statistical NLP (1990s-2010s), present NLP methods have huge potential for implementation. Natural Language Processing (NLP) refer to automated machine-driven algorithms for understanding of human language and extracting information (Dinov, 2018). Common tasks for these methods include text and speech processing, morphological analysis, syntactic analysis, lexical semantics, relational semantics, and discourse (Natural language processing, 2021). Some new applications includes: automatic summarization, machine translation, natural language generation. One of the very interesting directions of NLP development in the context of project management is the analysis of sentiment.

Sentiment Analysis (SA) is defined as "the use of natural language processing, text analysis, computational linguistics, and biometrics to systematically identify, extract, quantify, and study affective states and subjective information"(Sentiment analysis, 2021). SA is used to classification the polarity of text at the document, sentence, or word level. Text can be classified as positive, negative, or neutral. Some more sophisticated models, can classify also emotional states such as enjoyment, anger, disgust, sadness, fear, and surprise according to Plutchik wheel of emotions (Plutchik, 1980).

There are two main approaches in Sentiment Analysis:

- machine learning – the analyzed text is introduced to the input of neural networks, on the output of which the sentiment value is obtained,
- lexical approach – has used lexicons of known sentiment-related words, their polarities, then uses those to score the sentiment of the text.

The first approach has some disadvantages in context of project communication. There are not enough data to learn neural network. This problem can be solved by using pretrained neural networks with embedded layers like GloVe for Tweeter texts (Pennington et al., 2014).

The second approach is based on lexicons. They are created in specific language, based on specific corpus. This approach was used in Tourani et al. In this paper (Tourani et al., 2017), authors have used general lexicons to analyze communication in open source projects. There are some publicly available sentiment lexicons which includes Affective Norms (Warriner et al., 2013), SentiStrength (Thelwall et al., 2010), SoCAL (Taboada et al., 2011), LABMT (Dodds et al., 2011). They can be used to analyze sentiment.

Through the lexical analysis of messages sent by the stakeholder, it is possible to evaluate their attitude (sentiment) towards the project. Identification of sentiments and emotions can provide an indication of someone's opinions towards certain project decisions or other people. This approach is used in politics as in business contexts (Pang, and Lee, 2008). It was also used in software engineering (Murgia et al., 2014).

5. Improvement Project Management with Sentiment Analysis

The growing importance of stakeholders in achieving the project's success is noticeable. Their commitment is based on communicating with them. There is also a visible tendency for communication to be based on electronic means. E-mails and instant messaging are used. This communication is susceptible to automatic analysis. On the other hand, effective methods of text analysis are created. This raises proposals to use these methods in project management.

Since stakeholder assessment is important in assessing success, it can be crucial to test their attitude towards the project. It is possible when analyzing the sentiment contained in communication with a stakeholder. Changing this attitude from positive to negative is a signal that appropriate actions should be taken to ensure that the attitude and, consequently, the assessment are positive.

The success of the project is a product of the assessments of all stakeholders. Of course, the importance and strength of stakeholder influence varies. Hence, it is necessary to weigh the attitude of the stakeholder and the strength of its influence. This gives rise to the idea of a global sentiment indicator. Changing the value of this indicator from positive to negative will make it necessary to take corrective actions at the level of the entire project.

The proposed indicators can be implemented in the project management support system. The first indicator can be used to monitor the attitudes of individual stakeholders. The second indicator monitors the entire project.

Determining the sensitivity of the system requires further research. It is a question whether the messages communicated will allow the calculation of changes in the level of sentiment. Another question that needs to be answered is whether the calculated changes in the level of sentiment indicate significant changes in the assessment of the project.

6. Conclusions

The growing role of stakeholders in the project makes it necessary to follow their attitudes. This can be done by analyzing the electronic communication they send. The importance of electronic communication in projects has increased with the advent of the COVID-19 pandemic. Sentiment (attitude) analysis methods are developed. Their use in project management is the main contribution of this work. Two indicators were proposed to track stakeholder sentiment (attitude). The first one follows the sentiment on a single channel of communication. The second is used to track global sentiment in the project. After verifying the usefulness of the proposed indicators, they can constitute the basis of the project management support system. By using them, the Project Manager could receive signals about the need to take appropriate action in relation to the stakeholders. This type of activity increases the Project Manager's capabilities in project management. The proposed system requires further research on system verified. After implementation it can be validated in real project. Contemporary methods of text analysis create new tools in project management.

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LEADERS' SUPPORT IN ORGANIZATIONAL CHANGE

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Purpose: As organizations look to the future, many are planning a hybrid working model where employees split their working time between in-office and remote work. The shift to a hybrid workplace is a significant change. While requiring vision, budgets, and talents to produce positive results, every change is particularly dependent on the presence of supportive leaders who build a safe psychological environment to motivate people and ensure their involvement and commitment. The aim of this paper is to review recent empirical studies on key antecedents of employee responses to organizational change through which leaders shape a supportive environment for change.
Design/methodology/approach: The review includes empirical studies from different disciplines, published between 2015 and 2021.
Findings: The analysis shows that trust in leaders is an important enabler of organizational change. Perceived justice, communication, and psychological empowerment also feature prominently in the recent studies, and, together with trust, play an important role between leadership and positive employee responses toward change.
Practical implications: Managers can considerably improve the success rate of their change initiatives by having insight into what key factors have impact on employees' attitudes toward organizational change. They can build on them to create and develop an environment that motivates individuals and ensures their involvement and commitment to change.
Originality/value: This article provides insights into the key factors influencing employee attitudes toward organizational change, which have recently attracted the attention of the scientific community across different disciplines. It also includes a research agenda proposal highlighting opportunities for future studies on leadership in organizational change.

Keywords: Organizational change, antecedents of employee response to change, leader support.

Category of the paper: Literature review.

1. Introduction

The Covid-19 pandemic has led to a global experiment in work organization, particularly in remote work. Although employees in the remote working model were able to benefit for example from the time savings traditionally spent on commuting or the flexibility of working hours, the Capgemini report (2021) presents other important findings about their condition. While their productivity increased, employees expressed concerns about remote working in the long term. The analysis found that in the remote system they were heavily impacted by the feeling of being permanently available and "always on call", which can ultimately result in burnout and consequent losses for the employer. The McKinsey report (2021) reaches similar conclusions, with many employees reporting that remote work contributed to fatigue, difficulty in disconnecting from work, deterioration of their social networks, and weakening of their sense of belonging. The same report indicates that nearly three-quarters of the approximately 5,000 employees McKinsey queried globally would like to work from home for two or more days per week, with more than half opting for at least three days of remote work. As a result, changing to a hybrid model seems to be an optimal solution, with several studies showing that hybrid working models will create a new working environment (McKinsey Global Institute, 2021; Capgemini, 2021; Hays 2021; Cisco, 2020; OLX, 2020; Adecco Group, 2020). Nevertheless, this move implies a significant organizational change, both in the organization of work within hybrid teams and the management approach.

Organizational change refers to the transition of an organization from one state of affairs to another (Lewin, 1951). Every company needs to embrace organizational change if they want to remain competitive. When done correctly, organizational change can turn every company into a more competitive, effective business and a better place to work. However, organizational change is not easy. The reality today is that all organizations need to be in a constant state of change. As excessive change is becoming the norm (Johnson, 2016), organizations experience the pressure to increase the frequency, extent, and impact of organizational changes (van den Heuvel et al., 2017), which in turn have a cumulative effect on employees in the organization (Herold, Fedor, and Caldwell, 2007).

Two trends can be noticed in organizational change research. The first aims to uncover the evolution of change and the macro-level factors that shape organizational change and its outcomes. The second considers change from the perspective of the change recipient, focusing mainly on the psychological processes and recipients' experiences during change, known as responses to change (Oreg, Vakola, and Armenakis, 2011; Oreg, and Berson, 2019).

Research on organizational change has been largely dominated by macro- and system-oriented (Xu et al., 2016) or conceptual change models and frameworks. This approach may evoke a rather mechanistic perspective of organizational change management which assumes that just by following the subsequent levels of the organizational change model employees will

automatically respond positively to change. This is obviously not true as the success of coping with change "is increasingly reliant on generating employee support and enthusiasm for proposed changes" (Piderit, 2000, p. 783). Employee attitudes and behaviors toward organizational change represent the most important predictors of its success (Abrell-Vogel, and Rowold, 2014; Armenakis, Harris, and Mossholder, 1993). At the heart of events, the main determinant of the extent to which any change can succeed is how change recipients react to organizational change (Oreg, Vakola, and Armenakis, 2011). Moreover, while the failure to successfully implement the planned change may be attributed to many factors, few issues are as critical as employee attitudes toward change (Choi, 2011; Eby et al., 2000; Miller, Johnson, and Grau, 1994; Rafferty, Jimmieson, and Armenakis, 2013).

Leadership plays an important role in the world of constant change and it has become an essential component for a successful change in any organization. "Organizational leadership and change go hand in hand, and one is nothing without the other" (Burnes, Hughes, and By, 2016, p. 2).

While there are many definitions of leadership, most of them tend to have one thing in common: putting emphasis on the complex and multi-faceted process of social influence it involves, whereby leaders influence the group toward their goals (McClanahan, 2020; Oreg, and Berson, 2019). "This process [leadership] is essentially a shared experience, a voyage through time, with benefits to be gained and hazards to be surmounted by the parties involved" (Hollander, 1995, p. 55).

Leaders have a significant effect on attitudes and behaviors of change recipients (Lee, A. et al., 2015; Bartunek et al., 2006), and have been shown to undertake a pivotal role in assisting employees to embrace altered organizational arrangements (Aitken, and von Treuer, 2020).

Leader support is critical for organizational change, and even a slight increase in perceived support can have meaningful repercussions for employee attitudes and behaviors (Ford et al., 2021). Managerial support is one of the major antecedents of perceived organizational support (POS), which refers to employees' perception of how much the organization values their contribution and cares about their individual well-being (Eisenberger, Rhoades Shanock, and Wen, 2020; Eisenberger, and Stinglhamber, 2011; Gigliotti et al., 2019; Kurtessis et al., 2017). Leaders support employees by building a culture of trust and a safe psychological environment that motivates people, ensuring their involvement and commitment (Boxall, and Macky, 2009; Travaglione et al., 2017). On a day-to-day basis, leaders' support helps employees cope with the demands of their role (Bakker, Demerouti, and Verbeke, 2004), producing positive outcomes for the organization such as employee engagement, motivation, and well-being (Breevaart et al., 2014; Nielsen et al., 2008; Skakon et al., 2010; Van Dierendonck, and Jacobs, 2010). These effects persist in the context of organizational change as supportive relationships lead to more positive employee attitudes toward change (Jimmieson, White, and Zajdlewicz, 2009), which in turn help employees proceed effectively with the tasks of change (Bouckenooghe, Devos, and Van den Broeck, 2009).

This paper focuses on key antecedents of employee responses to change, i.e. "factors which influence employees' evaluation of whether the change should be supported, viewed with indifference, or opposed" (Miller, Johnson, and Grau, 1994, p. 61), and through which leaders shape their support for change. Attention to factors affecting employees' reactions to change provides insight into key elements of managerial support required in organizational change.

2. Method

Using the Scopus database, a search was conducted to identify studies for the review. To this end, an electronic search of the abstracts was performed which were then scanned for the terms of organizational change and employees' reactions to change. To capture the most recent developments in the field, the search focused on the period from 2015 to date. This initial search yielded nearly 300 articles which were examined 'manually'. The studies included in the final analysis met the following criteria: (1) They were published not earlier than in 2015; (2) They contained a leadership aspect; (3) They included a variable that represented an antecedent of employee responses to organizational change; and (4) They were empirical studies.

3. Review

The analysis specifically revealed four antecedents of employee responses to change through which leaders shape a supportive environment for change: trust, justice, communication, and psychological empowerment.

3.1. Trust

The largest number of articles addressed the importance of a trusting relationship between leaders and change recipients, as well as perceived justice. Both trust and justice appear to be the core constructs in organizational sciences, with highly regarded benefits for the effective functioning of organizations (Holtz, 2013).

Trust in the leader is an important factor for the successful implementation of organizational changes, and it is pivotal to getting people to work toward a common goal, particularly under high levels of perceived uncertainty (Agote, Aramburu, and Lines, 2016). "The level of trust becomes a critical factor in influencing how the employees think, feel and act with respect to the current change" (Smollan, 2013, p. 725).

Trust has been much debated in the literature and, as a subject of interest in many disciplines, it has acquired multiple definitions across different sciences. One of the most influential definitions was provided by Mayer, Davis and Schoorman (1995, p. 712), who see trust as:

"[...] the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party." Trust grows over time where "major events such as organizational changes can bring about a complete reassessment of the trust relationship, either making or breaking the trust bond" (Tucker, Yeow and Viki, 2012, p. 190).

Studies show that there is a positive and significant association between trust and readiness to change (Gigliotti et al., 2019; Heim, and Sardar-Drenda, 2020; Thakur, and Srivastava, 2018). Trust is considered to be an overriding factor, the ultimate determinant of employees' eventual response to organizational change. In other words, even if change is perceived as beneficial by an employee, the lack of trust in the leader might still cause negative employee responses. "Trust in leadership can turn an uncomfortable situation into a comfortable one" (van den Heuvel et al., 2016, p. 36), and assist in decreasing the negative effects of certain leadership behaviors on organizational change capacity (Yasir et al., 2016). Moreover, the already significant effect of trust in management becomes even greater as the change implementation progresses; trust in management built up at previous stages of the change implementation continues to influence the following stages of the change process alleviating the problem of change resistance (Pereira, Maximiano, and Bido, 2019).

The subject of the vast majority of leadership research in the context of organizational change is transformational leadership, a style in which leaders encourage, inspire, and motivate employees to innovate and create change that will help the company to grow and shape its future success (van den Heuvel et al., 2016). "In the context of organizational change, transformational leadership behaviors are thought to empower employees to challenge the status quo and embrace new practices" (Henricks, Young, and Kehoe, 2020, p. 4). Studies reveal a positive relationship between transformational leadership and employee trust in the leader (Mittal, 2016; Peng et al., 2020; Yasir et al., 2016), and a direct, long-term positive effect on the change appraisal among the leader followers (Holten, and Brenner, 2015). Transformational leadership behaviors contribute to the trust-building process because transformational leaders understand individual needs of followers; thereby followers tend to trust them (Yasir et al., 2016). Moreover, trust in management increases during organizational change when employees work under transformational leadership style (Busari et al., 2019). Employee trust in transformational leadership has a positive influence on working relationships, which can lead to the enhancement of the leader-employee trust relationship and a stronger commitment to change (Yang, 2016).

Albeit with far less attention than transformational leadership, studies also show moral-based forms of leadership, ethical and authentic, as being inherently linked with the notion of change and the impact on employee response to change. The former, ethical leadership, has been defined in a variety of ways; however, it largely describes the extent to which the conduct of a leader is normatively appropriate and promotes well-being for stakeholders (Banks et al., 2020). Ethical leaders act in harmony with own principles and values, which are characterized by honesty, fairness, and equity as well as respect for the dignity, diversity and rights of individuals and groups of people (Knights, Grant, and Young, 2020). The latter, authentic leaders, are aware of who they are and what values they hold, and they are able to consistently behave in ways that are in agreement with these beliefs (Anderson et al., 2017). Hoch et al. (2018) found that ethics-rooted leadership approaches, such as the authentic and ethical leadership styles, show similar correlations with transformational leadership with an array of positive employee outcomes, including trust in the leader. Ethical leaders boost employee trust in the long-term fairness of their relationship with the organization, intensifying employee identification with the firm (Myra, and Jerwin, 2020). Authentic leadership elicits trust among employees, alleviating negative emotions such as anxiety and threat, and enhancing the positive ones such as hope and enthusiasm (Agote, Aramburu, and Lines, 2016).

An increasing body of research has been dedicated to a trickle-down model of leadership assuming that leader behaviors and styles are passed from higher-level leaders to lower-level leaders through social learning (Mawritz et al., 2012; Simons et al., 2007; Wo, Ambrose, and Schminke, 2015). This could indicate that trust in top leaders, or lack thereof, translates into comparable levels of trust in direct leaders. However, studies by Fulmer and Ostroff (2017) demonstrate that trust in leaders at different levels does not form independently and it also trickles up across hierarchical levels. One of the mechanisms through which trust trickles upward is direct leader procedural justice.

3.2. Justice

Similarly to trust, organizational justice has also received a lot of attention in organizational journals in the context of change. The likely reason for that recognition is that justice perceptions and trust assessments are consistent predictors of employee attitudes and behaviors. Organizational justice refers to perceptions of fairness in decision-making and resource allocation environments. It is commonly divided into three dimensions: distributive, procedural and interactional justice. Distributive justice is concerned with the fair distribution of the burdens and benefits of social cooperation among people with competing needs and claims. Procedural justice refers to the perceived fairness of decision-making procedures which are evaluated by their level of consistency, bias suppression, accuracy, correctability, ethicality, and the degree to which they allow voice and input. Interactional justice describes the fairness of interpersonal treatment during the decision-making procedures. It can be further divided into interpersonal and informational components, whereby interpersonal justice reflects the degree

of respect and decency leaders use when implementing procedures, while informational justice focuses on the degree of justification and truthfulness offered during procedures (Colquitt, and Rodell, 2011).

Justice is one of the key dimensions of leader character in the context of change. Leaders ensure that individuals are treated fairly and that consequences are concurrent with contributions; they provide others with the opportunity to voice their opinions on processes, offer timely and honest explanations for decisions, and "seek to redress wrongdoings inside and outside the organization" (Seijts, and Gandz, 2018, p. 4). When leaders are perceived as being fair and just, the chances are that those who might resist change will be encouraged to support the current change and will be opened for further change initiatives. Justice research posits that when employees perceive that they are being treated fairly they are likely to develop attitudes and behaviors conducive to the successful implementation of change (Georgalis et al., 2015), while leaders perceived as being fair receive assistance, support, and cooperation from their followers (Deschamps et al., 2016). Perceived justice within an organization is a determinant of optimism which partially mediates the relationship between organizational justice and commitment to change (Paolillo et al., 2015).

Research shows that procedural justice not only facilitates employees to accept values and goals pertaining to organizational change but also adapt themselves to pressures of external change (Lee et al., 2017). In turn, informational injustice with respect to change enhances the development of negative workplace emotions. When employees receive limited information about changes taking place in their work environment, their ability to cope with uncertainty diminishes, which then fuels the development of negative feelings. However, the adverse effect of informational injustice is attenuated by the presence of trust. Thus, when trust in managers is low, employees feel more hesitant to share concerns about information shortage or may become distressed by their suspicions about why managers withhold important information, which can make it more difficult to divert the negative energy stemming from the shortage and piling up (De Clercq, and Saridakis, 2015).

While management scholars have historically framed trust as a consequence of organizational justice, arguing that trust develops slowly based on a series of favorable interactions with the exchange partner, theory and empirical research outside of the management literature suggest that trust is present prior to the initiation of exchange relationships (Holtz, 2013). Some research shows dynamic relations between trust and justice, addressing the interplay between justice and trust over time (Kaltiainen, Lipponen, and Holtz, 2017).

Leaders should focus on perceived fairness since organizational justice is considered to have a positive impact on employee trust where expectations are based on perceived motives and treatment (Saunders, and Thornhill, 2004). Studies examining organizational justice have found that fairness perceptions are linked to trust in management. Employees' perceptions of trust toward management in organizations are influenced by the development of close interpersonal

relationships that are based on exchanges perceived as fair (Komodromos, Halkias, and Harkiolakis, 2019).

Research also demonstrates that managers who want to enhance support for change need to pay attention to fair procedures while increasing the perception of fairness. In other words, a climate of justice can help employees be more supportive and, consequently, less resistant to ongoing changes (Arnéguy, Ohana, and Stinglhamber, 2018; Bayraktar, 2019).

Transformational leadership of respondents' immediate supervisors correlates strongly with all aspects of organizational justice, with the relationship between leadership and motivation entirely mediated by justice (Deschamps et al., 2016). Thus, organizational justice helps motivate employees, which leaders use as a leverage to implement changes.

Studies also show that justice perceptions yield either immediate or delayed consequences which can be of short or long duration. People's reactions can depend on their previous experience of fair or unfair treatment, and there can be reciprocal relationships between their justice perceptions and response. As a result, even a single instance of unfair treatment can have repercussions in the future (Fortin et al., 2016). This imposes an obligation on leaders to create the climate of justice that will shape sustainable justice perceptions among employees.

3.3. Communication

While leaders benefit from inducing the perception of justice to increase employee support for change, the former interplays not only with trust. Clear communication throughout the change process also influences the perception of fairness (Bayraktar, 2019) and trust (van den Heuvel, Schalk, and van Assen, 2015).

Leader's effective communication, including the ability to clearly articulate the case for change as well as focus on the style and frequency of communication to ensure it is "fit for purpose", appears to be another key factor that promotes employees' identification during change (Aitken, and von Treuer, 2020). The success of organizational change strongly depends on internal communication. Lack of information and communication prompts uncertainty and anxiety among employees which have a negative effect on employees' readiness to embrace change (Elving, 2005). "Poorly managed change communication results in rumors and resistance to change, exaggerating the negative aspects of the change" (Appelbaum et al., 2017, p. 8). Communication supports the information and willingness to interact with employees during times of uncertainty and ambiguity (Komodromos, Halkias, and Harkiolakis, 2019).

Previous empirical studies have demonstrated that communication by leaders on all aspects and phases of the change process is central to the reduction of uncertainty among employees (Schweiger, and Denisi, 1991), which in turn can foster perceptions of fairness about the change (Brockner, 1994). Confirmation of this finding can be also found in recent research. The more useful, timely, and adequate the information about the change, the more fulfilled the psychological contract, the higher the trust, and the higher the perceived need for change, all of

which are positively related to employees' attitude toward change (van den Heuvel, Schalk, and van Assen, 2015).

Quality change communication contributes significantly to the affective commitment to change (Ouedraogo, and Ouakouak, 2018; Rogiest, Segers, and van Witteloostuijn, 2015), which in turn has a positive impact on the change success (Ouedraogo, and Ouakouak, 2018). Developing an employee interest in the change involves leaders communicating with staff to explain the change process and people's roles in it (Yahaya, 2020). "Reducing employees' inertia and mobilizing their support are principle tasks during an organizational change", while leaders' communication addressing the psychological needs of employees elicits their positive response to change (Endrejat et al., 2020, p. 8).

Effective communication means also positive communication. Muthusamy's research (2019) confirms the importance of positive communication and its effects on the emotional buy-in, whereby the former also serves as a stress reducer. Sharing positive communication is central to achieving organizational transformation.

Quality change communication also fully mediates the relationship between an involvement-oriented climate and the affective commitment to change (Rogiest, Segers, and van Witteloostuijn, 2015). Leaders who embrace employee inclusion provide adequate information and listen to employees to make decisions effectively and gain organizational support (Yahaya, 2020). The growing emphasis on participatory and horizontal communication creates space in which people can give meaning to the change events, which allows people to be listened to and be heard. This in turn ends up contributing to social exchange and empowerment. Organizations involved in complex and continuous changes need to empower their employees to enact the change in ways that are best suited to the challenges they encounter (Morin et al., 2016).

3.4. Psychological empowerment

The empowerment literature lacks a set of well-accepted and consistently applied definitions of the important elements in the empowerment process, which may be due to the common belief that empowerment is a single, easily defined construct, when, in fact, it is an ongoing process that takes place in a dynamic environment (Robbins, Crino, and Fredendall, 2002). The concept can be viewed from two perspectives. The first one is empowerment as a relational construct concerning the managerial style; it is about an individual's power and control with respect to others, as well as the sharing or spreading power. The second perspective is the motivational/psychological state that results from the empowering (relational) activities undertaken by leaders. Psychological empowerment refers to a set of psychological states that are necessary for individuals to feel a sense of control in relation to their work (Spreitzer, 1995). It also pertains to personal beliefs that employees have about their role in the organization (Spreitzer, 2007). The psychological perspective is focused on how employees experience their work. People will adjust and accept organizational change if they have the feeling of

competence and confidence to face the changes. By sweeping psychological empowerment, people will have the confidence, determination, a sense of meaning about their work, competence, determination, and most importantly, the feeling of impact on the organization (Spreitzer, 2007).

Psychological empowerment is one of the sources of competitive advantage in developing the organization's readiness to changes (Ölçer, and Florescu, 2015). As such it becomes even more relevant under conditions of continuous change, where dealing with changes becomes an integral part of one's job and must be balanced with regular job responsibilities (Morin et al., 2016).

As this analysis focuses on key factors through which leaders' behaviors shape recipients' responses to change, it considers the psychological empowerment patterns intended to motivate empowered behaviors and engagement in the work environment rather than managerial practices of simply sharing power with others.

Research about psychological empowerment and commitment to change shows that the former has a positive and significant impact on the latter (Susilo, and Mangundjaya, 2020). Psychological empowerment and organizational trust act as full mediators for the relationship between change leadership and the affective commitment to change (Mangundjaya, 2019).

Empowering leadership reduces behavioral intentions to resist future change and contributes to increased cognitive intentions to resist future change through the strengthening of psychological empowerment. High-quality leadership contributes to the development of the psychological environment (Seibert, Wang, and Courtright, 2011) that is particularly responsive to beliefs about management support for the changes (Morin et al., 2016).

3.5. Leader support

Leader support in organizational change has not gained much attention in recent research. Neither has POS even though the latter may play an important role in employee responses to organizational change. Firstly, social support is associated with feelings of control during change (Vardaman et al., 2012). It suggests that other forms of support, for example organizational support, may also contribute to positive change-related outcomes. A study by Kirrane et al. (2017) seems to second this proposition by demonstrating a link between managerial support and readiness for change. Secondly, POS is associated with positive feelings toward change, which may also translate into fostering readiness (Self, Armenakis, and Schraeder, 2007). Thirdly, POS has been linked to higher comfort with risk-taking (Neves, and Eisenberger, 2014), suggesting that it encourages a greater psychological safety in situations when people are faced with uncertainty, which is a frequent occurrence during organizational change. Finally, individuals tend to reciprocate the support they receive (Bowling, Beehr, and Swader, 2005; Eisenberger et al., 2001; Gouldner, 1960), which suggests that employees with higher levels of POS might "return the favor" by supporting the organizational change initiatives. Employees who are aware of the organizational support they

have received develop a "felt obligation" to care about the organization's well-being and help it achieve its objectives (Thakur, and Srivastava, 2018).

Organizations can improve the likelihood of bringing about change by supporting employees before change initiatives are introduced (Gigliotti et al., 2019). Studies show that POS plays a central role in the development of positive attitudes toward change which depend more on POS than material and extrinsic rewards (Giauque, 2015). As expected, POS acts as a mediator between direct antecedents of employee response to change. Readiness for change derives from POS (Arnéguy, Ohana, and Stinglhamber, 2018; Gigliotti et al., 2019), and the relationship between justice and readiness for change is mediated by POS (Arnéguy, Ohana, and Stinglhamber, 2018), with justice influencing readiness through POS.

The link between POS and readiness is also partially explained by trust as the delivery of support is associated with building trust toward management. Change recipients may draw upon this in accepting or rejecting change. "Managers should work to support their employees and build the associated trust in order to have a reservoir of ready change recipients when organizational transformation is inevitably attempted" (Gigliotti et al., 2019, p. 10). In the presence of trust and POS, the impact of change resistance on change readiness decreases to a great extent (Thakur, and Srivastava, 2018). However, as a study by Gigliotti et al. (2019) also shows, there is an inflection point (relatively high levels of POS) where additional organizational support does not yield substantial increases in trust, with the effect diminishing at higher levels.

4. Discussion and Conclusions

Leaders are a lynchpin in the success of every change initiative because of the relationship they have with employees in the organization. They are positioned to influence staff and secure their positive response to change. Employees look to their leaders for clarity, connection, and accountability, particularly during change.

The need for mutual support between leaders/managers and employees has recently attracted the attention of management scholars (Kurtessis et al., 2017; Van Buren, Greenwood, and Sheehan, 2011), and one of the reasons is organizations' shift from an employee focus to a strategic focus (Van Buren, Greenwood, and Sheehan, 2011). The relationship between employers and their employees is one of mutual obligation (Boxall, and Macky, 2009; Johns, 2006; Travaglione et al., 2017). Building a relationship of mutual respect where employees perceive that their needs are considered and are acted upon appropriately lies at the heart of managerial support (Travaglione et al., 2017). Such support can also facilitate the communication and implementation of strategic decisions (Dasgupta, 2015).

Changes perceived by employees as excessive can provoke negative reactions to change (Johnson, 2016), which is why the importance of leading people through change has gained credence. Leaders serve as role models in times of change, and the lack of leadership can generate negativity (van den Heuvel et al., 2016). Managers are the ones in the driver's seat of the change implementation process and therefore first to receive employee responses to organizational change. In light of the above, leaders can considerably improve the success rate of their change initiatives by having insight into what key factors have impact on employees' attitudes toward organizational change. Managers can build on them to create and develop an environment that motivates individuals and ensures their involvement and commitment to change.

The objective of this paper was to identify the key antecedents of employee responses to change, by means of which leaders can support their staff through organizational change. It is anticipated that these elements will be essential in managing a hybrid working team whose needs will focus primarily on getting managerial/leader support grounded in a culture of trust and a safe psychological environment. With this premise in mind, empirical research is planned on managerial support and behavioral competences required to manage hybrid working teams.

The analysis has shown that trust in leaders is an important enabler of organizational change. The overriding capacity of trust can turn an uncomfortable situation into a comfortable one; it is the ultimate determinant of the affective, behavioral, and cognitive responses of employees to organizational change. Perceived justice, communication, and psychological empowerment have also featured prominently in the recent research, all three playing an important role between leadership and positive employee responses toward change. The transformational, authentic, and ethical leadership has been found to also be linked with a greater likelihood of fostering the described aspects.

At this point, a distinction must be made between pre-change and change antecedents. The former are not directly linked to a particular organizational change, but are general quality indicators of the state of the employment relationship. Factors such as trust and psychological empowerment primarily concern the situation prior to the introduction of the organizational change. Therefore, they should be carefully considered by management during the planning and designing of the specific change stages. As Herold, Fedor, and Caldwell (2007, p. 949) point out, "organizations cannot roll out change after change assuming that each change is an independent event" without a thoughtful consideration of "extrachange factors, such as the workplace setting in which the change is occurring." If focus on pre-change antecedents is blended with communication practices, as well as procedural and distributive justice, the likelihood of positive change attitudes will increase. Thus, the knowledge of and focus on both pre-change and change antecedents should serve as the basis of leaders' long-lasting support (and consequently, POS) in order to build employees' approval for the entire transformation process rather than concentrate on each specific change.

With a few exceptions (Henricks, Young, and Kehoe, 2020; Holten, and Brenner, 2015; Kaltiainen, Lipponen, and Holtz, 2017; Morin et al., 2016), most studies on employee response toward change were of cross-sectional design, which critically limits the causal inference. The majority of the analyzed studies focused on a specific change initiative. Future research designed to provide a more systematic investigation into the large-scale organizational change seems required.

Furthermore, while it is clear that one course through which leaders influence organizational change is by eliciting more positive and less negative responses to it, according to the recent criticism of applicable research (Oreg, and Berson, 2018), responses to change tend to be treated in a very simplified manner as ranging from negative to positive, which overlooks their complexity. Very little research of reactions to change has been dedicated to study the possibility that individuals may concurrently exhibit positive and negative responses.

Although the number of studies on leaders and change that has accumulated over the recent years is considerable, research in this field lacks integration and has failed to provide a clear and broader understanding of leaders' role and, more specifically, their support for change. This is certainly a topic worth exploring in future research.

Finally, psychological journals as well as management/organizational reports are frequently siloed, preventing the exchange of ideas. A common approach could systematize the knowledge of the topic analyzed in this paper.

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CONSUMPTION AND HOME PREPARATION OF FERMENTED VEGETABLE PRODUCTS IN POLAND

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Purpose: To present the results of consumer research in terms of the self-reported levels of recognition, sourcing, self-preparation and consumption of certain types of fermented food products in Polish households and to investigate the traditions of making these products at home in two macro-regions.
Design/methodology/approach: Recognition of products, household consumption habits, sourcing of products (RHS) in Northern and Eastern Poland were explored. On-line questionnaire survey was conducted in households located in these macro-regions (n = 600). Data were analysed with Statistica 13.1 PL software, which included descriptive statistics and Chi-squared χ^2 test.
Findings: Pickled cucumbers and sauerkraut were the most recognized fermented vegetable products. These products are rooted in the culinary tradition of the households surveyed. Regional differences in terms of consumption, commitment to culinary heritage, engagement with traditional production at home and openness to new market propositions were observed. The region and place of residence influence the consumption of pickles, as well as related behaviours, customs and culinary traditions.
Research limitations/implications: The use of a convenience sampling method limits the conclusions and the generalisability of the results. The findings have theoretical implications as they bring new knowledge about consumer behaviour that is mediated by home heritage and tradition, and region of origin.
Practical implications: The results can be a starting point for food promotion agencies and for importers of ethnic food. The regional differences should be taken into account by food business operators.
Originality/value: There has been little empirical study on the subject. The designed RHS model can be replicated in further research.

Keywords: fermented vegetables, household consumption, macro-regions, tradition.
Category of the paper: Research paper.

1. Introduction

Many food habits and traditional products and dishes are associated with regional/country culinary heritage, which is affected by such factors as the availability of natural resources, the possibility of farming and animal husbandry, historical events, the pace of economic development of the region, local traditions, customs and religious ceremonies or various types of rituals related to the preparation and consumption of meals (Berndt-Kostrzewska, 2001). Fermented vegetables occupy a very important place among such products in Poland (Varzakas et al., 2017; Irakoze, Wafula, and Owaga, 2021; Słupski, Bernaś, and Głębczyński, 2021). Dishes prepared from fermented vegetables are the basis of the Christmas Eve dinner in Poland and some other countries, and recipes for Christmas dishes are passed down from generation to generation (Tambor, 2020; Słupski, Bernaś, and Głębczyński, 2021; Łukasiewicz et al., 2022). In September, the Sauerkraut Festival takes place in Charsznica in Lesser Poland that confirms the role of this product in Polish tradition. During this holiday, the king and the queen of cabbage are chosen. Such action is a strong marketing accent and applies not only to the product, but also to the region itself. This region is famous for the production of high-quality sauerkraut, which is often exported, and appreciated for its value all over the world. A very interesting promotional event is also the "Festival of Pickled Cucumber" organized in Kalisz Pomorskie. It refers to the tradition of pickling cucumbers in barrels immersed in the lake, now called the Cucumber Lake. Researchers agree that such events are an essential element in building a tourist brand (Wiśniewska, 2012; Marek, and Wiśniewska, 2021; Czekalski, 2021).

Old Polish cookbooks provide plenty of recipes for pickling cucumbers and cabbage due to the great popularity of these foods over the centuries. Many of these have strict requirements in terms of the time of preparation, the list of ingredients and additives that both stabilize the fermentation process and add aroma to the end-product, the quality of kegs/jars for pickling, and winter storage for maturation (Słupski, Bernaś, and Głębczyński, 2021; Łukasiewicz et al., 2022). The preparation of bigos, a traditional Polish dish based on sauerkraut, often eaten after hunting, sleigh rides and during the carnival, is described in the Polish literature, i.e. in a national epic "Master Thaddeus" by Adam Mickiewicz.

Another example of the presence of fermented vegetable products in national culinary tradition is the Korean kimchi (fermented Chinese cabbage), and the method of its production, called Kimjang, both included in the register of Representative List of the Intangible Cultural Heritage of Humanity. They form an essential part of Korean meals, transcending class and regional differences. The collective practice of Kimjang reaffirms Korean identity and is

an excellent opportunity for strengthening family integration. Kimjang is also an important reminder for many Koreans that human communities need to live in harmony with nature. There are regional differences, and the specific methods and ingredients used in Kimjang are considered an important family heritage, typically transmitted from a mother-in-law to her newly married daughter-in-law (https://ich.unesco.org...). An important factor conducive to marketing activities, including promotion, and protection of this product in Korea, is the Kimchi Industry Promotion Act amended in 2020 (Min, Cho, and Seo, 2021). The popularity of these products among consumers around the world is due to their century-long presence in the everyday human diet (Słupski, Bernaś, and Głębczyński, 2021; Łukasiewicz et al., 2022), as well as their long shelf-life, functionality, safety, sensory, and nutritional properties (Rezac et al., 2018). In Poland, the most traditional fermented food categories are fermented cucumbers and fermented cabbage (sauerkraut) (Korzeniowska-Ginter, 2017). Many dishes based on sauerkraut and pickled cucumbers are included in the list of traditional products supervised in Poland by the Ministry of Agriculture. Most of them (9 products) were registered in Eastern Poland (www.gov.pl...). The role of this type of products in promoting the country, the region, and even lifestyle, is now undeniable. They are recognized as a powerful marketing tool, also when it comes to culinary tourism (Grębowiec, 2017; Domagała, Najgebauer-Lejko, and Walczycka, 2022). Sauerkraut and pickled cucumbers-based products and dishes are also very popular in neighboring countries, e.g. in the Czech Republic, Slovakia, Lithuania or Ukraine, which is related to mutual historical heritage interwoven with national tradition (Paulauskienė et al., 2018; Garmasheva et al., 2019; Kameník, 2022; Shamtsyan et al., 2022). However fermented products from abroad are also gradually entering the Polish food market, e.g. from China, Japan or Korea (Tambor, 2020). Moreover, regional variations in food consumption, including fermented vegetables, food preparation and food behaviors, depending on different demographic features, have been observed by different researchers. This type of pattern has been noted in countries of all sizes, with a more traditional approach in this regard characterizing the inhabitants of rural areas and smaller towns (Barslund, 2007; Camel et al., 2015; Chatelan et al., 2017; Sang et al., 2020; Bousquet et al., 2021). Food fermentation as a form of preservation is no longer as essential as it was centuries ago when any other form of food preservation was limited. However, this traditional food processing technique has experienced a cautious cultural renaissance (Provident Barometer, 2018; 2019; 2020; Davison, 2018; Lewin, 2022).

Fermented vegetables, as probiotic products, have a very beneficial effect on human health which is critical to the dissemination of such foods. Probiotics are defined as live microorganisms which when administered in adequate amounts confer a health benefit on the host (FAO/WHO, 2002). In general, fermented foods are foods and beverages made using controlled microbial growth and enzymatic conversion of food components (Marco et al., 2017). A key role in the fermentation process is played by microbial food cultures, live bacteria, yeasts and moulds (Herody et al., 2010). Their value is associated with their physiological

features such as substrate utilization and metabolic capabilities. Their common occurrence in foods, coupled with their long historical use, contributes to their acceptance as Generally Recognized as Safe (or GRAS) for human consumption (Singh and Gaur, 2021). Although the current probiotic market is dominated by dairy food products, non-dairy foods such as probiotic fermented cereals, vegetables, fruit, and vegetable juices are becoming more and more popular, due to increasing health concerns about lactose intolerance, milk protein allergy, high cholesterol content and high amounts of saturated fatty acids of dairy based foods (Lillo-Pérez et al., 2021). Researchers point out that the market of probiotic products, especially of plant origin, is developing more and more due to contemporary consumer trends (Pimentel et al., 2021). This is due to the noticeable tendency to avoid animal products, the production of which is contributing to the deepening of the climate crisis (Mahoney et al., 2021; Kowalska, and Manning, 2022). This situation is conducive to the development of various new marketing strategies, the aim of which should be to promote this type of product. In the promotion of this type of products, special emphasis should be placed on their pro-health features and their relationship with the tradition and identity of a given country or region (Pimental et al., 2021; Kariyawasam, Lee, and Paik, 2021).

The purpose of our article is to present the results of consumer research in terms of the self-reported levels of recognition, sourcing, self-preparation and consumption of certain types of fermented food products in Polish households and to investigate the traditions of making these products at home in two macro-regions: Northern Poland (NP) and Eastern Poland (EP). NP is classified as part of Poland A, while the EP is classified as part of Poland B. This is due to differences in the level of income, wealth, unemployment rate, as well as access to education and culture (Cieślak-Wróblewska, 2021). Poland B is a less developed region of Poland than Poland A as a result of some historical events. The two analysed macro-regions (NP, EP) are economically and culturally different and the original cause of the differences was the territorial partitioning of Poland by Russia, Prussia and Austria. Poland was partitioned and disappeared from maps of Europe and the world for over 120 years. The presence of Prussian culture in NP and of Russian influence in EP has a tangible impact on local livelihoods, culture and economic opportunities.

In our marketing research two categories of fermented vegetable products are considered: traditional products derived from cultural heritage which are well established in the Polish culture, and emergent products, namely those fermented vegetable products that are gradually appearing on the Polish market from abroad, e.g. from Asia. To our knowledge, our research fills the research gap, because although there are studies on the consumption of fermented vegetables products in Poland, there are no comparative studies regarding new emerging products of this type from other countries.

We have divided the article into several parts. After the introduction, the subsequent parts cover the methodological approach, including the design of the RHS model, the results and the discussion. The article ends with conclusions, the research implications and limitations, and further research directions.

2. Material and methods

Data were collected through a self-administered on-line survey run in two economically and culturally different regions of Poland to explore similarities and differences between consumer behaviors. We have prepared a measurement tool called the RHS (recognition, habits and sourcing) questionnaire. Data collection was carried out at two universities: University X, the largest university of NP, and University Y, the largest university in EP. The questionnaire was approved by the Research Ethics Committees at both universities. The survey population were households located in either EP or NP represented by students of these universities. The measurement tool was a self-completed survey questionnaire, prepared by the authors in Polish and English, which consisted of an introduction, instructions for the respondents, nine relevant questions and five questions on the demographic characteristics of the students participating in the survey and the characteristics of their households. The English version of the RHS questionnaire was used for efficient communication between the authors of this paper (see Table 1). The following traditional product categories were analysed: fermented cucumbers and sauerkraut. The following emerging product categories were analysed: fermented beetroots, fermented pumpkins, kimchi, fermented carrots, fermented peppers, fermented tomatoes, fermented radishes, fermented mixed vegetables, and other fermented vegetables.

Table 1.
The RHS questionnaire

----------	**I – Question regarding recognition of the products**				
a. fermented beetroots b. fermented pumpkins c. sauerkraut (fermented cabbage) d. kimchi (fermented Chinese cabbage) e. fermented carrots f. fermented cucumbers g. fermented peppers h. fermented tomatoes i. fermented radishes j. other …fermented mixed vegetables	Do you recognise this food product?				YES (1) NO (0)
	II – Questions reflecting household consumption habits				
	Are fermented sour pickled vegetables consumed in your household?				YES (1) NO (0)
	How often is the product (alone or with other foods) consumed in your household?				
	Never (0)	No more than once every six months (1)	Monthly (2)	Weekly (3)	Several times a week (4)

Cont. table 1.

	III – Questions/statements reflecting sourcing of fermented vegetable products (self-preparation, motives for self-preparation, sourcing of ingredients, sourcing of recipes)
	For each product listed click on the statement that best describes your consumption behaviour at home.

I/We do not eat this product at home (1)	I/We only buy this product from a store to eat at home (2)	I/We do not make this product but eat product at home only if we get it made by friends or relatives (3)	I/We make this product ourselves to eat at home (from vegetables bought from a store or market) (4)	I/We make this product ourselves to eat at home (from vegetables we grow) (5)	I/We make this product ourselves to eat at home (from vegetables grown by relatives or friends) (6)

If vegetables are pickled in your household, please answer the question: where do you (and/or other members of your household) obtain vegetables intended for pickling? Click all those that apply.
a. Hypermarket/Supermarket b. Discount store, e.g. Lidl c. Small format grocery store d. Market e. Organic shop f. Organic farm g. Farm h. On-line shop i. Other household j. Relatives k. Own vegetable garden
If vegetables are pickled in your household, please answer the question: which sources of pickles' recipes are important for you (and/or other members of your household)?
Not important (0) Important (1)
a. Mother, other relatives and/or friends representing an older generation b. Family and friends of a similar age c. Celebrity Chef's website, TV programme, cookbook etc. d. Cookbooks e. TV programme f. Periodicals and newspapers (paper version) g. Grocery store handouts (e.g. weekly flyers) h. Nutrition interest websites i. Grocery store/Company-branded websites (e.g. Lidl) j. Food blogs k. Food-related mobile applications l. Facebook m. Pinterest n. Own experience

Cont. table 1.

	If vegetables are pickled in your household, please answer the question: what has motivated you (and/or other members of your household) to prepare fermented sour pickled vegetables on your own? Click to show your level of agreement or disagreement with each statement.					
		Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
	a. I think that homemade fermented sour pickled vegetables are healthier than those bought from a store. b. I think that making pickles at home is a way of saving money. c. I think that homemade fermented sour pickled vegetables are of a better quality than those bought from a store. d. Self-prepared fermented sour pickled vegetables were always present at my home. e. I like making pickled vegetables at home.					
	IV – Profile questions					
	Please select the word or phrase that best matches your response.					
	What is the place of your residence?			In what macro-region of Poland is located your household?		
	a. City of 500,000 inhabitants and more b. City of 100,000-499,999 inhabitants c. City of 20,000-99,999 inhabitants d. City up to 19,999 inhabitants e. Rural areas			a. Central (Łódz, Świętokrzyskie Province) b. Eastern (Podlaskie, Lublin, Subcarpatian Province) c. Northern (Pomeranian, Warmian-Masurian, Kuyavian-Pomeranian Province) d. Southern (Lesser Poland, Silesian Province) e. Northwestern (West Pomeranian, Greater Poland, Lubusz Province) f. Southwestern (Lower Silesian, Opole Province) g. Masovian Voivodship (Masovian Province)		
	How many persons are in your household?			What is your self-reported economic status?		
	a. 1 b. 2 c. 3 d. 4 e. 5 and more			a. Very good b. Rather good c. Average d. Rather poor e. Very poor		
	What is the name of your university?					
	UX			UY		

The questionnaire was piloted to ensure all questions were appropriately designed and no changes were made to the final questionnaire. The questionnaire in Polish was distributed via the Internet throughout the universities' channel (emails and MS Teams), social media (Facebook), and personal connection (emails, Messenger). An opportunity sampling method was used; the sample was drawn from that part of the population which was close to hand. It was a group sampling (the whole groups of students were invited to participate in the survey). The completion of the questionnaire was associated with the informed consent to participate in the study. Participation was voluntary. The students who accepted to participate in the study were invited to complete the questionnaire.

The study was positioned with the research questions (RQ) posed, taking into account three research perspectives of the research model: recognition, habits and sourcing: (A) Recognition of products: RQ1: Do consumers recognise particular fermented foods? (B) Household consumption habits: RQ2: What are the household habits regarding the consumption of (individual) fermented vegetable products? (C) Sourcing of products: RQ3: Where do consumers source fermented vegetable products? RQ4: Where are vegetables intended for self-preparation of fermented products sourced? RQ5: What are the motives for self-preparation of fermented vegetable products? RQ6: Where are the recipes for self-preparation of fermented products sourced?

Data were collected through the survey period December 2020 – February 2021 and analysed with Statistica 13.1 PL software, which included descriptive statistics and Chi-squared χ^2 test. Chi-square test for independence helps us determine whether two classification criteria are independent of each other. This technique makes use of contingency tables (*cross-tabs*) – tables with cells corresponding to cross-classifications of attributes or events (Aczel and Sounderpandian, 2008). It has been assumed that the results are statistically significant when $p < 0.05$. Due to the use of a convenience sampling method, we took care to maintain the homogeneity of the sample (Jager, Putnick, and Bornstein, 2017). This homogeneity was promoted by focusing on two groups of students but, respectively, coming from the same universities and regions. The on-line survey responses were collated and then the data was cleaned to avoid duplication or poor quality data. Responses with repeat values and identical IP addresses were discarded. Using this approach, 691 full responses were obtained. Due to the use of the group sampling method the respondents' households were located in seven regions of Poland: Central (n = 24), Eastern (n = 209), Northern (n = 391), Southern (n = 4), Northwestern (n = 18), Southwestern (n = 2), and Masovian province (n = 43). Since the survey was directed to students representing households located in two explored macro-regions: EP and NP, the responses collected from students whose households were located in other five regions were excluded from further analysis.

3. Results and discussion

Finally, a sample of 600 households was obtained (EP: n = 209, NP: n = 391) (see Table 2). Nearly two thirds of the households analysed were located in NP. About half of the households analysed were located in big cities of over 100 thousand inhabitants and twenty-six percent of them were in rural areas. Only 16.8% of the households consisted of 1 or 2 members. When asked the perceived financial status just 4% of the respondents stated that was 'rather poor' or 'very poor'. The results are now presented and discussed and introduced by research question. Where the number of respondents varies this is confirmed in each question.

Table 2.
Profile of the sample (n = 600)

Variable	Category	Frequency	Percentage (%)
Distribution area of households (region)	Eastern Poland	209	34.83
	Northern Poland	391	65.17
Distribution area of households (place of residence)	City of 500,000 inhabitants and more	127	21.17
	City of 100,000-499,999 inhabitants	181	30.17
	City of 20,000-99,999 inhabitants	98	16.33
	City up to 19,999 inhabitants	35	5.83
	Rural areas	159	26.50
Number of household members	1	18	3.00
	2	83	13.83
	3	142	23.67
	4	218	36.33
	5 and more	139	23.17
Self-reported economic status of respondents	Very good	113	18.83
	Rather good	326	54.33
	Average	137	22.83
	Rather poor	21	3.50
	Very poor	3	0.50

3.1. Recognition of products and household habits (RQ1 and RQ2)

The level of recognition was assessed (n = 598) and two traditional fermented vegetable products were well known among the respondents: fermented cucumbers (99.2% recognition) and sauerkraut (96.2%) respectively (see Table 3) confirming results of earlier studies, showed these products are the most popular fermented vegetables in Poland, being highly valued among consumers and having a role in identity formation and associated with home and cultural heritage (Korzeniowska-Ginter, 2017).

There was a medium level of recognition of fermented beetroots, fermented mixed vegetables, kimchi and fermented peppers among the respondents where around half of the respondents recognised the products. Other fermented vegetable products were the least recognized by the participants (see Table 3) concurring with Czyżowska et al. (2020) and Szutowska et al. (2021). The products are already emerging in Poland since they appear in the (online) store/processing plant offer which are often family-owned, as well as on culinary blogs and in culinary workshops which promote consuming and preparation of fermented vegetable products. Statistically significant differences in recognition of fermented products between the macro-regions were found only for kimchi ($p < 0.05$). The level of recognition of kimchi was associated with location and was higher among respondents from NP (63.5%) than among respondents from EP (40.2%). The level of kimchi recognition was statistically significantly higher (at $p < 0.05$) among respondents living in cities of 500,000 inhabitants and more (there is only one such a city in NP, Gdansk). A statistically significantly lower percentage of respondents from big cities declared that kimchi was "never" consumed in their households whereas a significantly higher percentage of respondents from big cities claimed that kimchi was consumed in their households at least once a month. Polish citizen's preferences regarding

food consumption have changed substantially in recent years. Polish citizens are increasingly experimenting in the kitchen, influenced by culinary programmes and increasing availability of oriental products in supermarkets and discounters. These marketing channels introduce Asian products not only as part of their temporary offers, but also their regular offering. Moreover, a greater interest in Asian cuisine and dishes can be seen in restaurants, mainly in larger cities, where more and more access is being created (Tambor, 2020). The opening of Poland to global gastronomy, fosters interest in various ethnic products. It is influenced by noticeable demographic changes, increase in the level of education, development of tourism, as well as globalization of the living space. However this is more of an urban than a rural trend, especially because it is in cities where specialized grocery stores are available (Pielak, and Czarniecka-Skubina, 2016). Products traditionally consumed in Asia are a novel alternative in Poland and as an important part of a healthy diet (Tamang et al., 2020).

Table 3.
Fermented vegetable products recognition

All participants answering this question											
(n = 598)	fermented cucumbers	sauerkraut	fermented beetroots	fermented mixed vegetables	kimchi	fermented peppers	fermented carrots	fermented tomatoes	other	fermented radishes	fermented pumpkins
Percentage that do recognize (%)	99.16	96.15	55.85	55.52	55.35	50.17	28.43	27.42	24.25	18.39	14.04
Participants representing households located in Eastern Poland											
Percentage that do recognize (%)	99.52	99.04	58.37	54.07	**40.19**	47.37	26.32	32.06	19.62	17.22	11.48
Participants representing households located in Northern Poland											
Percentage that do recognize (%)	98.97	94.60	54.50	56.30	**63.50**	51.67	29.56	24.94	26.74	19.02	15.42

Only 2.17% of the respondents claimed that fermented vegetable products were not consumed in their households, and they were from NP and this is a statistically significant result ($p < 0.05$). Figure 1 shows the frequency of consumption of particular fermented vegetable products in the sample population. Nearly seven out of ten of the surveyed households (68.16%) ate fermented cucumbers either weekly or several times a week; and just over a quarter of households consumed sauerkraut either weekly or several times a week (27.5%). This result is in line with other studies (Pielak, and Czarniecka-Skubina, 2016; Korzeniowska-Ginter, 2017).

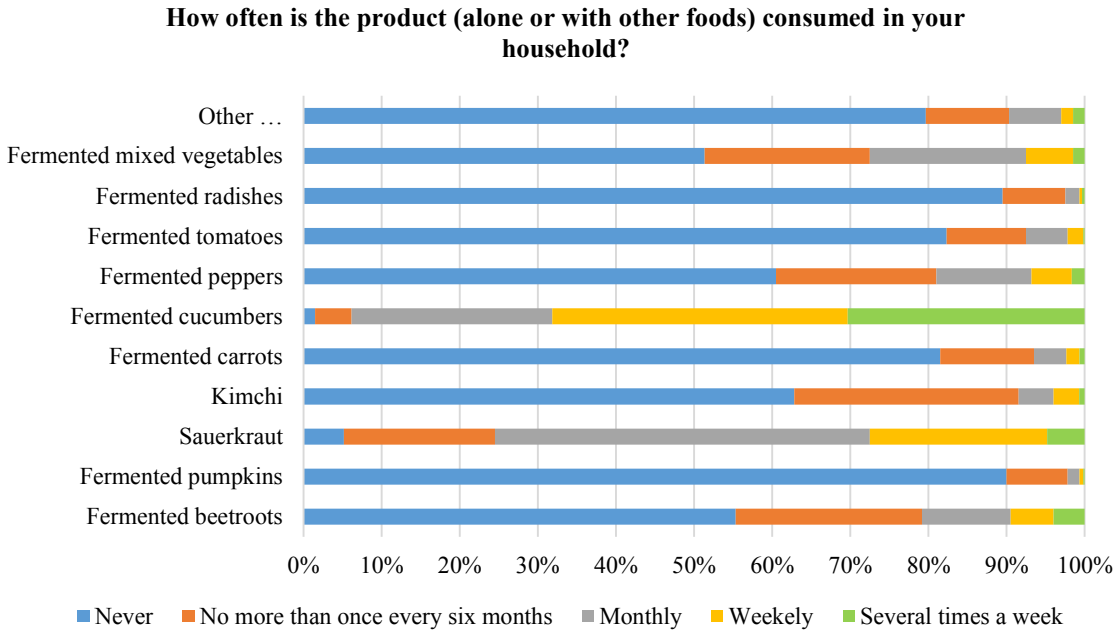

Figure 1. Frequency of consumption of fermented vegetable products in the research sample (n = 600).

A significant association was also identified between macro-region and the consumption of sauerkraut ($p < 0.05$). Sauerkraut was more often consumed in households located in EP. Respondents from NP, when asked about the frequency of consumption of sauerkraut, more than twice more often answered "never" or "no more than once every six months" (30.42%) than respondents from EP (13.47%). This may be due to culinary heritage, as dishes based on sauerkraut were traditional EP dishes, as cited in historical (Dumanowski, 2019), and cultural references (Kłosiński, 2000). For seven products over half of the respondents said they never consumed the products. In comparison fermented cucumbers and sauerkraut were widely consumed. In summary, the level of recognition for some fermented foods varies by location (RQ1) and the household habits associated with consumption of fermented vegetables (RQ2) has been shown to vary by region and product.

The analysis of responses for the next session is focusing on the two most recognized and more often consumed fermented vegetable products, i.e. fermented cucumbers and sauerkraut.

3.2. Sourcing of products (RQ3, RQ4, RQ5 and RQ6)

Only 1.67% of our respondents claimed that fermented cucumbers were not present in their diet and the diet of their households' members (see Figure 2). Exactly 63% of respondents declared that fermented cucumbers were made at home by them or their households' members. Over 44.66% of the respondents claimed fermented cucumbers were made either from vegetables grown in their home garden or from vegetables grown by relatives or friends. This may be due to the fact that the number of people cultivating crops in their own allotment gardens in Poland is estimated at 4 million, which constitutes approximately 11% of the adult population. A similar tendency regarding home-made fermented cucumbers was also observed

by other studies (Korzeniowska-Ginter, 2017). Allotment gardening in Poland is a century-long tradition that has been cultivated by each new generation. The idea of allotment gardening originated in the 16th century, when plots of land were let, under perpetual usufruct, as gardens to city inhabitants (Mokras-Grabowska, 2020). For several years, there has been a growing interest in having allotment gardens in Poland, which has grown during the pandemic (Szkup, 2020). Therefore, it is not surprising that just 13.17% of our respondents stated that their households purchased fermented cucumbers from a store.

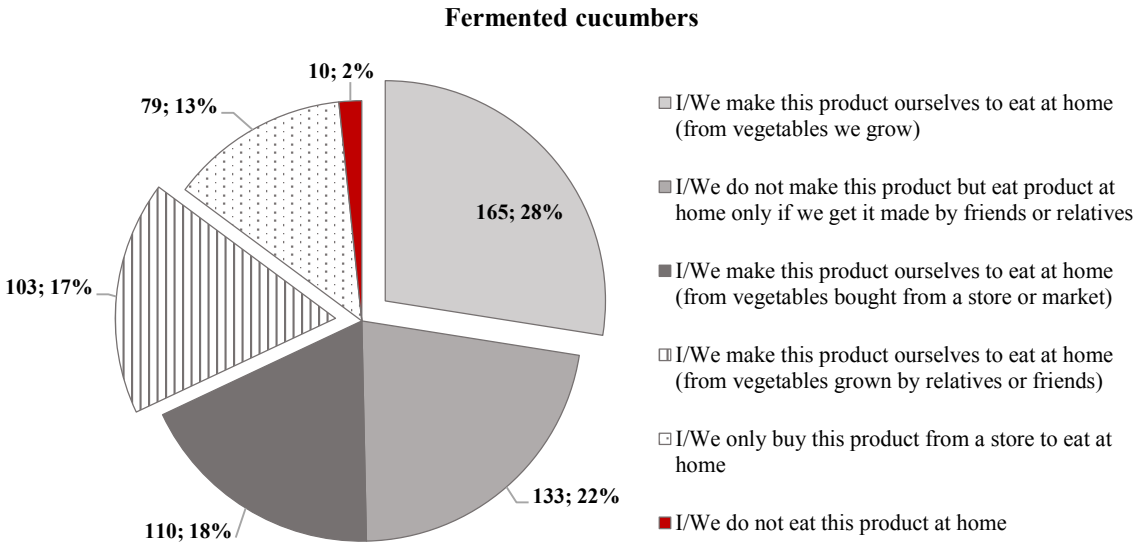

Figure 2. Self-reported consumption behaviour concerning home preparation of fermented vegetable cucumbers (n = 600).

A statistically significant association was discovered between place of residence and the way fermented cucumbers were sourced ($p < 0.05$). Fermented cucumbers were more often bought from a store or sourced from relatives/friends in households located in bigger cities of over 100 thousand inhabitants than in smaller cities and rural areas. These products were more likely to be homemade from vegetables grown in own home garden in households located in small towns of under 20 thousand inhabitants and rural areas. The traditional approach to the preparation of this type of products was statistically confirmed by Korzeniowska-Ginter (2017), who recognized that the inhabitants of smaller towns and villages were significantly more likely to prepare homemade preserves, because this was the tradition of their families. The issue of having less access to own raw materials in larger cities, a higher pace of life, and less time to prepare food due to work and commuting also seem to be important. According to Provident Barometer (2018), the preserves were most often prepared by villagers who had access to their own agricultural products. They didn't have to get engaged in shopping, they enjoyed what their land produced and they perceived making fermented vegetables at home as a great way to save money. A statistically significant association was also identified between macro-region and the way fermented cucumbers were sourced ($p < 0.05$). In NP, the percentage of households sourcing fermented cucumbers only from a store was double that of households in EP.

Fermented cucumbers were more often homemade from vegetables grown in own home garden in households located in EP. A statistically significant association was also discovered between number of household members and their sourcing of fermented cucumbers ($p < 0.05$). Fermented cucumbers were more likely to be made from vegetables grown in the home garden in households composed of 5 and more members. Fermented cucumbers were bought from a store twice as frequently in households composed of two members as in households composed of 1, 3 or 4 members. The Provident Barometer (2018) also confirmed that an important factor in making fermented products at home was the number of people in a household. Over 70% of households with four or more people declared that they prepared pickles from vegetables grown in their own home garden. No significant association was identified between self-reported economic status and sourcing fermented cucumbers. Almost half of the respondents (48.83%) claimed that sauerkraut was purchased from a store to consume at home, and 28% of the participants declared that sauerkraut was made at their home, whereas cabbages were more often bought from a store or market (see Figure 3).

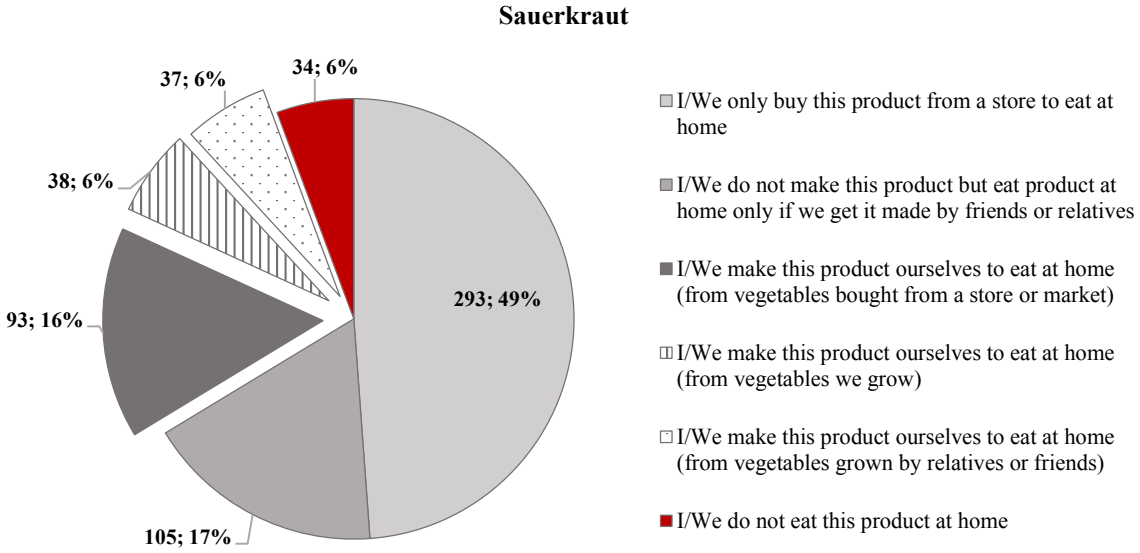

Figure 3. Self-reported consumption behaviour concerning home preparation of sauerkraut (n = 600).

A statistically significant association was identified between place of residence and the way sauerkraut was sourced ($p < 0.05$). Sauerkraut was more often bought from a store in households located in cities of 500 thousand inhabitants and more. Cabbages were more often fermented to make sauerkraut using vegetables grown in home garden in households located in rural areas. The same tendency was reported in Provident Barometers (2018; 2019). A statistically significant association between macro-region and the way fermented cabbages were sourced was discovered ($p < 0.05$). Sauerkraut was more frequently bought from a store in households located in NP and more often made at home from cabbages grown in home garden in households located in EP, as in the case of fermented cucumbers. It is probable that the economic status of respondents from less economically developed regions (e.g., being a part of Poland B)

influences the cultural belief that preserves made at home are cheaper. Homemade preparation of fermented products can be treated as a manifestation of rational food consumption in households and rational sourcing of raw materials (Korzeniowska-Ginter, 2017).

Home gardens (without recreational space) are areas which are usually located around the farm, but separated from the rest of the farm. The presented research data may result from the fact that the total area of such gardens is four times larger in EP than in NP (GUS, 2019a; 2019b).

The majority of consumers surveyed sourced fermented cucumbers from their own households whereas one third of respondents claimed sauerkraut was made at home by them or their households' members (RQ3). The way fermented cucumbers and sauerkraut were sourced differed depending on whether the household was located in urban or rural areas in EP or NP.

Respondents (n = 456) replying to the question on the source of vegetables (RQ4) intended for pickling at home were asked to tick all the answers that applied. Vegetables intended for pickling were reported as being most often sourced in a market (61.18%) and home vegetable gardens (58.33%). Nearly half of households (44.95%) obtained vegetables for pickling from other households, or a discount store (30.7%), farm (28.73%), hypermarket or supermarket (24.56%), small format grocery store (18.2%), then at a lower frequency, organic farm (7.23%), organic shop (3.95%), on-line shop (1.32%), and relatives (1.32%). These results differ from those presented in Provident Barometer (2019), where 75% of the respondents claimed that they prepared preserves using the crops from their own allotment garden and 40% of the respondents declared purchasing vegetables intended for pickling in a store or market.

A statistically significant association (at $p < 0.05$) was shown between place of residence and sourcing vegetables for pickling in hypermarket or supermarket; and between place of residence and sourcing vegetables for pickling in a discount store and/or small format grocery store. Respondents living in rural areas rarely obtained vegetables for pickling from hypermarkets or supermarkets, a discount store and/or a small format grocery store. The preference for these sources of vegetables grew with the increase of the number of inhabitants in a city.

Place of residence and sourcing vegetables for pickling in the home garden was statistically significantly associated ($p < 0.05$). Vegetables intended for pickling were much more likely to be grown in households located in rural areas than urban areas. Macro-region was found to be significantly associated with sourcing vegetables for pickling in hypermarket or supermarket ($p < 0.05$), sourcing vegetables for pickling in a discount store ($p < 0.05$) and sourcing vegetables for pickling in small format grocery store ($p < 0.05$). These sources of vegetables intended for pickling were definitely more popular in households located in NP. The reason for this might be that inhabitants of NP may have less access to home gardens but greater access to supermarket/hypermarket chains (GUS, 2019a; 2019b; 2019c).

A statistically significant association was also identified between macro-region and obtaining vegetables for pickling from home garden ($p < 0.05$). Vegetables intended for pickling were much more often grown in households located in EP. These results show a regional variation in where vegetables are sourced for fermenting and grown in the garden and a difference between rural and urban areas.

The data (see RQ5) suggests that there were two major motives for preparing fermented sour pickled vegetables at home, strong respondents' confidence in (1) the health attributes of homemade fermented sour pickled vegetables; and (2) quality of homemade fermented sour pickled vegetables (see Table 4). Moreover, a large majority of the respondents (72%) "agreed" or "strongly agreed" with the following statements: "… making pickles at home is a way of saving money", "self-prepared fermented sour pickled vegetables were always present at my home". The last declaration shows strong ties to the family's culinary heritage. This is confirmed in the literature on fermented products, where health aspects (Korzeniowska-Ginter, 2017; Tamang et al., 2020); durability and safety (Rezac et al., 2018), cheapness (Korzeniowska-Ginter, 2017), taste and nutritional properties (Rezac et al., 2018; Tamang et al., 2020), willingness to improve physical condition (Rezac et al., 2018), limited trust to products offered by industrial manufacturers (Korzeniowska-Ginter, 2017), and cultural heritage and family tradition (Korzeniowska-Ginter, 2017) are all cited as important factors of influence.

Table 4.
What has motivated you (and/or other members of your household) to prepare fermented sour pickled vegetables on your own?

----------	**To what extent do you agree or disagree with the following statements?**				
	I think that homemade fermented sour pickled vegetables are healthier than those bought from a store (n=478)	I think that making pickles at home is a way of saving money (n=479)	I think that homemade fermented sour pickled vegetables are of a better quality than those bought from a store (n=477)	Self-prepared fermented sour pickled vegetables were always present at my home (n=475)	I like making pickled vegetables at home (n=478)
Strongly disagree	3.6%	2.3%	2.5%	4.2%	**13.0%**
Disagree	2.5%	5.0%	2.7%	9.5%	**19.5%**
Neutral	14.0%	21.1%	11.1%	13.5%	32.8%
Agree	**34.3%**	44.0%	**34.4%**	37.9%	24.9%
Strongly agree	**45.6%**	27.6%	**49.3%**	34.9%	9.8%

Over 73% of the respondents assessed the importance of particular sources of recipes for self-preparation of fermented vegetable products (see RQ6). "Mother, other relatives and/or friends representing an older generation" was most frequently indicated as an important source of such an information. Over 97% of the respondents assessed this source of information as an important one (see Figure 4). It confirms that knowledge of making pickles is a tradition

handed down from generation to generation by word of mouth. This is a very important issue, not only in Poland, because it is related to cultural, family and regional identity and heritage (Dumanowski, 2019). Preparing food at home is often very symbolic and has become a part of family heritage and ritual, especially during various holidays, including religious feasts (Bieńko, 2018). Home has always been associated with tradition, identity and a sense of security. It is not only a place to live, but also a space associated with emotional experiences.

A statistically significant association (at $p < 0.05$) was identified between place of residence and the importance of "celebrity chef's website, TV programme, cookbook" as a source of pickles' recipes. Respondents living in bigger cities more often indicated celebrity chef's activities as an important source of recipes for self-preparation of fermented vegetable products. A statistically significant relationship was also identified between macro-region and the importance of "celebrity chef's website, TV programme, cookbook" as a source of pickles' recipes ($p < 0.05$); 33.5% of the respondents living in EP found this source important whilst 55.39% of the respondents from NP found this source important. According to Bieńko (2018), in Poland there is a growing interest in various blogs and culinary programs, especially those run by celebrities, regardless of the consumer's place of residence. The author shows that the most important sources of culinary inspiration are online recipe websites and cookbooks, and the role of the press and TV cooking programs devoted to diets and healthy food has also increased. The popularity of online recipe websites and food blogs reveals a great deal of interest in healthy eating. Social media is one of the key culinary digital communication channels in this area.

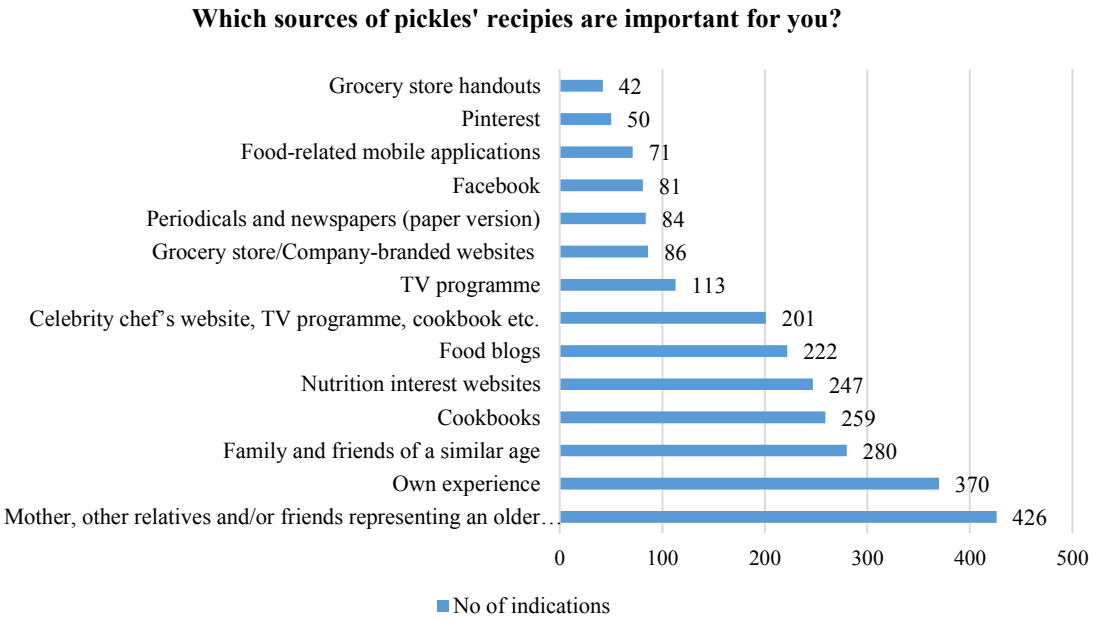

Figure 4. Sources of recipes for self-preparation of fermented vegetable products (n = 439).

A statistically significant relationship was also discovered between place of residence and the importance of food blogs as a source of pickles' recipes ($p < 0.05$). Respondents living in bigger cities more often indicated food blogs as an important source of recipes for self-preparation of fermented vegetable products. A statistically significant association was also identified between self-reported economic status and the importance of Facebook as a source of pickles' recipes ($p < 0.05$). Participants whose self-reported economic status was better, more frequently indicated Facebook as an important source of such recipes. According to the report "Digital 2020," Facebook is not the most frequently chosen medium in Poland (Hootsuite, 2020), it ranks second after Youtube, which may suggest that video presentations may be more important for users. However, Youtube was not included in our research, and this is the limitation of this study.

4. Conclusions

Pickled cucumbers and sauerkraut were the most recognized fermented vegetable products in this research. Thus, we confirmed that these products are deeply rooted in the culinary tradition of the households represented by the respondents. Their presence in the diet of Polish people has been proven historically and documented in old recipes, and in classical literature. It appeared that respondents with access to land to grow vegetables are more likely to produce them at home and the motives for self-production are linked to family and culinary heritage and tradition, but also to perceived quality and health benefits. Culinary heritage is also important in obtaining recipes for the preparation of fermented vegetable products. The major source of recipes was family members and friends. The inhabitants of smaller towns and villages were significantly more likely to prepare homemade preserves. However, there are emergent trends, mainly in larger cities, manifested by interest in food from other countries, activity on internet forums, observing culinary blogs and celebrity chefs' programs. Although Poland is not a large country, regional differences in terms of consumption, commitment to culinary heritage, engagement with traditional production at home and openness to new market propositions regarding pickles were observed. The inhabitants of EP keep alive the tradition of self-preparation of fermented vegetable products and growing vegetables in their own home gardens while people from NP, especially in larger cities, are less likely to follow traditional methods of production. Our research shows that the region and place of residence influences the consumption of fermented products, as well as related behaviours, customs and culinary traditions.

The findings have theoretical implications as they bring new knowledge about consumer behaviour that is mediated by home heritage and tradition, and region of origin. The results are also of practical value, as a starting point for agencies dealing with food promotion and for importers of ethnic food dealing with its introduction to the market. The regional variances are of note for food marketers and the food industry in general. Promotion of food sustainability and the role of home production of food is also considered in this paper and there is opportunity to consider this further especially the environmental footprint of home produced food, manufacturing produced food and how this compares to imported options available in retail stores.

There are some limitations of the research. Firstly, the use of a convenience sampling method limits the scope of the conclusions and the generalisability of the results. Secondly, there is a lack of prior domestic and international research on the topic. The only studies we have identified came from Polish literature, and considered fermented cucumbers and sauerkraut. Nevertheless, the obtained results constitute an interesting comparative study and are a starting point for further research in this field, e.g. the RHS model can be replicated in future research.

Further research can be focused on recognizing the consumer differences between other regions of Poland, but also between Poland and neighbouring countries with a common history, culinary tradition and heritage, e.g. Lithuania or Ukraine.

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ENGINEERING ETHICS – MAIN PRINCIPLES

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Purpose: The aim of the paper is to analyze the main principles of the usage of the engineering ethic in the enterprise.
Design/methodology/approach: Critical literature analysis. Analysis of international literature from main databases and polish literature and legal acts connecting with researched topic.
Findings: Engineering students should learn the concepts of engineering ethics in much the same way as they learn technical topics. As they build awareness of ethical issues related to engineering and learn about the tools available to deal with ethical dilemmas, such as codes of ethics, they should be able to extrapolate this knowledge and anticipate some of the problems that may arise. We believe that every engineer should be familiar with the basic concepts of engineering ethics in order to make proper use of ethical codes in their country and their organisation. An ethical approach to engineering can achieve better working conditions and better outcomes for all people and stakeholders of the organisation
Originality/value: Detailed analysis of all subjects related to the problems connected with main principles of engineering ethic.

Keywords: ethic, ethic codex, human resource management, Industry 4.0.

Category of the paper: literature review.

1. Introduction

The word 'ethics' comes from the Greek word 'ethos' meaning 'character'. Ethics is a set of rules or principles that are generally considered to be the norm or right and wrong or right and wrong that are usually imposed by an outside group, society or profession or so (Engineering Ethic, 2018).

Engineering ethics is part of a broader concept called business ethics. The concept of business ethics includes the following areas (Robinson et al., 2007):

- The values that underpin business, including values relevant to particular professions in business, such as accountants or managers.
- Identify how values can be embodied in the organisation. This includes the development and implementation of appropriate codes of ethics.
- Specific policies identified in organisations in areas such as corporate governance or workplace relations.
- Broader corporate responsibility towards the local community and environment and global issues – implementation of the concept of corporate social responsibility.

Especially in the times of Industry 4.0 when there is a big importance of the information and digitalization (Kwiotkowska et al., 2021; Stawiarska et al., 2020; 2021) we should put attention on the role of the engineering ethic within the enterprise (Drozd, and Wolniak, 2021; Gajdzik, and Wolniak, 2021). The good managed organization in the Industry 4.0 conditions should implement the ethic code to their business practice.

The aim of the paper is to analyze the main principles of the usage of the engineering ethic in the enterprise.

2. Ethical actions

In determining whether or not a given action is ethical, we should focus on five basic skills: moral reasonableness, respect for the person, tolerance of diversity, moral hope and integrity. These are characterized in Table 1.

Table 1.
Basic skills in identifying actions as ethical

Skill	**Charavteristic**
Moral rationality	The ability and willingness to act morally.
Respect for the person	Treating other people with care.
Tolerance for diversity	There needs to be a broader view of the ethnic and religious differences that exist between people. Each person is different from the other when they are compared on the basis of moral reasoning. Acceptance of these differences is really important.
Moral hope	Moral conflicts can be resolved through better communication and rational dialogue, based on facts, open, which is accepted and appreciated by both sides.
Integrity	Moral integrity must be maintained. Being honest and having strong moral principles helps in effective problem solving. You should also consider the professional life and personal beliefs of others when solving a problem.

Source: author's own analysis on the basis: (Harris et al., 2006).

The importance of engineering ethics is due to a number of factors affecting the field. These are described in Table 2.

Table 2.
Factors influencing business ethics

Factor	Characteristic
Globalisation	Globalisation has contributed to the growth of international business in such a way that it is estimated that over half of the world's largest organisations are corporations. The fact that they must work closely with various governments around the world has led to an increased sense of responsibility for their actions.
Information and communication technologies	This has led to an increase in global transparency as a result of rapid access to information from many different sources. As a result, it has become increasingly difficult for organisations to hide what may be the more controversial aspects of their activities.
Fiscal pressure	Increasing fiscal pressures have forced companies to withdraw from previous philanthropic endeavours. At the same time, this has led to greater discussion about the roles of government and business and how business can contribute to society.
The growing importance of intangible assets	This is linked to the recognition that in the new economic environment there is a system of values shared by a significant proportion of society on which the success of the organisation depends. It is also partly linked to growing public awareness of key issues such as sustainability.

Source: author's own analysis on the basis: (Harris et al., 2006).

The word ethics has many meanings, as does engineering ethics. According to the literature, we can define engineering ethics as the study of moral problems and decisions facing individuals and organisations involved in engineering; and the study of related questions about the moral conduct, character, policies and relationships of people and organisations involved in technological activities (Martin, 2009). Morality includes the beliefs and practices about right and wrong by which we guide our behaviour. According to another definition, engineering ethics consists of the duties and rights that should be observed by those involved in engineering activities, as well as the desirable ideals and personal commitments in engineering (Gębczyńska, and Wolniak, 2018; Grabowska et al., 2021; 2020; 2019). Engineering ethics is the study of decisions, policies and values that are morally desirable in engineering practice and research (Martin, 2009). Engineering ethics, like all detailed ethics, makes sense insofar as it can be used in everyday activities by those in professions whose specificity sets such a framework for ethical reflection (Jaśtal, 20018).

It is believed that the professional morality of an engineer depends on his individual morality – without the latter the former cannot be achieved. In a situation where morality is not in line with the content of the ethical codes, there will be no goods in the society which postulate the content of these duties (Pyka, 2010).

In order to perform his tasks well, an engineer, in addition to in-depth professional knowledge, must have some understanding of moral issues. Due to the specificity of professional situations, this understanding must sometimes go beyond the usual canon of moral decency. Codes of ethics of professional organisations can assist in discerning the moral aspects of typical professional situations. Such codes of ethics should not be considered as a set of precepts and prohibitions, but only as a set of guidelines, helping (especially young and inexperienced professionals) to avoid typical temptations and pitfalls arising in professional practice, related for example to conflicts of interest, to frictions arising from the relationship between different social positions (e.g. boss-employee, designer-contractor, professional-

client) or to the definition of substantive, legal and moral responsibilities of individuals and legal entities (Jaśtal, 2018).

3. Codes of ethics

Due to the fact that at the level of the description of the situation, the codes of ethics only indicate minimum moral standards of behaviour, their message is primarily expressed not in commands and prohibitions, but in the presentation of desirable models of personality. Such models include not only purely professional competences, but also various criteria for defining a person as a trustworthy professional. Such criteria may include, for example (Wajszczyk, 2013):

- the ability to take into account in his/her activity the general social objectives,
- ability to shape relationships within a group,
- awareness of the limits of one's competence and the scope of professional autonomy,
- awareness of the inevitable risks involved in their undertakings.

The concepts of ethics and morality are not unambiguous, nor is the relationship between them. One of the main meanings of these terms is related to the distinction between normative and descriptive ethics. Ethics here belongs to the realm of knowledge and theory – morality, as actual human conduct, belongs to the empirical realm.

The codes of professional ethics of the engineering profession are dominated by duties which may be regarded as the canon of moral conduct in the engineering profession (Wajszczyk, 2013):

- the paramount importance attached to the safety, health and welfare of society,
- providing services only within the scope of one's own competence,
- making public statements only in an objective and truthful manner,
- acting for an employer or client as a trustworthy representative or agent,
- avoiding fraudulent acts,
- acting with dignity, responsibility, ethics and in accordance with the law so as to enhance the honour, reputation and usefulness of the engineering profession.

In the engineering profession, advanced knowledge in a given engineering specialty is needed in addition to an efficient professional court. Its scope and level is in the focus of technical universities, while the importance of professional judgment education remains little clearly perceived. This is because the skills that are included in the concept of sound professional judgement are not amenable to scientific theory – they need to be considered on a case-by-case basis and it is difficult to make accurate generalisations. Similarly, the role of good moral judgement of a situation is not sufficiently brought out and emphasised in textbooks

on engineering ethics and business ethics. Professional experience, like life experience, cannot be effectively conveyed in the form of a verbal message, much less a lecture of some general theory. Therefore, the following normative recommendations are formulated in relation to engineering professional judgment (Pyka, 2010):

- The engineer should possess and develop technical knowledge.
- The engineer should strive to educate and continuously develop the capacity of his/her own professional judgment. He should be faithful to this judgment in all decisions and actions of his professional practice.

When considering problems in the field of engineering ethics, it is worth mentioning a concept called whisteblowing. This activity consists in disclosing irregularities, illegal, dishonest or forbidden actions which occur in the workplace. A necessary criterion for this system to work effectively is that the whistleblower acts in good faith, i.e., based on facts and other objective motivations, as opposed to personal considerations. A whistleblower is a person who reports or discloses irregularities or ethical doubts concerning behaviour, actions or phenomena occurring in the workplace (Sygnalista, 2017).

A distinction is made between internal and external whistleblowing. If the information about the wrongdoing in the company has been communicated to the management or the relevant organisational unit, it is called internal whistleblowing. If, on the other hand, the information has been communicated to the public or to an audit institution, then there is external whistleblowing (Jonek-Kowalska, and Wolniak, 2021). External whistleblowing can have disastrous consequences for an organisation in the form of loss of orders, contracts, positive image, customers, a series of burdensome inspections, sometimes leading the organisation to bankruptcy. For this reason, it is in the interest of the organisation that information about irregularities does not get out (Lewicka-Strzałecka, 2014).

Whistleblowing has many benefits for both organisations and their employees who use this form of whistleblowing. Among the most important are (Bielińska-Dusza, and Żak, 2018):

- minimising the risk of reputational or financial damage through the early detection and management of incidents of fraud or irregularity;
- increasing the chance of detecting undesirable activities, more effectively preventing such events in the future;
- gaining knowledge about fraud in order to reduce, eliminate and counteract it;
- Supporting the creation of an ethical working environment, increasing employee engagement;
- reducing the risk of litigation and, if disputes do arise, increasing the chances of a positive outcome;
- decrease the number of irregularities and abuses thanks to a clear and safe system of reporting them;

- strengthening the image of an honest and ethical company among internal and external stakeholders (an effective element of employer branding);
- building the image of a transparent and professionally managed company – through disapproval of abuses and people who commit them, and through documentation of the company's activities concerning counteraction and combating irregularities;
- counteracting the tightening of legal regulations limiting the freedom of economic activity, which can be caused by tolerating abuses by companies;
- in the long run, reducing revenue losses, thus achieving both economic and image gains.

In American textbooks on professional engineering ethics, one can see the intention to develop the ability of readers to solve ethical dilemmas independently or in groups. Teaching engineering ethics can lead to the following goals (Wajszcyk, 2013):

- To make students aware of the existence of a structured set of professional norms and duties expected of an engineer in the course of practicing his profession, the student must in this case be able to recognize and distinguish between the different types of duties, define their content and explain with examples what actions and attitudes are desirable and what are not. The training effect will be the acquisition of specific knowledge.
- Acquisition of skills of desirable behaviour in professional situations specified by the code of conduct, giving rise to conflicts of norms and ethical dilemmas or various professional temptations (fraud, corruption) and providing a way to solve them. Obtaining this effect means gaining appropriate skills and requires the application of various materials and didactic techniques in order to achieve the desired level and persistence of learning outcomes.
- The range of attitudes such as: demonstrating awareness of the social role of a technical university graduate, the need to formulate and communicate information and opinions to the society concerning the achievements of technology and other aspects of engineering activity.

A well written professional code of ethics related to the engineering profession should include the following issues (Engineering Ethics, 2018):

- Responsibility to the profession.
- Responsibility to oneself.
- Responsibility to the employer with whom the member is an employee.
- Responsibility to the client.
- Responsibility to other individual members of the group or profession.
- Responsibility towards the community.
- Responsibility towards the environment.
- Accountability to other groups or professions.

- In addition, the code should address issues relating to responsibility for confidentiality – and include whistleblowing.
- The code should also include statements on how to determine whether members have broken the institution's ethical rules.

An example of a code of conduct for the engineering profession is the document produced by the National Society of Professional Engineers in the USA. The NSPE is the only engineering society that represents engineers of all disciplines in the USA. Its original code of ethics was approved in 1946. In this chapter we have used the latest version from 2019. The current code is quite comprehensive and has many detailed rules of conduct as well as professional responsibilities. Public safety, technical competence, accurate data, avoidance of conflicts of interest and other improprieties, professional behaviour based on integrity and professional development are important and are emphasised in the NSPE code of ethics (Baura, 2003).

The example of a code of ethical conduct, shown below, comes from England – it is a document prepared by the Engineering Council. It states that institutions should ensure that they have appropriate disciplinary processes in place that follow the council's guidelines. The following 16 responsibilities for engineers are highlighted (Guidance, 2016):

- Have the right skills, act with care and diligence and with due regard to professional standards.
- Prevent avoidable risks to health or safety.
- Prevent avoidable risks to both physical and cyber security.
- Operate in a sustainable manner and prevent avoidable negative environmental and social impacts.
- Maintain and improve one's competence, undertake only professional tasks for which one is competent, and disclose appropriate limitations to such competence.
- Accept responsibility for the work performed under their supervision.
- Treat all persons fairly and with respect.
- Encourage others to develop their knowledge and competence.
- Avoid, where possible, actual or perceived conflicts of interest and inform stakeholders when such conflicts arise.
- Comply with the obligation of confidentiality towards relevant parties.
- Reject bribery and all forms of corrupt behaviour and make positive efforts to ensure that others do the same.
- Report concerns about danger, risk, misconduct or wrongdoing that affects others ('blow the whistle') and support a colleague or other person to whom you have a duty of care who raises such concerns in good faith.
- Assess and manage risks and communicate them appropriately.
- Assess liability and have professional indemnity insurance where necessary.

- Notify the institution of a criminal conviction, bankruptcy or disqualification as a company director.
- Notify the institution of any significant breach of the institution's code of conduct by another member.

An example of a Polish code containing issues relating to engineering ethics is the code of professional conduct for members of the Polish Chamber of Civil Engineers. This code specifies two main objectives of engineering activity (Kodeks, 2018):

- The purpose of engineering activity is to continuously improve the living conditions of people by shaping the natural environment respecting its value for human needs, health, social and individual development.
- Engineering activity as a service to the society, is a carrier of its civilization development and co-creates its culture. This activity also satisfies the current needs of society, taking into account the experience of the past, the anticipated directions of development and their consequences.

Issues concerning the interaction between the engineer and society have found their place in the Code (Kodeks, 2018):

- In his activities, the engineer shall be guided by the public good and the principles of professional and personal integrity.
- The engineer shall be mindful of the consequences of his/her activity reckoning with the threats to the safety, welfare, health and life of people.
- Engineering activity is an art and the engineering profession is a profession of public trust. Care for the increase of the authority of the profession should characterise the engineer's work and his public appearances.
- An engineer should express professional opinion only if it is based on appropriate knowledge.
- An engineer shall not allow corrupt actions, both in his own conduct and tolerate them in others.
- The engineer shall take part in social activities and use his knowledge and experience for the betterment of life.

It also draws attention to issues of the engineer's attitude to the environment. The following paragraphs (Kodeks, 2018) address these issues:

- The engineer's awareness of the impact of changes and limitations in environmental conditions should accompany his decision-making, especially in the sphere of investment or related to the operation of the infrastructure entrusted to his care.
- The engineer should have a full understanding of the impact of his work on the environment.

- The engineer should be aware of the interdependence of various ecosystems. He should prevent the introduction of changes to the environment which would cause its permanent degradation. Damage caused to the environment as a result of investment or operation activities should be removed or reduced to a minimum upon completion of the work.
- As far as possible, the engineer should use renewable and recycled materials in his works.

Another example of an ethical code in the engineering profession is the code developed by PZIITB – Polish Association of Construction Engineers and Technicians. The code of ethics of this society consists of the following points (Kodeks, 2018):

- Never to disappoint the public trust that society has placed in my profession.
- Strive for the civilisational development of the country and society and contribute to its culture.
- Constantly improve my professional qualifications.
- Be guided by the public good and the principles of professional and personal ethics.
- Observe the rules of building and construction process safety.
- Serve the good of the association, its ideas and goals.

According to research conducted by the Polish Chamber of Bidding Engineers (PZIIB), the most frequent violations of ethical principles concern such issues as (Kodeks, 2018):

- unjustified questioning of the skills and competences of other chamber members;
- using unfair competition;
- incomplete or simplified execution of commissioned work, often caused by undercutting the price;
- issuing opinions and technical expertise tailored to the client's expectations, disregarding the principles of knowledge and the art of building;
- misleading principals with regard to the authorisations, knowledge and experience held;
- undertaking the performance of tasks without the required authorisation.

Another example of the Polish Code of Engineering Ethics is the FEANI Code of Ethics developed by the Association of Polish Mechanical Engineers and Technicians (SIMP). According to this code, an engineer bears the following obligations in terms of professional ethics (Kodeks etyczny, 2018):

- An engineer undertakes only those tasks that are within the scope of his expertise. When a task exceeds the limits of his professional competence, he should seek the cooperation of appropriate experts.
- The engineer is responsible for the organisation and execution of his tasks.
- He must obtain a clear specification of the services expected of him.
- In carrying out his tasks, he takes all necessary measures to overcome the difficulties encountered, while ensuring the safety of people and property.

- He/she shall receive a fixed remuneration, commensurate with his/her services and responsibilities.
- He shall endeavour to ensure that the remuneration received by all persons with whom he works is commensurate with the work performed and the degree of responsibility incurred.
- An engineer strives for a high level of technical achievement, including the technologies used, which will contribute to maintaining a healthy and pleasant living environment.

According to the rules of professional ethics, a member of the Chamber in disciplinary proceedings may be punished for breach of the code of ethics with: a warning, a reprimand, suspension of membership in the Chamber for two years or, in extreme cases, removal from the membership list (Sułkowski, and Wolniak, 2016; 2015; 2018; Wolniak, and Skotnicka-Zasadzień, 2014; Wolniak, 2011; 2013; 2014; 2016; 2017; 2019; 2020). In practice, the consequence of suspension or expulsion is a ban on performing independent technical functions in the construction industry. It should be added here that, in the case of expulsion from the list of the chamber members, re-admission can be applied for after a lapse of 10 years. In effect, such a long break means elimination from our professional group (Kodeks, 2018).

In Poland, professional organisations and associations provide training, lectures and readings on professional ethics. However, these initiatives are uncoordinated and the resulting works are scattered and irregular (Wolniak, and Sułkowski, 2015; 2016; Wolniak et al., 2019; Wolniak, and Hąbek, 2015; 2016; Wolniak, and Jonek-Kowalska, 2021; 2022; Wolniak et al., 2020; Wolniak, and Skotnicka, 2011; Wolniak, and Skotnicka-Zasadzień, 2010; 2018; Hąbek and Wolniak, 2013; 2016; Hys, and Wolniak, 2018; Ponomarenko et al., 2016; Wolniak, and Grebski, 2018). There is currently a lack of coordinated cross-university and nationwide activities supporting professional ethics and aimed at universities and engineering associations (Wajszczyk, 2013).

Based on the information described in this chapter, one can try to identify why it is important to study engineering ethics. Why this concept is important for an engineer. We can distinguish the following reasons why this kind of professional ethics should be analysed and studied (Kodeks etyczny, 2018):

- Engineering by its nature is a profession of managing the unknown, and this involves higher risks that reflect on the end users (society).
- To sensitise engineers to important ethical issues before they have to face them and to create an appropriate awareness that can influence the earliest stages of engineering endeavours.
- To develop 'moral autonomy' and enable engineers to self-regulate and protect the safety and well-being of society, as well as the profession, regardless of the environment or place of operation.

- To train engineers to analyse complex problems and solve them in the most ethical way, without compromising their personal ethics or professional obligations.
- Engineering ethics is not about doing the right thing when the ethical choice is obvious. It is about finding the basis in a complex ethical dilemma that achieves the most benefit and least harm for all parties without compromising public safety, resources, clients or the profession.

4. Conclusion

Engineering students should learn the concepts of engineering ethics in much the same way as they learn technical topics. As they build awareness of ethical issues related to engineering and learn about the tools available to deal with ethical dilemmas, such as codes of ethics, they should be able to extrapolate this knowledge and anticipate some of the problems that may arise (Barakat, 2011).

We believe that every engineer should be familiar with the basic concepts of engineering ethics in order to make proper use of ethical codes in their country and their organisation. An ethical approach to engineering can achieve better working conditions and better outcomes for all people and stakeholders of the organisation.

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THE ROLE OF THE ENGINEERING PROFESSION IN DEVELOPING AND IMPLEMENTING SUSTAINABLE DEVELOPMENT PRINCIPLES

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Purpose: The aim of the paper is to analyze the role of the engineer in the process of implementing sustainable development principles in the industrial enterprise.
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 analyses presented in the publication have drawn attention to the issue of the engineer's role in the implementation of the principles of sustainable development by an industrial enterprise. Particularly now, during the implementation of Industry 4.0, engineers should pay attention to the implementation of sustainable development principles in industry. These issues are also important as a result of the energy transition implemented in EU countries, which requires organizations to reduce their energy intensity, thus promoting sustainable development. The implementation of Smart City technologies also means that sustainability issues must be taken into account in engineering city planning.
Originality/value: Detailed analysis of all subjects related to the role of engineers in the sustainable development principles implementation.

Keywords: sustainable development, Industry 4.0, Smart City, engineer.

Category of the paper: literature review.

1. Introduction

Sustainability is now a very widely used concept in management and engineering. The term sustainable development was introduced in 1987 in a report published by the Burtland Commission. The title of the report was "Our Common Future", and in it the authors tried to link issues of economic development with environmental stability. In the report they defined Sustainable Development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987). This was the most quoted definition of the concept of sustainable development.

Nowadays the concept of sustainability is very tightly connected to the new concept of managing like: Industry 4.0 (Stawiarska et al., 2020; 2021; Grabowska et al., 2019; 2020; 2021; Kwiotkowska et al., 2021; Drozd, and Wolniak, 2021) and Smart Cities (Wolniak, and Jonek-Kowalska, 2021; 2022). Especially in the times of Industry 4.0 implementation engineers should have an extensive knowledge to adjust the technology to new principles (Gajdzik, and Wolniak, 2021; Wolniak et al., 2020).

Sometimes the concept of sustainability can be seen in a broader way. For example, John Ehnfried believes that sustainable development is not really a vision of the future. It is merely a modification of the current process of economic development. All modifications have some potential to mitigate or slow down the unsustainable trajectory of the globe, but they are all just quick fixes. He defines sustainability as the possibility that human and other life will always thrive on Earth (Ehrenfeld, 2008).

The aim of the paper is to analyze the role of the engineer in the process of implementing sustainable development principles in the industrial enterprise.

2. Sustainable development

The concept of sustainable development explores the relationship that exists between economic development, environmental quality and social justice. Sustainable development has three main dimensions: economic, environmental and social. These are often referred to as the triple bottom line [Figure 1] and are used to measure the success of a particular development programme or project. The triple bottom line concept was first used by John Elkington, founder of the British consultancy SustainAbility (Elkington, 1994).

We have three approaches to sustainability, each based on an emphasis on one of these dimensions. They are described in Table 1.

Table 1.
Main dimensions of sustainable development

Dimention	Characteristic
Economic approach: Income maximisation while maintaining a constant or increasing stock of capital.	The central idea of sustainable development is that present decisions should not worsen the prospects of maintaining or improving our standard of living in the future. This means that our economic systems should be managed in such a way that we can live in the future with the dividends of our resources. Sustainable economic growth means that real GNP per capita increases over time, and this growth is not threatened by "feedbacks" from biophysical (pollution, resource degradation) or social impacts. Sustainable development means basing development and environmental policies on a cost-benefit comparison and careful economic analysis that will enhance environmental protection and lead to increasing and sustainable levels of well-being.

Cont. table 1.

Ecological approach: Maintaining the resilience of biological systems and physical systems.	Sustainability is the maintenance of basic ecological processes and life support systems, the conservation of genetic diversity and the sustainable use of species and ecosystems. The term 'sustainable development' suggests that the lessons from ecology can and should be applied to economic processes. It encompasses ideas from the World Conservation Strategy, providing an environmental rationale through which development claims about improving the quality of (all) life can be challenged and tested.
Socio-cultural approach: Maintaining the stability of social and cultural systems.	Sustainable economic development is directly related to raising the living standards of the poor, which can be measured in terms of increased food, real income, education, health care, water supply, sanitation, and only indirectly to economic growth as a whole.

Source: own analysis on the basis: (Rogers et al., 2008).

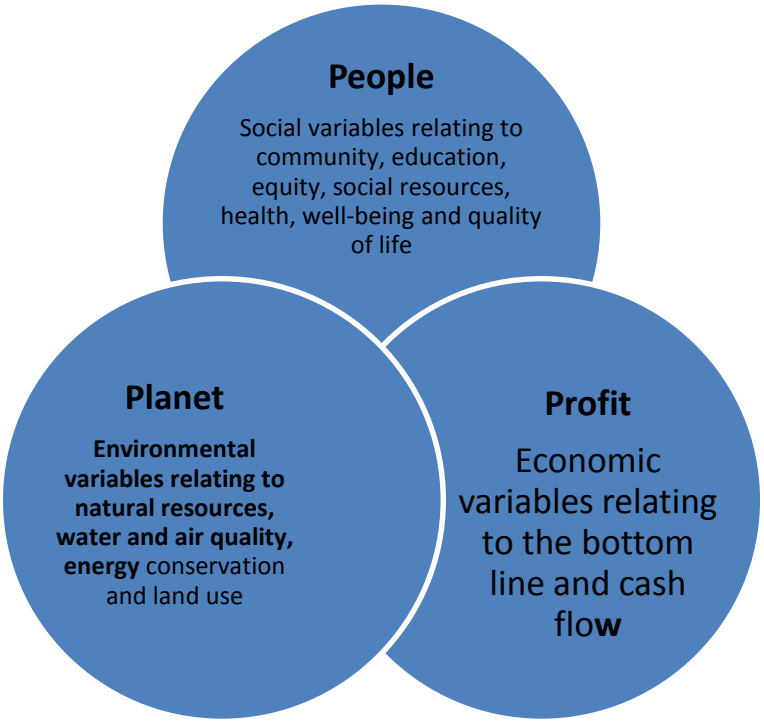

Figure 1. Interrelation of the elements of the triple bottom line concept. Source: (Dalibozhko and Krakovetskaya, 2018).

3. Implementation of sustainable development in business practice

In order to implement the objectives of sustainable development in business practice, we must carefully implement this concept in the entire business, political and social environment. An indispensable part of this process is the large role of civil society (Gębczyńska, and Wolniak, 2018). Civil society is an association of citizens (beyond their families, friends and business) who voluntarily commit to their interests, ideas and ideologies. From the

perspective of sustainable development, we can distinguish the following main roles of civil societies (Rogers, 2008):

- they demand rights to life and health,
- demand access to land, water and other services,
- forming user groups for sustainable management of resources under common ownership,
- mobilising individual households and social groups to improve the environment,
- sharing information and resources with other groups on common environmental and political issues,
- putting pressure on industry to clean up the environment and hold business accountable,
- Increasing the power of groups,
- putting pressure on governments to take seriously the rights and needs of marginalised people.

When we think about sustainability, there is a spectrum of views on the concept (Figure 2). At one end of the spectrum are those who suggest that we should protect nature at all costs, change the way we live and seek to reduce economic growth as a means of reducing consumption (Sułkowski, and Wolniak, 2016; 2018; Wolniak, and Sułkowski, 2015; Wolniak, Skotnicka-Zasadzień, 2014 Wolniak, 2011; 2013). At the other end of the spectrum are those who believe that necessity is the mother of invention and that technical solutions will be invented that will eliminate the need for such drastic measures.

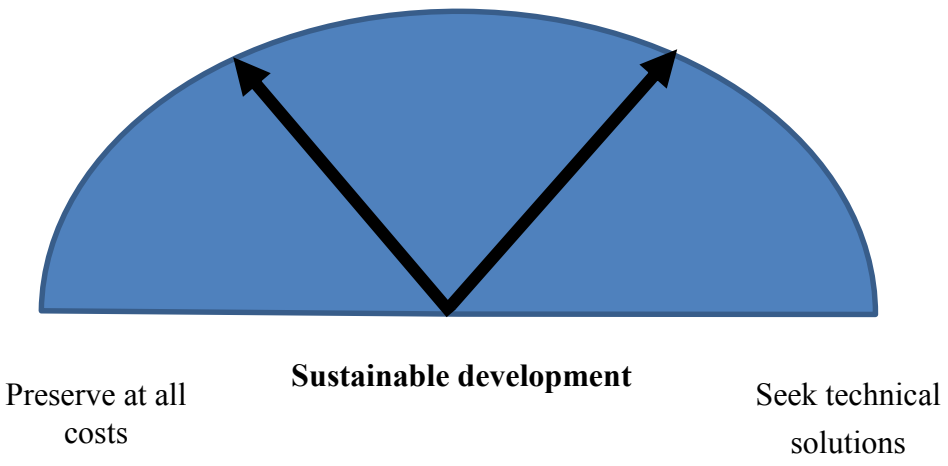

Figure 2. The spectrum of approaches to sustainable development. Source: (Brandon and Lombardi, 2005).

If humanity is to achieve the implementation of the concept of sustainable development, we should adopt its patterns that reflect natural processes (Wolniak, 2014; 2015; 2016; 2017). The role of engineers in sustainable development is very important and can be illustrated by the close relationship between the human ecosystem, and the natural ecosystem. Engineers contribute to the natural ecosystem in all its stages (Engineers, 2002):

- By developing, processing and transporting natural resources in closed-loop systems, we can reduce waste and increase resource efficiency.
- Harvesting renewable resources such as water, fish and trees, within the limits allowed by nature, will ensure a continuous supply of resources for people and natural ecosystems. Minimising the use of non-renewable resources, such as oil and rare minerals, and replacing them with environmentally friendly substitutes will also help increase the supply of natural resources.
- Processing natural resources efficiently and with little or no waste helps to conserve the earth's limited natural resources. We can further conserve resources by designing products and packaging for reuse and recycling, and by industrial processes and equipment that have minimal negative environmental impact throughout their life cycle.
- The transportation of goods is a major contributor to environmental pollution; to minimise these impacts, we can efficiently transport resources and manufactured goods to consumers by pipeline, river, rail, road, ship and aircraft, using technologies that have minimal impact on surrounding land use and meet consumer needs with little waste.
- The way we develop, process and transport resources can improve living standards in many ways. These include providing clean water, energy, residential and commercial buildings and streets and other forms of infrastructure, efficiently storing and distributing food, and meeting acceptable health standards, including high quality waste management and disposal.
- To keep the natural and built environment clean and unpolluted, we can reduce the amount of waste throughout the ecosystem cycle by continually recycling and recovering the remaining by-products from resource development, industrial processing and meeting consumer needs. A certain amount of waste in the system is inevitable, but it should occur in forms that have minimal long-term environmental impact. The impact of residual waste can be offset by continuing programmes to clean up and reuse old landfill sites, and by other forms of environmental restoration.
- The impact of energy source development on the atmosphere, land and water can be reduced through more efficient use of energy and production from non-fossil sources.

4. Sustainable engineering

The role of the engineer is very important in the supply chain in manufacturing and logistics of consumer goods. They should focus on improving processes to be more environmentally friendly. These processes should consider the following points at each stage of the production process of any goods and services (Azapagic, and Perdan, 2005):

- reduction of material requirements (total mass consumed),
- reduction of energy intensity (energy consumed at each stage of production),
- reduction of toxic dispersion (release of toxic substances into all media),
- increasing material recycling (reuse of materials or energy),
- maximising sustainable use of renewable resources (avoiding the depletion of finite raw materials),
- extending product life (optimising product life),
- increasing service intensity (creating added value while reducing environmental impact).

By combining the concept of sustainability with engineering knowledge, we obtain the so-called sustainable engineering concept (Wolniak, 2017; 2019; 2020, Wolniak, and Sułkowski, 2015; Wolniak et al., 2019). Sustainable engineering can be defined as a concept that considers the interactions in engineering activities of technical, ecological, social and economic systems and avoids transferring problems from one area to another (Sustainable engineering, 2015).

Twelve principles of sustainable engineering can be distinguished, which are described in Table 2. These principles are used in the development stage of new products/processes.

Table 2.
Principles of sustainable engineering

Principle	Approach	Impartance
Try to ensure that inputs and outputs of materials/energy are not hazardous	Reduce risk Reduce exposure	Reduces/minimises risks by reducing internal risks
Waste minimisation	A good design solution should use by-products	Lower purchase and disposal costs
Design for easy separation and cleaning	Plan for recycling and reuse	Easy separation/cleaning – easy waste management
All components must be designed for maximum weight, energy and efficiency	Smaller is better Reducing expenses	Lower expenditure
Avoid unnecessary weight/energy consumption	Production must respond to demand in real time	Minimising overproduction
Use entropy and complexity as a guide to make end-of-cycle decisions	Not all products should be subjected to the same treatment at the end of the cycle	Disposal solutions can no longer be seen as universal
The product should not be designed to last longer than necessary	Designing unnecessary features is wrong	Reducing accumulation of high-tech waste

Cont. table 2.

The product must not have unnecessary capacity/capacity	Design for realistic applications and conditions	Reduces/eliminates the use of required components
Minimise the variety of materials	Minimise the use of different materials, especially adhesives, sealants, coatings	Simplify waste management
Product development is only part of the life cycle	Consider the methods of extraction of the required raw materials and transport	Minimise the environmental impact of the associated life cycle stages
Evaluate products based on life cycle analysis	Consider the methods of extraction of the raw materials needed and transport	Minimise the environmental impact of the associated life cycle stages
Prioritise the use of renewable and readily available resources	Avoid the use of non-renewable energy sources, except where the use of renewable ones can be more damaging	Minimise the overall impact of resource use

Source: (The 12 principles, 2016).

A very important part of achieving the relevance of sustainability concepts in the work of engineers is adequate education. The practice of sustainable development requires a new approach from engineers, which will focus on participation in open decision-making processes (Abraham, 2006). The new role implies a different model of professional practice and requires a different approach to teaching and learning (Azapagic, and Perdan, 2005; Wolniak, and Hąbek, 2015; Wolniak, and Skotnicka, 2011; Wolniak, and Skotnicka-Zasadzień, 2008). The US Centre for Sustainable Engineering Study has prepared a report on the role of sustainable education in shaping. They believe that the long-term goal of 21st century engineering education is to enable practicing engineers to integrate sustainability principles into all stages of their practice, so that "sustainable engineering" eventually equates to "good engineering" (Bryne et al., 2010).

In 2004, the U.S. National Academy of Engineering formulated its Vision of the Engineer of 2020 (NAE, 2004). The report states that engineers should be conscious leaders of sustainable development and notes that this process should begin in educational institutions and be based on the basic tenets of the engineering profession and its activities (Wolniak, and Skotnicka-Zasadzień, 2010; Wolniak, and Sułkowski, 2016). The report suggests that engineering curricula should be reconsidered to prepare today's engineers for the careers of the future, with due regard to the rapid pace of global change and its inherent lack of predictability (Bryne et al., 2010).

In 2005. The Royal Academy of Engineers in London published twelve Guideline Principles for Engineering for Sustainable Development. These principles were as follows (RAE, 2005):

1. Go beyond your own locality and immediate future.
2. Innovate and be creative
3. Seek a sustainable solution.
4. Strive to involve all stakeholders.
5. Make sure you know the needs and wishes.
6. Plan and manage effectively.

7. Give sustainability a chance to address any concerns.
8. If polluters have to pollute, they have to pay.
9. Take a holistic approach, from cradle to grave.
10. Do things right, having decided what is right to do.
11. Beware of cost-cutting that masquerades as value engineering.
12. Practice what you preach.

The following year, the Canadian Council of Professional Engineers published the National Guidelines on Environment and Sustainability. This document outlined nine points to which professional engineers should adhere. It states that an engineer (CCPE, 2006):

1. should develop and maintain an appropriate level of understanding, awareness and monitoring system of environmental and sustainability issues related to the field in which he/she specializes;
2. he/she should draw on the relevant expertise of specialists in areas where the professional engineer's knowledge alone is not sufficient to address environmental and sustainability issues;
3. should use professional and responsible judgement in his/her considerations of the environment and sustainable development;
4. should ensure that environmental planning and management is integrated with all their activities that may have any adverse effects;
5. should include environmental costs as one of the primary factors used to assess the economic feasibility of projects for which they are responsible;
6. should recognise the value of environmental performance and sustainability, consider a full life cycle assessment to determine the benefits and costs of additional environmental management, and seek to implement effective, sustainable solutions;
7. should engage and solicit stakeholder input in an open manner and seek to respond to environmental issues in a timely manner;
8. should comply with legal requirements and strive to exceed or improve them by applying the best available, cost-effective technologies and procedures. Should disclose to appropriate authorities information necessary to protect public safety;
9. should actively work with others to improve understanding of the environment and sustainable practices;

In 2009, the Engineering Council in the UK set out six sustainability guidelines for the engineering profession. These points can be used by professional engineering bodies to develop guidance for their members. These included (ECUK, 2009):

1. contributing to a sustainable society, now and in the future;
2. using professional and responsible judgement and taking a leadership role;
3. doing more than simply complying with regulations and codes;
4. using resources efficiently and effectively;
5. seeking multiple perspectives to address sustainability issues;
6. managing risks to minimise negative impacts on people and the environment.

When we want to design a good programme on sustainability to teach engineers this concept, we should consider the following questions (Coral, 2009):

1. what competencies related to sustainability should an engineer acquire at university and how should they be defined?
2. how are these competences currently taught?
3. what are the advantages and disadvantages of different pedagogical strategies in teaching sustainability?
4. how can the teaching of sustainability be measured?
5. what do students learn in the different sustainability courses?
6. which pedagogical strategies are more effective in acquiring sustainability competencies?
7. What type of curriculum structure is most beneficial for enabling the necessary pedagogical strategies?
8. what recommendations can be made to university/school/department management and teachers to improve engineering education in sustainability in a systemic way?

On the basis of the answers to these questions, it is necessary to prepare courses in engineering studies that give engineers adequate knowledge and competences in the field of sustainable development (Azireiro, and Davim, 2020). J. Coral has made a detailed analysis of which engineering competences are closely related to sustainable development. He distinguishes four of them (Coral, 2009):

- critical thinking,
- systems thinking,
- inter-trans-disciplinarity,
- values and ethics.

Table 3.
Implikacje nowych koncepcji zarządzania przemysłowego dla inżynierów

Conception	Characteristic
Industry 4.0	We are now at the beginning of the fourth industrial revolution, where data and the interconnectedness of machines and the Internet of Things are driving new productivity and innovation. Engineering continues to be at the heart of this latest revolution. Engineers play an important role in these innovations, developing new ideas and scientific breakthroughs into new inventions and products that can help many countries accelerate their economic development.
Green infrastructure and smart cities with increasing urbanisation	With increasing urbanisation and urban growth, engineers are expected to develop new innovations in green infrastructure for smart cities and the development of low CO2 energy sources. Engineers play an important role in addressing climate change and implementing sustainable solutions for the use of depleting resources, especially water.
Demand for engineering in Asia, Africa and Latin America	There is a growing demand for engineers and engineering services in Asia, Africa and Latin America as the world's fastest growing economies urbanise and develop their infrastructure.

Source: own analysis on the basis (WFEO, 2008).

These competences are best suited to sustainability education and should be taught at every level of engineering education.

A very interesting concept for linking sustainability with engineering activities has been prepared by the World Federation of Engineering Organizations. In 2018, it prepared a Plan for achieving the UN Sustainable Development Goals through engineering by 2030. This plan considers the combination of engineering knowledge with new industrial management concepts such as Industry 4.0, Smart Cities, etc. The main implications of these concepts for engineers are described in Table 3.

5. Conclusion

The analyses presented in the publication have drawn attention to the issue of the engineer's role in the implementation of the principles of sustainable development by an industrial enterprise. Particularly now, during the implementation of Industry 4.0, engineers should pay attention to the implementation of sustainable development principles in industry. These issues are also important as a result of the energy transition implemented in EU countries, which requires organizations to reduce their energy intensity, thus promoting sustainable development. The implementation of Smart City technologies also means that sustainability issues must be taken into account in engineering city planning.

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THE MODEL OF COHESIVE MANAGEMENT CAPABILITY – A THEORETICAL FRAMEWORK

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Purpose: The benefits of workforce diversity and diversity management are widely discussed. However, meta-analyses of empirical studies on the relationship between workforce diversity and organisational performance show that it is either very weak or non-existent. This discrepancy between theoretical expectations and empirical results, coupled with the increasing diversity of the workforce in business practice, has stimulated work on a particular type of management to benefit from differences among organisational members, i.e. cohesive management. The purpose of this paper is to propose a model of the organisational cohesive management capacity (CMC).
Design/methodology/approach: The general concept of cohesive management was based on the results of analyses of management activities carried out in top European football clubs – organisations characterised by a high diversity of the workforce and, at the same time, essentially free of discriminatory biases. Extensive literature research was conducted to define and operationalise the dimensions of CMC in relation to business.
Findings: The hypothetical model of the organisation's CMC was developed. It is shaped by four dimensions: game for talent, sense of unity of purpose, shared identity, and transparency of operations.
Research limitations/implications: Research limitations/implications: A limitation of this study is the lack of empirical verification of the hypothesised CMC model.
Originality/value: The value of the article is to adapt the management practices inherent in top football clubs to businesses. It defines the dimensions of CMC in business organisations by grounding them in management science theory. The developed concept seems to be of particular relevance to industries strongly dependent on highly qualified employees, high technology industries. The developed model provides a complete and coherent basis for undertaking empirical research.

Keywords: workforce diversity, cohesive management, talent management.

Category of the paper: Conceptual paper.

1. Introduction

The members of any organisation are diverse in many ways (in terms of their age, level of education, values and beliefs, gender, nationality, position in the organisational hierarchy, etc.). If an organisation accepts differences and tries to manage them, it is more responsive to customer needs; moreover, it is more competitive. Such a belief is the basis for diversity management, which involves "(...) accepting differences in the workforce and transforming them into higher effectiveness of their work, into better results, into promoting the image of the organisation as an attractive employer" (Koźmiński et al., 2014, p. 415). However, as the results of studies in this area indicate, the effects of this management approach are not unequivocally positive. Although organisations have started to pay much more attention to diversity, the programmes to promote it are not easy to instill in them. According to Dobbin and Kalev (2016), the main reason lies in the fact that most of their programmes boil down to controlling management actions. As the studies indicate, the approach tends to exacerbate various biases instead of reducing them. People tend to contest rules that limit their freedom of decision and action. In light of the literature reports, what is unclear is the benefits the organisation is to derive from diversity. The results of the meta-analyses of the relationship between workforce diversity and organisational performance identified from the articles published during the last several years indicate that it is either very weak, non-existent or statistically significant (Schneid et al., 2015; Tworek et al., 2020).

Accordingly, it was decided that further studies were necessary and some authors of this text participated in such studies. The studies pertained to the organisations characterised by a significant diversity of the workforce and yet essentially free of discriminatory bias, and taking into account different dimensions of diversity and the performance indicators which were more appropriate than the financial ones. To a considerable extent, these requirements are met by European football clubs, whose effectiveness is undoubtedly measured by their positions in the final competition table. The analysis revealed no correlation between players' nationality diversity as well as their age and the club's points in the final competition table and position in it. However, the best football leagues have a more diverse workforce than average leagues. On the other hand, in-depth studies covering the best European clubs (from the UEFA ranking), not leagues, revealed an admittedly weak but significant correlation between the nationality diversity of footballers and the position in the UEFA ranking (Tworek et al., 2020).

The results of these studies became the starting point for work on a particular type of management aimed at benefiting from differences among organisational members, i.e. cohesive management. Its concept is based on the results of the analysis of management activities carried out in the best European football clubs, which, as it seems, constitute perhaps the model stage of the organisation improvement process, mainly due to their far-reaching agility. Moreover, their management faces essentially the same problems associated with the management of

contemporary dynamic business organisations (Bolchover, and Brady, 2006; Hopej, and Kandora, 2019). The purpose of this paper is to present the hypothetical model of the organisation's cohesive management capability (CMC). In particular, the paper presents the concept of cohesive management and identifies the factors that shape the CMC in business organisations by grounding them in management theory.

2. The concept of cohesive management – football lesson

The success of football clubs depends mainly on the players they have managed to recruit. Why do such clubs as Real Madrid, FC Barcelona, Manchester City, Bayern Munich and Paris-Saint-German make multi-million dollar transfers practically every year? The answer is simple: winning matches is determined by outstanding footballers and the better the player is, the better he earns. What is more, football is one of the few industries that can effectively compete as there are many sellers and buyers who have access to information about the quality of the players they buy and sell. If the salary is too low, footballers move to another club. Otherwise, they are sold. Therefore, it is not difficult to agree with the opinion expressed by J. Cruijff, a prominent footballer, later also a manager, that management in football is all about finding the best players, because "if your players are better than your opponents, 90 percent of the time you will win" (Kuper, and Szymanski, 2017, p. 109).

Not surprisingly, there is a game, perhaps even a war, planned in all aspects, among the top clubs for football talents. According to Bolchover and Brady (2006), there is a talent cycle process involving the search for, acquisition, development, retention and disposal of talent, each link of this process overlaps with the next one so, for example, selling should include looking for successors. In the retention phase, the manager should already be thinking about selling. While it is true that many clubs do not do badly in some phases, only the best pursue the entire cycle.

It should be stressed that what is visible is that the activities of the talent cycle are at present almost free of various prejudices, including those related to racial aspects. In the 1990s, discrimination against black football players virtually ceased to exist. Perhaps the best example of their acceptance in football is the racism-sensitive L. Thuram, who argues that in "(...) football it is harder to discriminate because we are judged based on specific results. There are no subjective criteria in this area. I really have never met a racist in football. Perhaps they existed somewhere but I did not see them" (Kuper, and Szymanski, 2017, p. 140).

Are the best football clubs differentiated by nationality or skin colour of their players? Even a cursory analysis of their composition indicates that such diversity is significant and, in many cases, very great. Players come from different countries, often from several continents.

Moreover, nationality is not something permanent. Instead, it changes under the conditions of relatively frequent workforce changes.

The players of top football clubs are also distinguished by the fact that on the pitch, and to some extent outside it, they are unified by a sense of the unity of a common purpose. A. Ferguson, a long-time Manchester United manager, comments on it in the following way: "In my business, togetherness is not just a nice concept that you can take or leave according to taste. If you don't have it, you are nothing. Selfishness, factionalism, clique-ishness are all death to a football team. As a manager in football, I have never been interested in simply sending out a collection of brilliant individuals. There is no substitute for talent but, on the field, talent without unity of purpose is a hopelessly devalued currency" (Bolchover, and Brady, 2006, p. 210).

In such clubs, players must have, and – as a rule – they do have, the conviction that the others put into their work as much of similar effort and dedication as possible. If this is not observed, an appropriate response is necessary. In his autobiography, the Manchester United manager refers to a particular first-team player who was very popular among his fans. A. Ferguson, however, believed that the footballer had become arrogant over time in the locker room and on the pitch, playing not for the team but at his whim. Transferring him turned out to be the only rational solution.

The formation of a sense of unity of purpose requires that this purpose be formulated so that players roll up their sleeves and work together to achieve something significant. S. Westerveld, a former Liverpool FC goalkeeper, recalls that before the 2000/2001 season, all players were asked to agree on a common purpose for the season. Almost everyone said it would be good to finish the games as one of the top three clubs. For most of the season, the team was outside the podium but the fight for it lasted until the last round of the competition. In the end, a determined Anfield Road team winning many of their last matches outperformed their rivals, achieving the intention (Bolchover, and Brady, 2006).

Furthermore, it is not uncommon for players in top clubs to feel like family. For example, one of the charges of FC Liverpool manager – J. Klopp – says the following about the manager: "Because of his belief in me, I have played so much and been able to develop. The way he treats us during training practice, the way he builds relationships with the younger players, is unbelievable. He is like a father to all of us. I try to do my part and I hope that (...) he will be proud of me" (Jurgen, zdobywca ludzkich serc, in press). These words are not surprising in the context of the German manager's view that one cannot achieve success in football without respecting or even loving one's players. They feel it and fight for him, as well.

A. Ferguson also had "fatherly" relations with football players. In fact, he was not afraid to treat someone ruthlessly if he thought it would provide the team with something good (e.g., J. Stam, J. Leighton). However, many Manchester United players remember him as a good "father". Particularly significant is the following opinion of D. Beckham, whose relationship with Sir Alex has not always been ideal: "Sir Alex will always be like a father to

me. He has always been and always will be one. It does not matter if he said something good or bad in the past. I only remember the good times. He was the man who gave me the chance to play for the club of my dreams" (Beckham…, in press). C. Ronaldo, R. da Silva and M. Silvestre, among others, have made similar statements.

Unifying players for a shared achievement is also done through organisational culture developed by outstanding managers. B. van Nistelrooy, a Dutch footballer, has admitted that A. Ferguson at Manchester United was one of the most critical factors that made him sign the contract. Sir Alex has shaped a culture that attracts young footballers based on passion, a desire to win and a sense of community. Let us add to that the reputation of a man who can deal with celebrities and, in this way, a powerful instrument of integration emerges.

J. Klopp also implements the effective unification of footballers by means of organisational culture. He requires them to do the same: respect him, the team and what they try to accomplish. His players must commit to a shared value system that includes: unconditional commitment, a passionate obsession, determination, no matter which way the game goes, willingness to support everyone without exception, willingness to seek help, a commitment to contribute 100% effort for the good of the team, and personal responsibility (Wygrywaj…, in press).

There is also the final issue. Football is highly transparent. A former Manchester United chairman once said that there are about 40 meetings of shareholders in each football season, with 40,000 people attending each. As a rule, everything can be seen for what it is, and what is hidden is quickly revealed by insightful media (Bolchover, and Brady, 2006). For example, not too long ago, the media revealed that one of the English club West Ham United activists made sscandalous comments about African footballers, stating that he no longer wanted to employ them in the club because of the problems they cause off the football pitch. Club authorities immediately suspended him because West Ham United does not tolerate discrimination of any kind (West Ham's…, in press).

In light of the above discussion, the following observations emerge. Firstly, the management of top football clubs is based on treating people equally and is focused on winning more games. Secondly, it has four dimensions:

- It affects primarily people whose recruitment is not done under the banner of diversity. However, it refers to a diverse pool of players (in terms of their race, nationality, age, among other factors) resulting from the search for the most talented footballers as part of an ongoing game of talent.
- There is a sense of unity of purpose, requiring the formulation of achievable, quantifiable goals as well as team members' holistic thinking. Moreover, it is necessary to respect the classical principle of subordinating the personal interest to the general interest.
- A shared identity results from focusing on what footballers have in common rather than what divides them. The existing differences between them are then, to some extent, bridged or drowned in a sea of similarities.

- The transparency and openness of the activity, which in football is not a groundless declaration, is primarily due to the relentless media attention. Almost no detail escapes the cameras' attention; everything is repeated, commented on and counted in the statistics.

Finally, as it seems, business is now heading down the road that football went down some time ago. It is a journey towards realising a truth once spoken by Bill Shankly, the former Liverpool FC manager: "(...) the way to live and be truly successful is by collective effort, with everyone working for each other, everyone helping each other, and everyone having a share of the rewards at the end of the day" (Critchley, 2018, p. 9). Incidentally, football sometimes seems to be one of the last bastions of sanity and a place where specific self-evident values that have already ceased to be self-evident elsewhere still apply (Mościcki, 2019). Let us, therefore, try to consider whether enterprises also share the readiness for cohesive management.

Therefore, let us consider whether the readiness for cohesive management, which implies the need to integrate the activities of diverse members of the organisation, is also shared by enterprises.

3. Cohesive management capability – hypothetical model development

The issue of talented organisational members has received increasing attention, thanks – in part – to a group of McKinsey consultants who used the phrase "war for talent" to emphasise the importance of talent for organisational excellence (Gallardo-Gallardo et al., 2013). According to Chambers et al. (1998), the war for talent among global companies is related to three main challenges: their functioning in a highly complex economy, requiring highly qualified talents prepared to manage multicultural teams; increased competition for talents, including the one from small innovative companies such as start-ups, which limits the pool of available talents; and increased the professional mobility of employees, who, emphasising their development, more often change their employers. These challenges cause "a war once fought as a sequence of recruitment battles to transform into an endless series of skirmishes (...) (for the best workers – authors' note)" (Chambers et al., 1998).

The war or game for talent is one of the best ways to improve organisational performance, the source of competitive advantage and a critical success factor for organisations operating in a complex environment (Collings and Mellahi, 2009; Gallardo-Gallardo et al., 2013; Hopej, and Kandora, 2019). However, for globally oriented companies, in addition to the game for talent, diversity management is becoming a strategic imperative (Daubner-Siva et al., 2017; Ozbilgin et al., 2015). In essence, the game for talent will involve developing a diverse architecture of human resources identified as talents while diversity management will

encompass the inclusion of all employees (Ozbilgin et al., 2015). As regards the practices used in football, what becomes the priority in the game for talent is to acquire the most talented players and foster their development and integration with the team of people coming from different backgrounds. Similarities in this regard can be found in organisations. In light of increasing career opportunities, the organisations' need for the development of global orientation, the reduction of barriers to the movement of people and the overall ageing of the workforce in many countries, the need for interaction among workers from different backgrounds will grow exponentially (Tung, 2016). In this context, the game for talent in organisations is more frequently treated as an essential management practice (Gupta, 2019), which will primarily entail creating opportunities for the development of high-potential employees while taking into account the inclusive principles that allow each employee to discover and develop their talents (Daubner-Siva et al., 2017).

As Coffman and Buckingham (2018) note, every employee has talents in the form of thinking and acting patterns that set them apart from other people. It will depend on the manager whether this talent is used and developed by implementing the tasks for which the employee has a natural aptitude or obscured by a given person's knowledge and skills (confirmed by diplomas) (Buckingham and Coffman, 2016). For this purpose, the following activities should be carried out: 1. to conduct talent casting, enabling to transform hidden talents into action; 2. to manage by exception, taking the individual employee's needs into account; 3. to spend the most time with the most productive employees to improve their performance; 4. to provide feedback on performance; and 5. to break through the constraints of the organisation's employee evaluation schemes so that there is focus on achieving excellence (Buckingham, and Coffman, 2016).

The successful game for talent is seen as a significant determinant affecting success or failure in international business (Briscoe et al., 2009; Cappelli, 2008). Therefore, talent acquisition in the market game is a challenge faced by many organisations competing for the same global talent pool, especially in the context of talent scarcity and market diversity (Vaiman et al., 2012). Recruiting and retaining the managerial talent required to run the organisation's global operations also often becomes an issue (Briscoe et al., 2009; Cappelli, 2008; Vaiman et al., 2012). There is a noticeable shift in competition for talents among employers functioning on the national, regional and global levels (Sparrow et al., 2017).

The following hypothesis may be formulated in view of the above considerations: *H1: The more effective the game for talent is, the higher the CMC is*.

Another dimension (the sense of unity of purpose) refers to the goal-setting theory, which is based on the assumption that ambitious (high) but attainable and quantifiable goals motivate individuals to greater effort in achieving them. This occurs as a result of: directing attention to important issues related to the purpose, stimulating employees to exert more effort, increasing persistence in goal achievement and enabling the process of learning and applying action strategies that increase the employees' performance (Locke, and Latham, 2002). Success in

achieving ambitious goals translates into internal effects felt by employees, i.e. lack of fatigue with their work, a sense of accomplishment and increased motivation as well as external effects such as higher organisational revenues, opportunities for promotion and professional development and employment stability (Mento et al., 1992).

Of utmost importance in developing the sense of unity of purpose is the implementation of the idea of contributing to the whole. This contribution is a prerequisite for the operation of the organisation, provides the opportunity for specialists to transform themselves into universalists, is the basis for long-term motivation, and is the path to the organisation with a flat hierarchy (Malik, 2019). It can also be added that if employees and managers strive to contribute to the whole with their skills and experience, this seems to be the key to ensuring that existing differences between people do not affect one another.

Focusing on the contribution made to the whole involves the classic principle of subordinating the personal interest to the general interest. As is known, it reminds that in the organisation, the interest of an employee or a group of employees cannot dominate over the interest of the enterprise. While it is not easy to reconcile the two respectable interests, it is essential. Moreover, the better it is, the more solid the basis for solving many persistent problems in management is.

Focusing on one's contribution to the whole is also the basis of systems thinking. According to Senge, it is a way of thinking about the forces and relationships of systems behaviour and the language for understanding and describing them (Senge, 2006). They are distinguished by perceiving the whole instead of details, relations instead of separate elements and processes instead of individual events. In other words, thinking from the perspective of the whole comes to the fore. It is not always easy but it is possible and, in relation to managers, it means the implementation of management activities taking into account all the conditions of the organisation and facilitating the subordinates to notice the whole. As Malik (2019) points out, this is best seen in good conductors who go to great lengths to explain the piece as a whole to musicians. They require each instrumentalist to become integrated into the whole. Likewise, the solo play is part of the whole but – without it – it becomes meaningless (Malik, 2019).

The above considerations led the authors of the study to formulate the following research hypothesis *H2: The more there is a sense of unity of purpose in an enterprise, the higher the CMC is*.

The third dimension of cohesive management (shared identity among employees) is derived, among others, from Social Identity Theory, which is based on the idea that people perceive themselves and others in terms of belonging to a social group (Porck et al., 2019; Zhang et al., 2020). Identifying group membership and assigning values and emotions to it is thought to reduce the subjective uncertainty associated with lack of cues about appropriate attitudes and behaviours (Hogg, 2012; Porck et al., 2019; Zhang et al., 2020). The cognitive component of identification reflects an individual's perception as a member of a group (Ashforth, and Mael, 1989; Porck et al., 2019) while the affective component depicts a sense

of pride in belonging to the organisation. In view of this, a higher level of social identity with the selected group makes individuals want, to a much greater extent, to conform to the norms and values of the group with which they identify (Ashforth and Mael, 1989; Porck et al., 2019). It is worth noting that employees may have multiple foci of identification in the form of a sense of shared identity with more than one group (Hogg, 2012; Mell et al., 2020; Porck et al., 2019; Zhang et al., 2020) and the degree of identification with different groups may be independent of each other (Ashforth, and Mael, 1989; Porck et al., 2019).

An individual's strong identity with a group is related to understanding and manifesting shared norms and values that provide a basis for self-categorisation and thus enhance the sense of belonging to the group (Zhang et al., 2020). Furthermore, the congruence of group decisions with the personal preferences of group members increases the sense of belonging and unity with the group (Blader, and Tyler, 2009). Employees who identify more strongly with their group are more likely to support it, act for its benefit and pursue common goals (Ashforth, and Mael, 1989; Blader, and Tyler, 2009; Mell et al., 2020). For people with a strong group identity, group success in achieving goals and objectives will be synonymous with individual success (Blader, and Tyler, 2009). In addition, individuals who identify more strongly with a group tend to treat members of their group preferentially, showing a greater willingness to cooperate with them and place more trust in them, focusing on the cohesive sense of closeness (Dokko et al., 2014; Mell et al., 2020). The more individuals identify with a social group, the more they focus on the members of that group and the similarities that exist among them (Blader and Tyler, 2009; Dokko et al., 2014).

In light of the above, another research hypothesis emerges: *H3: The greater the organisation's commitment to a shared identity is, the higher the CMC is*.

The last dimension of cohesive management (the transparency of business operations) was defined based on organisational transparency, which was cited in management science until the end of the 20th century more as a rhetorical device, rather than a mode of management (Schnackenberg, and Tomlinson, 2016). Currently, the interest in this issue is constantly growing and covers more and more new areas of organisational research. For instance, on the level of information systems transparency, it concerns the organisation's relationship with its customers in the digital market (Granados et al., 2011). In the case of organisational behaviours, transparency is studied in the context of organisational trust, leadership or organisational culture (Kaptein, 2008; Pirson, and Malhotra, 2011) while in accounting and finance, transparency refers to the decisions made in financial markets (Bushman et al., 2004). Such a broad approach to transparency in research shows that it is a concept that is often defined depending on the context of the studies.

Transparency is located on a specific continuum, where at one end of the continuum, there is the total transparency of operations, impossible to achieve in an organisation while, at the other end, there is the "hazing" of operations. Total transparency may lead to an uncontrolled flow of information and disclosure of details of competitors' operations (Drucker, and Gumpert,

2007). Non-transparency, on the other hand, contributes, among other things, to corporate malfeasance (Bushman et al., 2004; Schnackenberg, and Tomlinson, 2016), loss of organisational credibility (Pirson, and Malhotra, 2011) and widens the scope of unethical employee behaviours (Kaptein, 2008).

The transparency of operations is expected to result in the increased credibility of the organisation, trust and more effective cooperation among employees as well as cooperation with the environment (Berggren, and Bernshteyn, 2007; Drucker, and Gumpert, 2007; Schnackenberg, and Tomlinson, 2016). In addition, by being more transparent, individual contributions to organisations become more visible. Communicating goals transparently is crucial for employees to understand how their own goals and outcomes relate to those of other employees (Berggren, and Bernshteyn, 2007). Organisations can consciously use information in ways that increase or decrease their transparency (Schnackenberg, and Tomlinson, 2016).

One of the actions leading to transparency of operations is the simplicity of the selected solutions. In management science, the treatment of simplicity, like transparency discussed earlier, will depend on the context of the study. For example, simplicity may relate to the strategic aspect of the organisation, the way products are designed or organisational structures (Hopej-Kamińska et al., 2015). The simplicity of the solutions adopted is linked to organisational complexity whereas undesirable complexity requires simple solutions (e Cunha, and Rego, 2010). However, it should be noted that simplicity and complexity should not be treated as opposing concepts but as parts of a single system that coexist and interact with each other.

Transparency seems to be fostered by adherence to the principle of the simplicity of organisational forms. Not so long ago, it was thought that, according to Ashby's Law, the only answer to the complexity of the environment should be a similar complexity of the management system. The apparent shift in thinking which can be observed is to question this law. It turns out that responding more effectively to what is happening in the environment involves simplifying procedures and structures because following the complication of social interdependence leads to rigidity and complexity (Crozier, 1994). It is not difficult to agree with Welch that "Having great players, you will get the most out of them if the relationship between superiors and subordinates and their responsibilities are transparent. An organisational chart is not one way to achieve this, but it is a necessary first step" (Welch, and Welch, 2005, p. 143). The cited author also believes that the lack of openness is the Achilles heel of business, blocking creativity, quick action, and talented people's potential.

Given the above, there is the following research hypothesis *H4: The greater the transparency of the operations is, the higher the CMC is*.

4. Conclusions

The original concept of cohesive management presented in this article is based on the results of the analysis of management activities carried out in the best football clubs, usually coping very well with a team of players who is diversified in many respects. Extensive literature research was conducted to define and operationalise the dimensions of cohesive management in relation to business organisations. Table 1 summarises the main research hypotheses and the detailed ones related to the structure of each dimension.

Table 1.
Hypothetical model of the CMC

Dimension	Main hypotheses	Specific hypotheses
Game for talent	H1. The more effective the game for talent is, the higher the CMC is.	H1.1. The less hiring takes place under the banner of diversity, the less effective the game for talent is. H1.2. The more talent-oriented the mentality is, the more effective the game for talent is. H1.3. The stronger the market dimensions in talent acquisition and retention are, the more effective the game for talent is.
Sense of unity of purpose	H2. The more there is a sense of unity of purpose in an enterprise, the higher the CMC is.	H2.1. The greater the degree of quantifiability of goals is, the greater the sense of unity of purpose is. H2.2. The greater the degree of the practice of systems thinking is, the greater the sense of unity of purpose is. H2.3. The more the principle of subordinating the personal interest to the general interest is observed, the greater the sense of unity of purpose is.
Shared identity	H3. The greater the organisation's commitment to a shared identity is, the higher the CMC is.	H3.1. The more common values and shared identity are manifested in the organisation, the stronger the shared identity is.
Transparency of operations	H4. The greater the transparency of operations is, the greater the CMC is.	H4.1. The more managers trust in simplicity, the greater the transparency of operations is. H4.2. The more a culture of honesty and openness is fostered, the greater the transparency of operations is. H4.3. The more employees are trusted to be open and honest, the greater the transparency of operations is.

The hypothetical model of CMC needs empirical verification in different business contexts. First of all, the research should be conducted in organizations operating in different countries, in organizations that are diverse in terms of the size and in terms of the degree of technological sophistication. Secondly, it would be highly interesting to deepen the understanding of the concept by analysing selected case studies of organisations. Particularly suitable here would be high-tech companies, characterised by considerable workforce diversity, dependent on employees' high qualifications and talents (professionals ready to change jobs, searching for new challenges and benefits quickly). This would deepen our understanding of the different dimensions of CMC and, perhaps, reveal another dimension not included in the current model. Finally, the direction of research on the contribution of cohesive management in shaping business performance is particularly promising.

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LOGISTIC CUSTOMER SERVICE PROCESS IN THE FACE OF THE COVID-19 PANDEMIC

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Purpose: The main purpose of this article is to recognise whether changes in logistic customer service made by the surveyed companies after the outbreak of the COVID-19 pandemic differed depending on the size of the company, the type of business and the role that the surveyed enterprise played in the supply chain.
Design/methodology/approach: The results of empirical research conducted on a research sample of 250 companies are described (in the section concerning logistic customer service). The research was carried out in the second quarter of 2021.
Findings: The processes taking place in enterprises to which special attention was paid and those which were the most important for enterprises from the point of view of logistic customer service are indicated. The changes in logistic customer service made after the outbreak of the COVID-19 pandemic are outlined.
Research limitations/implications: In the face of the ongoing pandemic, business representatives' perception of logistic customer service may change over time. It is therefore worth repeating the research described in this article in the post-pandemic period in order to conduct a comparative analysis that may be a source of an interesting scientific discussion.
Practical implications: Indicating the scope of the changes in logistic customer service made by enterprises during the COVID-19 pandemic may constitute the basis for enterprises to compare their activities with those performed by the enterprises participating in the research. These changes can be implemented to gain a competitive advantage.
Social implications: Building awareness of the need to introduce changes in a company's operations during the COVID-19 pandemic is a necessary element for creating new standards in the area of logistic customer service, for which not only economic values, but also ecological and social values are increasingly important.
Originality/value: The processes taking place in enterprises and affecting customer satisfaction (which translates into a company's profit) during the COVID-19 pandemic have not yet been thoroughly studied due to the course of the pandemic and its duration. This article is addressed to managers dealing with logistic customer service.

Keywords: logistic customer service, pandemic, COVID-19.

Category of the paper: Research paper.

1. Introduction

This article summarises part of the empirical research carried out at the Department of Business Logistics at the University of Economics in Katowice. The research team addressed the concept of sustainable supply chains as it still has been poorly explored. Many authors (Beske, Seuring, 2014; Krzywda, Krzywda, 2014; Dubey et al., 2017) point out the need for further in-depth studies and analyses, mainly due to the multidimensionality and complexity of the issue under consideration, as well as the high cognitive value of the research results. It is worth emphasising that no extensive research on sustainable supply chains has been conducted in Poland so far.

The research was carried out in the second quarter of 2021, using computer-assisted telephone interviewing (CATI). A total of 250 enterprises were surveyed. The aim of the research was to identify the possibility of applying the concept of a sustainable supply chain based on already functioning, traditionally understood supply chains. One of the aspects discussed in the above-mentioned empirical research was logistic customer service in the conditions of the COVID-19 pandemic, which is described further in this article.

2. The importance of logistic customer service for the functioning of an enterprise

Dynamic changes taking place in the environment of enterprises make it necessary to constantly monitor and carry out activities necessary to maintain an advantage over the competition. Therefore, it is important to understand that what can distinguish a company from other enterprises operating in a similar market segment is manifested by (Christopher, Peck, 2005):

- an innovative product that meets customer expectations and solves their problems in an expected manner; by offering attractive products, a company emphasises the value of its own brand;
- the client relationship, based on building loyal cooperation with a client, bringing mutual benefits and proving the quality of service offered; the economic benefits achieved thanks to cooperation between a customer and a supplier;
- an efficient supply chain that flexibly manages the network, reacts quickly to changes and brings together optimal suppliers; high quality of service at the lowest possible cost.

It is this client relationship that has a significant impact on the activities and functioning of a company. In the highly competitive environment in which many companies operate, skilful customer service management enables an enterprise to gain a competitive advantage over other

companies in the market. An effective and efficient customer service process can ensure a high quality of service and thus customer satisfaction (Lysenko-Ryba, 2020, p. 132).

Customer service is divided into pre-transactional, transactional and post-transactional phases (cf. Kempny, 2001). Logistic customer service involves the physical manipulation of a company's products in the transactional phase and then in the post-transaction phase. However, it should be noted that logistic customer service has been widely discussed and defined by Halicka and Świętny (2012), Kempny (2001), Kisperska-Moroń and Krzyżaniak (2009), Walasek (2014) and others.

A definition of logistic customer service is also provided by Sarder: 'Logistics customer service is a part of a firm's overall customer service offering, customer service elements that are specific to logistics operations including fulfilment, speed, quality, and cost' (2020, p. 198).

As Marzena Kramarz (2016, p. 225) notes, the key variables that build logistic customer service are order fulfilment time, completeness, timeliness, certainty, product availability from stock, flexibility of orders, as well as convenience, including attributes related to service personnel, as well as documentation and the method of order transmission and product receipt. In turn, Sarder points out that 'one approach to maintaining good logistical support and cutting costs is to concentrate on communication solutions such as tracking shipment, status update, and accommodating last minute change request' (2020, p. 198).

On the other hand, when analysing the activities of enterprises in supply chains, it can be noticed that the awareness of the need to balance the supply chain and thus create new standards in the area of logistic customer service is growing because not only economic, but also ecological and social values are becoming more important. Undoubtedly, the high quality of customer service in the supply chain affects efficiency and customer retention. Therefore, in order to meet customers' expectations, enterprises adopt logistic service strategies, which, as Baraniecka (2011, p. 266) notes, should be well-thought-out, well-designed and implemented. This kind of strategy performs two functions:

- it allows the goals of logistics services to be adjusted to the strategic goals of a company, which involves optimisation of the quality and costs of customer service affecting its profitability;
- it allows for further improvement (going beyond the individual possibilities of the individual activities of an enterprise) in terms of costs and the quality of service through the implementation of projects based on advanced cooperation with a client.

Recently, however, the current satisfaction of customer needs has been shaken, and the chain has even been broken in some industries due to the outbreak and development of the COVID-19 pandemic. Research by Edelman on the key role that companies would play during the COVID-19 pandemic covered 12 markets. The interviews were conducted with 12,000 people from Brazil, Canada, China, France, Germany, India, Italy, Japan, South Africa, South Korea, Great Britain and the United States. The results turned out to be unambiguous: as many as 90% of the respondents believed that enterprises should do their best to protect the welfare

and financial security of their employees and suppliers, even if it entailed significant financial losses, until the end of the pandemic (Edelman 2020). Therefore, it can be concluded that the respondents want their needs to be met on an ongoing basis, regardless of the pandemic situation. As a result, it was interesting from the researcher's point of view to analyse changes made in logistic customer service after the outbreak of the COVID-19 pandemic in enterprises depending on their size, the type of business and the role they play in the supply chain.

3. Analysis of research results

The empirical research, which included 250 enterprises, was carried out in the second quarter of 2021 using CATI. The structure of the studied enterprises was as follows:

- subgroup 1: 200 small and medium-size enterprises,
- subgroup 2: 50 large enterprises.

It should be noted that quota sampling was used for the individual subgroups, taking into account the dominant type of business activity according to the Polish Classification of Activities (PCA). This means that the sample of subgroup 1 reflects the structure of the general population of small and medium-size enterprises, and the structure of subgroup 2 that of large enterprises operating in Poland.

The research results were analysed using the methods of descriptive statistics (including measures of the community structure and the interdependence of phenomena) and statistical inference. The respondents were dominated by owners and representatives of senior and middle management – a total of 72% of the respondents. On the other hand, 28% of the respondents were people who held specialist positions in these enterprises.

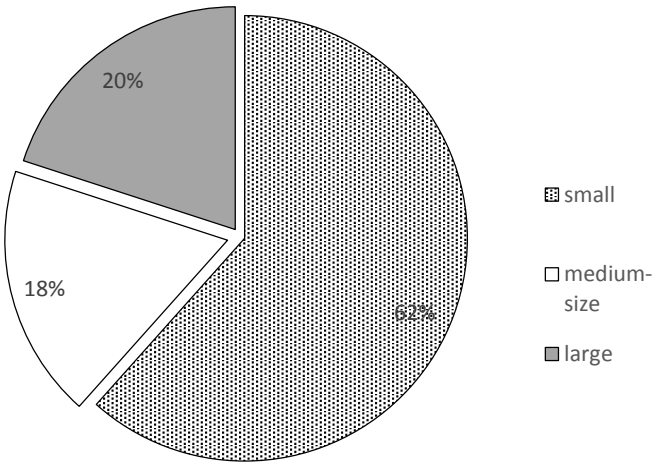

Figure 1. The Enterprises by size.

As mentioned earlier, 250 enterprises were surveyed, and 80% of them employed from 10 to 249 people, and 20% employed 250 or more people (Figure 1).

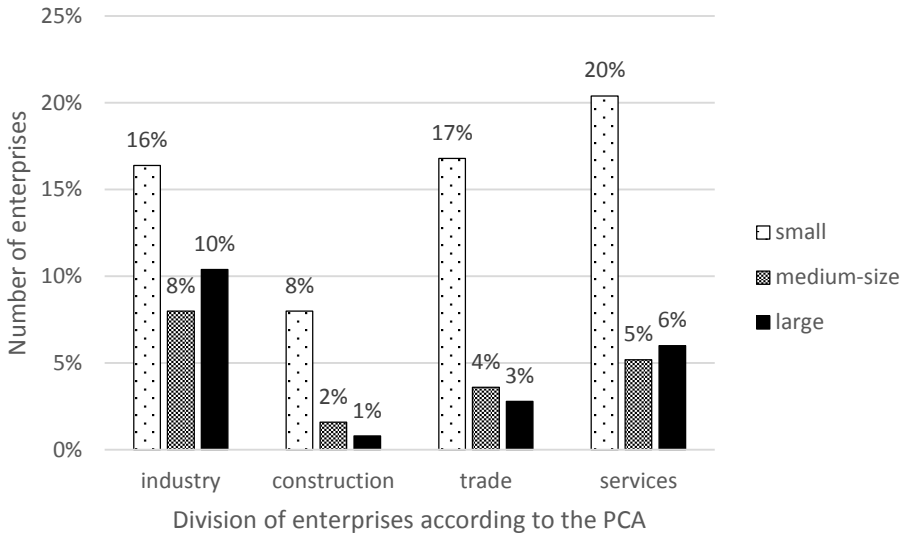

Figure 2. The Enterprises by category.

Figure 2 shows the categories of the surveyed enterprises, taking into account the PCA in line with the principle adopted by the Central Statistical Office (GUS, 2016, p. 11). The following PCA classes: B, C, D and E were assigned to the 'industry' category. Moreover, except for B, C, D and E – 'industry', F – 'construction' and G – 'trade', classes from I to S were assigned to the general category of 'services' (in line with the classification made by the Polish Agency for Enterprise Development). Overall, 35% (87 entities) of enterprises were qualified to the 'industry' category, 10% (26 entities) to the 'construction' category, 23% (58 entities) to the 'trade' category and 32% (79 entities) to the 'services' category.

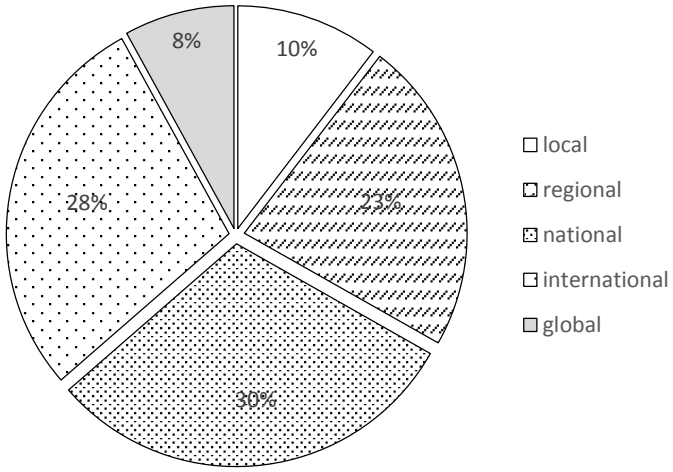

Figure 3. Geographic reach of enterprises.

Overall, 64% (160 entities) of the enterprises had a local, regional and national reach, and the remaining 36% (90 entities) had an international and global reach (Figure 3).

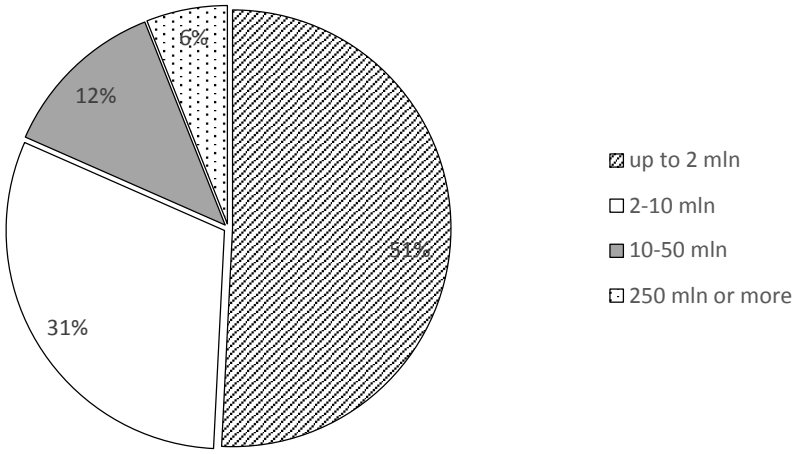

Figure 4. Annual net turnover (in Euros).

The respondents also commented on the amount of the annual net turnover (in Euros). These results are presented in Figure 4. More than half of the surveyed companies declared a turnover of up to 2 million, 31% (77 entities) up to 10 million, 12% (31 entities) up to 50 million, and the remaining 6% (15 entities) of 250 million or more.

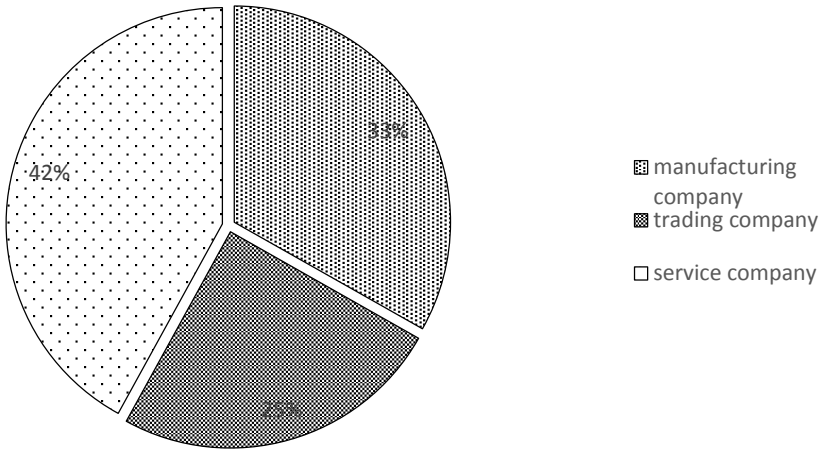

Figure 5. Type of company.

The research involved 33% (83 entities) manufacturing companies, 25% (62 entities) trading companies, and 44% (105 entities) service companies (Figure 5).

The respondents were also asked about their companies' position in the supply chain. The results obtained are as follows: 9% (23 entities) were indirect suppliers of the supply chain leader, 12% (30 entities) were direct suppliers of the supply chain leader, 38% were supply chain leaders (96 entities), and 40% (101 entities) were direct recipients of the supply chain leader (Figure 6).

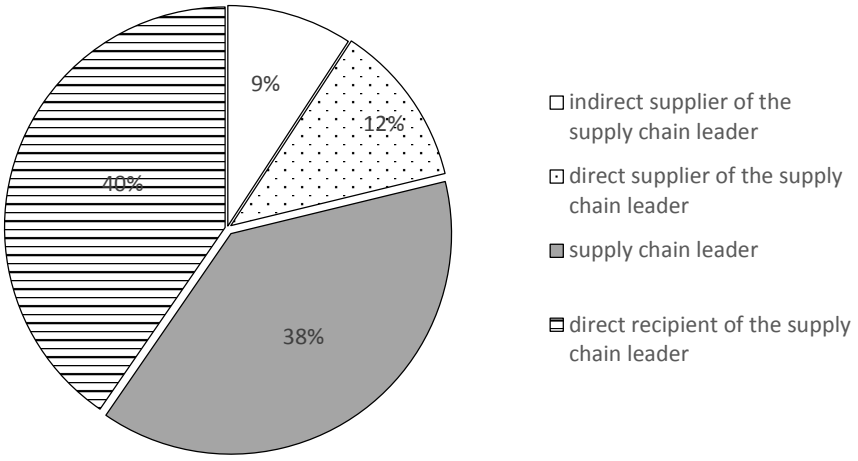

Figure 6. Position in the supply chain.

As part of the research, the surveyed representatives of the 250 business entities were asked to which processes their enterprises paid special attention, and which were the most important for them from the point of view of logistic customer service (the Mann-Whitney U test and p-values were used for this purpose).

Table 1.
Correlations between the variables of the logistic customer service process and the variables that are key to building logistic customer service

variables	uniqueness of service	luxury service regardless of costs (a price-insensitive customer)	excellent communication with a customer in the ordering process and after the sale of a product	distribution of unique products and excellent after-sales service, particularly spare parts
the shortest delivery time	109 (47%)	-	-	-
product availability from stock	-	-	-	101 (40%)
reliability of deliveries (particularly timeliness)	-	-	-	-
flexibility of logistic customer service	109 (47%)	-	-	-
accuracy and completeness	-	25 (10%)	-	-
supply of spare parts	-	-	147 (59%)	-

Source: own study.

It was found that 47% of the surveyed companies declaring that they offered unique services paid attention to shortening the delivery time and the flexibility of logistic customer service. More than half (59%) of the enterprises noted the importance of excellent communication with clients in the context of spare parts delivery.

Cramér's V and p-value were also calculated for the above variables, amounting to 0.25 and 0.01, respectively. Based on these results, it can be concluded that those companies that care about excellent communication less often indicated the uniqueness of service and more often pointed to the maximisation of the quality of service (the highest standards) implemented in the supply chain. Additionally, those companies that most care about the distribution of unique products and excellent after-sales service much less often indicated the uniqueness of service and more often excellent communication with clients (Cramér's V of 0.31 and p-value of < 0.01).

Another correlation verified during the research was that between the size of a surveyed company and the key variables building its logistic customer service (Table 2).

Table 2.
Distribution of the frequency of responses to questions describing the correlation between the size of a surveyed enterprise and the key variables building logistic customer service

Size of company	**Small**	**Medium-size**	**Large**	**N**	**Pearson's chi-squared test**	**p-value**
Variables	**Real numbers (theoretical)**	**Real numbers (theoretical)**	**Real numbers (theoretical)**			
The shortest delivery time (time and delivery tailored to customer requirements)	**44 (33,9)**	5 (10,1)	6 (11,0)	55	25,545	0,004
Availability of a product from stock	27 (24,6)	7 (7,4)	6 (8,0)	40		
Reliability of deliveries (particularly timely deliveries)	19 (17,9)	8 (5,3)	2 (5,8)	29		
Flexibility	22 (31,4)	10 (9,4)	**19 (10,2)**	51		
Accuracy and completeness	25 (30,2)	**12 (9,0)**	**12 (9,8)**	49		
Delivery of spare parts	**17 (16,0)**	4 (4,8)	5 (5,2)	26		
Total	154	46	50	250		

* Significant variables are marked in bold.

Source: own study.

Based on the analysis of the correlations between the size of the surveyed companies and the key variables that build logistic customer service, it can be seen that medium-size and large enterprises are less interested in the shortest delivery times and deliveries of spare parts than small enterprises. It can also be noticed that the declared significance of the accuracy and completeness of deliveries is higher in the case of medium-size and large enterprises and lower in the case of small enterprises.

Another studied correlation was that between changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic, and the size of a studied enterprise. The detailed results of the study are presented in Table 3.

Table 3.
Correlation between changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic and the size of a studied enterprise

Declared change	Small	Medium-size	Large	Kruskal-Wallis equality-of-populations rank test	p-value
time of response to an inquiry	1,558	1,739	1,9	8,32	0,016
geographic reach	1,61	1,587	2,34	5,39	0,068
timeliness and form of delivery (e.g., mail order sale)	1,857	1,978	2,34	12,01	0,003
time from placing an order to delivery	1,896	1,935	2,44	12,99	0,002
completeness of supplies	1,506	1,565	1,78	7,93	0,019
faultless deliveries understood as deliveries without damage, errors in documentation, etc.	~~1,377~~	~~1,543~~	~~1,56~~	~~2,97~~	~~0,226~~
flow of information about delivery/delivery difficulties	1,61	1,826	2,02	6,16	0,046
organisational changes	1,831	2,652	2,92	35,87	<0,001
price changes	1,76	2,369	2,1	14,49	<0,001
complaint handling procedure	1,35	1,848	1,82	27,08	<0,001

The crossed-out data in the table mean no correlation.

Source: own study.

Given that $p < 0.1$, the difference is statistically significant. Hence, the conclusion that at least one pair of groups of enterprises differs significantly in terms of the size of a company. After analysing the results from Table 3, it can be concluded that changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic were more important for medium-size and large enterprises than for small enterprises. Additionally, it can be seen that with the increase in the size of an enterprise, these processes changed more.

The correlation between changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic and the type of business activity was also studied.

Table 4.
Correlation between changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic and the type of business activity

Declared change	Manufacturing	Trading	Service	Kruskal-Wallis equality-of-populations rank test	p-value
time of response to the inquiry	~~1,675~~	~~1,548~~	~~1,714~~	~~1,57~~	~~0,457~~
geographic reach	1,626	1,823	1,6	6,29	0,043
timeliness and form of delivery (e.g., mail order sale)	2,084	2,258	1,724	13	0,002
time from placing an order to delivery	~~2,048~~	~~2,226~~	~~1,857~~	~~4~~	~~0,135~~
completeness of supplies	1,626	1,79	1,4	8,51	0,014
faultless deliveries understood as deliveries without damage, errors in documentation, etc.	1,53	1,564	1,304	8,36	0,015

Cont. table 4.

flow of information about delivery/delivery difficulties	1,783	1,919	1,580	5,19	0,075
organisational changes	~~2,193~~	~~2,129~~	~~2,248~~	~~0,43~~	~~0,808~~
price changes	~~2,048~~	~~1,889~~	~~1,886~~	~~1,32~~	~~0,517~~
complaint handling procedure	~~1,675~~	~~1,516~~	~~1,438~~	~~3,72~~	~~0,156~~

* The crossed-out data in the table mean no correlation.

Source: own study.

Considering that $p < 0.1$, the difference is statistically significant. Hence, the conclusion that at least one pair of groups of enterprises differs significantly depending on the type of business activity. After analysing the results from Table 4, it can be concluded that changes in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic were more important for trading and service companies than for manufacturing companies.

After performing the above analyses, it was necessary to recognise whether the changes introduced after the outbreak of the COVID-19 pandemic in the surveyed companies differed depending on the size of the company, the type of business and the role that the surveyed enterprise played in the supply chain.

Table 5.
Differentiation of changes in the processes related to logistic customer service

Variable	Size of company	Type of business	Position in the supply chain
time of response to the inquiry	NO	NO	YES
geographic reach	NO	YES	NO
timeliness and form of delivery (e.g., mail order sale)	YES	YES	YES
time from placing an order to delivery	YES	NO	YES
completeness of supplies	NO	NO	YES
faultless deliveries understood as deliveries without damage, errors in documentation, etc.	NO	NO	NO
flow of information about delivery/delivery difficulties	NO	NO	NO
organisational changes	YES	NO	NO
price changes	YES	NO	NO
complaint handling procedure	NO	NO	YES

* 'YES' – a given variable differentiates changes in the processes related to logistic customer service; 'NO' – a given variable does not differentiate changes in the processes related to logistic customer service.

Source: Zwolińska 2021, p. 84

Based on Table 5, it can be concluded that the variables that most differentiate changes in the processes related to logistic customer service in the surveyed enterprises are the position in the supply chain occupied by the company and its size.

4. Summary of the research results

Logistic customer service undoubtedly has a significant impact on the competitiveness of enterprises. Attention should be paid not only to external stakeholders, but also to the activities of internal stakeholders who contribute to increasing the level of customer satisfaction. This is important because a satisfied customer is more likely to repeat purchases than one who gives up a purchase or gives a negative opinion about a purchase for various reasons. Of course, it should be remembered that, as with other processes taking place in a company, in this case the Pareto principle should be applied, according to which only 20% of satisfied customers generate 80% of the profits. Therefore, changes taking place in logistic customer service during the COVID-19 pandemic result from both the changing needs of customers, which are forced by the pandemic situation, and the legal provisions regulating the functioning of enterprises during the pandemic. As can be seen, the pandemic has affected behavioural patterns and therefore companies need to keep pace with the changes that have occurred.

The empirical research results have shown that the variables that most differentiate changes in the processes related to logistic customer service in the surveyed companies are the enterprise's position in the supply chain and the size of this enterprise. Moreover, it can be concluded that changes made in the processes related to logistic customer service after the outbreak of the COVID-19 pandemic are more important for medium-size and large enterprises than for small enterprises, and that they are more important for trading and service companies than for manufacturing companies.

In summary, this article describes part of a larger research project focusing on the concept of sustainable supply chains. Indicating the scope of changes in logistic customer service made by enterprises during the COVID-19 pandemic may constitute the basis for enterprises to compare their activities with those performed by the enterprises participating in the research. Companies can also implement these changes to gain a competitive advantage.

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