POLITECHNIKA ŚLĄSKA **ZESZYTY NAUKOWE**

SILESIAN UNIVERSITY OF TECHNOLOGY SCIENTIFIC PAPERS

ORGANIZACJA I ZARZĄDZANIE
Zeszyt Naukowy nr 177

ORGANIZATION AND MANAGEMENT
Scientific Paper no. 177

Nowoczesność przemysłu i usług

Modernity of industry and services

Pod redakcją
Bożeny SKOTNICKIEJ-ZASADZIEŃ
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Bożena SKOTNICKA-ZASADZIEŃ
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GLIWICE 2023

Wydano za zgodą
Rektora Politechniki Śląskiej

ISSN 1641-3466
ISSN 2720-751X

WYDAWNICTWO POLITECHNIKI ŚLĄSKIEJ
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Nakł. 80 Ark. wyd. 57 Ark. druk. 45,75 Papier offset 70x100, 80 g
Zam. 87/23

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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 various universities from Poland. The number consists of 41 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about: entrepreneurship, service management, business models, human resources management, strategic management, knowledge management, production management, Corporate Social responsibility, digitalization in management, information management, small and medium enterprises management, the impact of COVID-19 pandemic on management, Industry 4.0, sustainable development, and Smart City.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

EXPLORING THE DRIVERS OF A UNIVERSITY-BASED ENTREPRENEURIAL ECOSYSTEM – EXAMPLES OF GOOD PRACTICE

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Purpose: The article strives for a more deeper understanding of the concept of a university-based entrepreneurial ecosystem and how it can support start-ups and contribute to the regional development. The empirical purpose of the study is to diagnose the key actors and drivers, initiatives and examples of good practice of a university-based start-up ecosystem with a strong leadership of the founders center.

Design/methodology/approach: The paper draws on a management science literature review, covering various approaches to the concept of entrepreneurial ecosystems, using the following methods: exploration, interpretation, comparing, and analysing critical factors. The empirical research applies the method of in-depth semi-structured direct interview with experts in the field of support services to potential founders and start-ups with academic origin, the case study method, participatory observation, and reflection. The explorative qualitative study uses both descriptive and explanatory techniques.

Findings: The research findings provide insight in the real nature of the university-based start-up ecosystem presenting its key stakeholders which provide a conducive environment for potential founders and start-ups. The study highlights examples of good practice implemented in the regional entrepreneurial ecosystem.

Research limitations/implications: Research limitations of this study resulting from the analysis of a purposefully-selected case of a local university-based entrepreneurial ecosystem only do not allow formulating general conclusions. Nevertheless, it illustrates a real business practice and thus contribute to the discussion on the dilemmas associated with increasing the efficiency and sustainability of entrepreneurial ecosystems. Future research line will concern the assessment of the interdependencies among the key stakeholders of the start-up ecosystem to look for more effective cooperation.

Practical implications: The examples of good practice reflected in the study prove the great commitment of the Viadrina Founders Center and its significant contribution to the development of the entrepreneurial ecosystem in the State of Brandenburg in Germany. These good practices can be an inspiration for other business incubators and local ecosystem actors.

Originality/value: The originality of the conducted exploratory research lies in presenting the real business practice and challenges of the development of a university-based entrepreneurial ecosystem, and thus inspire for further analysis and extended research on problems associated with increasing the sustainability of local start-up ecosystems.

Keywords: university-based entrepreneurial ecosystem, entrepreneurship, start-up ecosystem, incubators, stakeholders.

Category of the paper: Research paper, case study.

1. Introduction

The concept of entrepreneurial ecosystems has gained popularity within research, policy, and practitioner fields over the last decade. The potential of integrated policies, programs and processes which foster entrepreneurial activities in the region and boost intelligent evolution, technology transfer as well as productivity and employment growth was noticed and became the subject of many studies (Isenberg, 2011; Mason, Brown, 2014; Stam, Bosma, 2015; Hayter, 2016; Brown, Mason, 2017; Freiling, Baron, 2017; Spigel, 2017; Autio et al., 2018; Stam, Spigel, 2018; Theodoraki et al., 2018; Tomski, 2018; Wallisch et al., 2019; Stam, Welter, 2020; Buła, Schroeder, 2020; Stam, Van de Ven, 2021). Despite the fact that entrepreneurial ecosystems have become a prominent concept, there are still many questions and doubts about how they should be composed and interrelated to create start-up-friendly framework conditions and increase the attractiveness of investments in the region.

It should be emphasized that entrepreneurial ecosystems develop naturally through co-evolution. In order to effectively stimulate and accelerate this process, it is necessary to implement appropriate forms of substantive, regulatory, financial or infrastructural support. The efficiency of organizations and entities included in entrepreneurial ecosystems depends not only on their own competences and potential, but also on interactions with other entities and the condition of the entire ecosystem. Universities and research institutes act as talent factories in the start-up ecosystem and strengthen knowledge and technology transfer in the region. Moreover, universities occupy a special position in this context due to their institutional support and as an attraction factor. In addition to spin-off effects, this is primarily about the students and graduates who enrich the talent pool with their skills and ideas. Activities and support programs offered at educational and research institutes are of particular importance here.

On the part of regional politics, however, framework conditions must be created that facilitate start-up activities and the development of an entrepreneurial ecosystem. These include, among other things, the time and costs involved in founding a company and the provision of public funding and laws for the design of venture capital funds and their investments. Moreover, the development of entrepreneurial skills and a start-up culture in the region can also be specifically supported by local government measures. In addition to the increased establishment of start-up-oriented training in schools and universities, this includes the implementation of high-profile campaigns such as start-up weeks, hackathons and entrepreneurial events. Success stories of innovative companies in the ecosystem can affect its

condition, contributing to its evolution. According to Isenberg, "even one success can have a surprisingly stimulating effect on an entrepreneurship ecosystem – by igniting the imagination of the public and inspiring imitators" (Isenberg, 2010, p. 48).

It should be noted that entrepreneurial ecosystems represent a renewed interest in localized conditions for entrepreneurship aligned with a focus on the agency of entrepreneurial actors to create and transform their own contexts. Therefore, the "drivers" of an entrepreneurial ecosystem should connect resources and attract and fuel entrepreneurial actors in the entire region to provide a self-sustaining environment for the intelligent development.

The entrepreneurial ecosystem frameworks by Isenberg (2010), Mason and Brown (2014) as well as the local start-up ecosystem by Wallisch et al. (2019) are the theoretical basis of this study. The article strives for a more deeper understanding of a university-based entrepreneurial ecosystem and its critical actors. The empirical purpose is to identify the key actors and drivers of the local university-based start-up ecosystem and present examples of good practice which create a conducive environment for academic start-ups and regional development.

First, the paper provides an overview of the concept of an entrepreneurial ecosystem to establish an informed understanding of the conducted study. Second, the emphasis is on the local ecosystem actors – individuals, enterprises, institutions – which help to provide a nurturing environment for academic start-ups in the seed stage. Third, the explicit focus is on entrepreneurial initiatives and incentives undertaken by the Viadrina Founders Center to provide potential entrepreneurs with necessary business knowledge about starting their own business and networking within the ecosystem. The study highlights the mutual relationships within the start-up ecosystem and good practice examples which are crucial to stimulate and support ambitious entrepreneurship in the region.

Research limitations of this study resulting from the analysis of a purposefully-selected case of a local university-based entrepreneurial ecosystem only do not allow formulating general conclusions. Nevertheless, it illustrates a real business practice and thus contribute to the discussion on the dilemmas associated with increasing the efficiency and sustainability of entrepreneurial ecosystems.

2. The concept of entrepreneurial ecosystems

Ecosystems are a cognitively interesting area of exploration in the field of management science. However, even within the academic literature, the concept of entrepreneurial ecosystems is mainly used metaphorically with unclear relationships to other theories of innovation and regional economic development (Alvedalen, Boschma, 2017; O'Connor et al., 2018; Scaringella, Radziwon, 2018). The emergence of this concept is the result of applying the "ecosystem" metaphor to the issue of entrepreneurship where the ecosystem is considering

a functional whole of the coordinated set of elements and mutual relationships between them and their environment.

The idea of entrepreneurial ecosystems was quickly adopted by governments and non-governmental organizations such as the Kauffman Foundation (Stangler, Bell-Masterson, 2015), the OECD (Mason, Brown, 2014), and the World Economic Forum (2014). The current thinking about entrepreneurial ecosystems can be seen as the result of development in various directions, such as, for example, the business ecosystem (Ben Letaifa, 2013; Adner, Oxley, Silverman, 2013; Stańczyk-Hugiet, 2015), the innovation and knowledge ecosystem (Autio, Thomas, 2014; Adner, Kapoor, 2016; Brown, Mason, 2017; Klimas, Czakon, 2021), the entrepreneurship (Isenberg, 2010, 2011) or entrepreneurial ecosystems (Stam, 2015; Stam, Spigel, 2017) or their connections with the system theory (Cohen 2006; Isenberg 2011; Stam, 2015), the network theory (Autio, Thomas, 2014; Letaifa, 2016) or clusters (Gilbert et al., 2008; Mason, 2008; Delgado, Porter, Stern, 2010).

The entrepreneurial ecosystem approach provides a means of synthesizing these different avenues to open up new research questions on both policy issues on how to support economic growth and prosperity, and more fundamental social science questions such as the relationship between structure and key actors (Spigel, 2020). Moreover, entrepreneurial ecosystems emphasize the role of "place" and provide a lens for understanding regional transformation through entrepreneurial action (Audretsch, 2015; O'Connor et al., 2018). What is more, ecosystems are capable of self-organization and self-development in the form of complex, adaptive systems related to the interrelationships of components and the ability to adapt "inside" and evolve together with the changing environment (Chan, 2001, in: Tomski, 2018, p. 115). However, since an ecosystem is composed of living organisms, its relationships co-evolve (Hayter, 2016).

A particularly influential approach to entrepreneurial ecosystems has been developed by Daniel Isenberg at Babson College who refers to as an "entrepreneurship ecosystem strategy for economic development" (2011, p. 1). He strongly emphasizes the importance of context: each ecosystem emerges under a unique set of conditions and circumstances where social, cultural and institutional factors play an underpinning role. Subsequent research, inspired by system theories, enables us to understand the ecosystem as a whole (Isenberg, 2011; Stam, 2015). These studies visualize ecosystem composition and the elements the system contains. Moreover, Isenberg (2010) identified six generic domains in the entrepreneurial ecosystem, namely: a conducive culture, a range of institutional and infrastructure supports, quality human capital and social networks, venture friendly markets for products and services, as well as enabling policies and leadership, and availability of appropriate financial capital. All these domains contain many elements and factors "interacting in highly complex and idiosyncratic ways" (Mason, Brown, 2014, p. 5).

In turn, Mason and Brown (2014) proposed a very extensive definition of the entrepreneurial ecosystem, emphasizing the diversity of the ecosystem's actors, processes and mutual formal and informal relationships. It is "a set of interconnected entrepreneurial actors (both potential and existing), entrepreneurial organizations (e.g. firms, venture capitalists, business angels, banks), institutions (universities, public sector agencies, financial bodies) and entrepreneurial processes (e.g. the business birth rate, numbers of high growth firms and serial entrepreneurs (…) which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment" (Mason, Brown, 2014, p. 5). In turn, Spiegel (2017) emphasizes the result of an effective ecosystem, which is the productive entrepreneurship. This ecosystem is composed of an interdependent group of local culture (actors), social networks, universities, investment sources, coordinated economic policies (factors) in such a way as to create a good environment enabling productive entrepreneurship in a given region. Furthermore, a stable environment where trust prevails fosters the transfer of knowledge and skills between the members involved. In this sense, trust and cooperation are based on complementarity, which is characterized by cumulative and synergistic interactions between members of the ecosystem (Thomas, Autio, 2013; Adner, Kapoor, 2016). Without ties and common goals between the actors of an ecosystem, they would not be able to share important resources, some of which they are willing to share (e.g. experience, human capital, expertise, infrastructure).

The research subject in this study is the local university-based start-up ecosystem "driven" by the academic business incubator – the Viadrina Founders Center – which is presented in the empirical part of this article. Taking into account the above considerations, it should be noted that the start-up ecosystem as a specific type of entrepreneurial ecosystems that focuses on the potential of founders and start-ups in their region. It includes start-up ventures, i.e. those at the initial (seed) stage of development, looking for a scalable and profitable business model (Blank, Dorf, 2012) by introducing innovative products and services to the market (Ries, 2011) and operating in conditions of high variability of the environment and competitiveness. Moreover, a start-up ecosystem forms the framework conditions and networks for this specific target in order to provide a better accessibility of resources and facilities to ensure an effective cooperation with local stakeholders. It creates the framework conditions and networks for this specific target group in order to provide a better accessibility of resources and facilities, to ensure an effective cooperation with supporting actors and regional factors. In addition, it aims to promote relationships between stakeholders and identify appropriate actions for the development of networks and support measures in the region (Wallisch et al., 2019). Drawing on this research stream, the author of this study defines a university-based start-up ecosystem as an interconnected group of actors and institutions in a local geographic environment, associated with a specific university, committed to provide conducive framework conditions for potential academic founders and start-ups in order to support networking within the entire ecosystem (Badzińska, Alt, 2021). It should be emphasized that the success of the ecosystem

lies in its entrepreneurial ability to create coherent socio-economic systems supporting the creation and development of new enterprises (Stam, Spigel, 2016). Undoubtedly, in order to ensure the sustainable development of an entrepreneurial ecosystem, consistency must be ensured in terms of critical factors.

It is well known that members of the entrepreneurial ecosystem benefit from a significant development of the whole system. There is a give-and-take relationship that helps individuals and institutions access external resources that undergo improvement and learning processes (Freiling, 2008). Furthermore, a turbulent environment forces ecosystem members to "contribute to the development of a favourable climate to maintain the ecosystem's stability, durability, and continuing value" (Theodoraki et al., 2018, p. 156). Other important aspects considered to be key elements of entrepreneurial ecosystems are culture, positive social norms and attitudes towards entrepreneurship, the availability of start-ups and growth capital, as well as the presence of large companies, universities and service providers.

Given the breadth of policy and research interest in entrepreneurial ecosystems, it is important to critically reflect on what work has been done and what knowledge has been accumulated about the contextual nature of the entrepreneurial process.

3. Research design and methods

For the cognitive purpose of this paper, an overview of the management science literature was conducted along with the analysis of secondary research results on the phenomenon of entrepreneurial ecosystems. The main attention was drawn to the critical actors (stakeholders) and conditions of a university-based start-up ecosystem. The following methods were used to cover various approaches to this concept: defining, comparing, attribute analysis, inference. In turn, the empirical part of the study is an attempt to indicate the key actors and drivers of the local university-based start-up ecosystem as well as examples of good practice for providing a nurturing environment for start-up incubation, and thus, the entrepreneurial development of the local ecosystem.

An in-depth analysis was conducted through the prism of "a leader-driver" of the local start-up ecosystem which is the academic business incubator – the Founders Center at the European University Viadrina in Frankfurt (Oder) in Germany. Therefore, in order to achieve the research objective and exemplify the good practices, the following research questions were posed: What is the configuration of critical actors of the start-up ecosystem "driven" by the Viadrina Founders Center? What forms of valuable support they offer to provide a nurturing environment for start-up incubation? What are the examples of good practice to strengthen the entrepreneurial culture in the region?

The confrontation of multiple data sources justifies the iterative nature of data collection in the years 2020-2023. The necessity to confront a variety of data sources forced the application of the principle of triangulation (a multi-method research approach) (Sułkowski, 2012; Glinka, Czakon, 2021). Data from secondary sources did not provide sufficient saturation of information for the research objective. To achieve the research goal an explorative qualitative study was conducted. Primary data was obtained from in-depth direct interviews with the manager and employees (4 persons) of the Viadrina Founders Center as well as incubator associates (3 experts in the field of academic entrepreneurship and knowledge transfer). An interview questionnaire was semi-structured and contained the following areas: (i) general questions about the Viadrina Founders Center and its organizational structure; (ii) questions about scope of services and facilities they provide to create a conducive environment for the creation and development of start-ups; (iii) questions about the sources of financing innovative business concepts of students and alumni; (iv) questions about the critical actors of the start-up ecosystem and the forms of support they provide. In order to verify the gathered information, the interview questionnaire was sent in an electronic form. Practical knowledge and experience of the surveyed experts in supporting start-up entrepreneurship in the region led to the conclusion that data obtained from in-depth direct interviews will help to attain the objective of the research. Furthermore, the source of primary data was also the author's participatory observation, reflection and active collaboration in the field of developing and supporting an entrepreneurial ecosystem within the research internship in the Viadrina Founders Center (September 2020, 2021). Moreover, the author's international cooperation and experience gained within the project "Heterogeneous University Start-ups" carried out at the Viadrina Founders Center in 2020-2021, the project "#InSpO. Start-up Ecosystem on the Innovation Axis on the Spree-Oder" running 2021-2023 in the State of Brandenburg in Germany as well as the Erasmus+ Staff Mobility (February 2022 and 2023) in the Viadrina Founders Center were an important source of information and the basis for the purposeful selection (Patton, 2002) of the research subject.

The empirical method makes use of a case study involving the analysis of entrepreneurial initiatives and incentives undertaken by the Viadrina Founders Center to effectively support entrepreneurial mindset by students and build valuable relationships with the ecosystem stakeholders. The rationale for the use of the case study is its usefulness for the practice-oriented approach (Yin, 2013) and the fact that it helps provide insights into the real university-based start-up ecosystem and diagnose which actors really provide and organize the connection of resources within the specific ecosystem. The nature of the presented case study is descriptive and reflective. To expand the database on the research subject an analysis of materials from the available secondary sources was also conducted. They included: incubator's website, press releases, opinions of supported students, and the social media run by the Viadrina Founders Center.

4. Research findings and discussion

The Viadrina Founders Center is a university-based business incubator located at the European University Viadrina in Frankfur (Oder), the State of Brandenburg in Germany, which was established in 2015. Currently, the Founders Center employs six people, mostly part-time. There are also four student employees with a small number of hours (8-10 hours per week), i.e. 4.8 full-time units. The Viadrina Founders Center is largely financed by third-party funds or additional funds, such as the Ministry for Economic Affairs, Labor and Energy (MWAE) with funds from the European Social Fund and the State of Brandenburg. The manager of the Viadrina Founders Center – Dr. Ramona Alt – has many years of experience in offering professional advice and practical support in creating startups, and she has been running the Founders Center since 2015.

The Viadrina Founders Center is strongly committed to a start-up-friendly climate in the State of Brandenburg therefore it undertakes activities to strengthen the start-up culture in the region, improve framework conditions and support start-up networks. As a key actor of the university-based entrepreneurial ecosystem it mainly provides services to potential founders and start-ups with academic origin facilitating their access to academic and business networking as well as assist scientist in the transfer of technology and substantive knowledge. In order to overcome resource gaps in the seed stage of start-ups the employees of the Viadrina Founders Center help support networking with external entities such as advisers, investors, potential partners or team members, early-adopter customers, and potential employees as well. Thus, it provides connectivity with the key actors of the local entrepreneurial ecosystem. Because the Founders Center is publicly funded, reductions in public funds can influence the scope of activities and decrease support for potential founders. This is one of the reasons why the manager looks for resources, relationships and actors who effectively support potential founders by sharing expertise, good business practices, organizing events and providing funding as well.

In recent years, the Viadrina Founders Center has attracted an average of 11-12 founders per year. However, the number of those who have been qualified for support is significantly higher. The mission of the Founders Center is also raising students' awareness of the entrepreneurial mindset through a variety of events and formats. These are then called participants in the program and there are an average of around 1400 people a year. Successful applicants are provided with public funding and mentor support. Moreover, the potential founders involved in these entrepreneurial initiatives recognize that it takes time to build a vibrant, sustainable venture.

The Viadrina Founders Center aims to create an environment which is conducive to academic start-ups therefore it has developed a set of framework conditions for encouraging entrepreneurial activities among potential founders (e.g. professional workshops during the

academic year, meetings with academic start-ups and business advisers, 'podium' discussion, pitch competition and many others). In order to sensitize students for entrepreneurship, the Founders Center team offers them individual support and practice-oriented learning, such as strategic guidance, business mentoring, advice on the financing plan and financing options as well as leadership and team development. Moreover, the Founders Center attaches great importance to the coherence of communication in the local ecosystem and is trying to build sustainable relationships with valuable actors through the exchange of best practices and creating common ecosystem value.

One of the major challenges for the team of the Viadrina Founders Center is to interconnect actors, available resources and competences in the local start-up ecosystem in a highly useful manner. Despite the fact that resources are often no stand-alone factors, when combined with both internal and often external assets they create synergies.

As there are a lot of possible combinations of actors in an entrepreneurial ecosystem, the question is who is the "architect" of the structure of the entire ecosystem. This study assumes that the main "driver" (leader) of the local start-up ecosystem is the Viadrina Founders Center, which initiates and supports activities towards the creation and development of academic start-ups. As a result of the conducted empirical research, the critical actors were diagnosed.

The key actors of the entire ecosystem are, of course, students – potential founders – as well as alumni and start-ups from the European University Viadrina and the local environment. On the one hand, with their key competences and innovative activities, they contribute to the creation of the start-up scene as the core around which the entrepreneurial ecosystem will develop and evolve. On the other hand, they gain significant value through access to internal and external networks that help them develop business partnerships, recruit qualified staff and seek advice from external experts. Since the subject of the research is the start-up ecosystem with academic origin, an important role is played by the academic community represented by researchers and entrepreneurship teachers, as well as authorities providing both substantive, organizational, and financial support as well. Other contact points at the European University like for example the Career Center or Office for Research and Graduate Education also contribute to raising awareness of entrepreneurship, self-employment and further development. In addition, the exchange of experiences and organizational cooperation with start-up centers and services at several partner universities in the State of Brandenburg also brings measurable effects for the local ecosystem.

Other key elements of the start-up ecosystem are entrepreneur associations, networking platforms and co-working spaces. They give the opportunity to engage potential founders, as they facilitate the sharing of knowledge and business experience, building a sense of common community of start-ups. In addition, each member of the start-up community contributes through its core competencies and collaborates with others to strengthen both individual performance and benefit from the value created by the entire entrepreneurial ecosystem.

The availability of finance is another critical factor in entrepreneurial ecosystems. Of particular importance is the critical mass of seed and start-up investors who will provide funding and hands-on support. Investors in the initial waves of new ventures are often private individuals. Most start-ups are initially funded through a combination of self-financing, microcredit, loans from family and friends, and bootstrapping. The Viadrina Founders Center offers professional advice in this area. Financial support can also be obtained from government institutions at the state level of Brandenburg. In turn, substantive support is offered by public business consulting centers, such as the Investor Center Ostbrandenburg (ICOB). The leading financial institutions for start-ups and entrepreneurs are the Investment Bank of the State of Brandenburg (ILB) and the Investment Bank Berlin (IBB). In turn, the Chamber of Industry and Commerce (IHK) and the Chamber of Crafts (HWK) offer professional career advice.

On the basis of own research and data from secondary sources, examples of good practices in building a sustainable entrepreneurial ecosystem were developed. Below are several initiatives and projects implemented by the Viadrina Founders Center, which confirm the significant contribution of the examined entity to the development of the entrepreneurial ecosystem in the State of Brandenburg.

4.1. International workshop Let's Match! Frankfurt/Oder – Potsdam – Poznań

On the initiative of the Viadrina Founders Center, as part of the Global Entrepreneurship Week 2020, a matching workshop for start-ups and potential co-founders were organized in November 2020. The event was attended by 27 people from three European universities: European University Viadrina, Poznań University of Technology and University of Potsdam. The main purpose of the event was to give an opportunity for students and alumni to become a member of an international team and connect with inspiring entrepreneurs in order to shape entrepreneurial attitudes and professional competences to operate in an international environment. Moreover, the aim of the workshop was to support interdisciplinary business start-ups with academic background to create a regional and international network for innovative businesses in the State of Brandenburg. As part of the workshop, participants had the opportunity to design an initial business concept or solve a problem for a selected start-up using the Design Thinking method. The workshop was led by a professional trainer from the HPI School of Design Thinking in Potsdam (Hasso Plattner Institute D-School University of Potsdam) who provided an attractive and creative way of transferring knowledge and dynamic cooperation in teams. The last element of the workshop was the participation in a moderated Livestream panel where four academic start-ups shared their previous experience in building a business and the difficulties related to the COVID-19 pandemic. Workshop participants positively assessed the event, emphasizing the substantive value and good organization, which undoubtedly influenced the development of entrepreneurial attitudes among the academic community and the development of cooperation between the involved Universities.

4.2. The project "Heterogeneous University Start-ups"

The project was implemented by the Viadrina Founders Center in 2020-2021. The main goal of the project was to create international teams of potential founders with heterogeneous education (technical, economic, social) and academic background. During the project Viadrina tried to build communication channels and create relationships with selected external partners to gain access to more specialist knowledge and resources not available locally. The experience gained within the project “Heterogeneous University Start-ups” confirms that networking, mutual support and regular interactions become more and more important over time.

4.3. The project "#InSpO. Start-up Ecosystem on the Innovation Axis on the Spree-Oder"

This project is a part of the model project "Best Practice Start-up Ecosystems in the New Federal States" founded by the Federal Ministry of Economics in Germany in 2021-2023. Developing and strengthening start-up networks by bringing founders together with each other as well as with science, education, business, administration and supporters, and thus create start-up-friendly framework conditions on site is the aim of the model project.

Two of the twelve selected initiatives (out of 70 submitted) come from the State of Brandenburg and one of the winners is the project "#InSpO. Start-up Ecosystem on the Innovation Axis on the Spree-Oder" carried out by the Viadrina Founders Center in 2021-2023. This success undoubtedly confirms the competence and commitment of the incubator's employees in the development of the local entrepreneurial ecosystem. They promote a lively start-up scene with innovative approaches. In various formats, such as Start-up Safari, Casual Friday or Innovation Camp, local founders have the opportunity to exchange ideas with experienced entrepreneurs and to gain new insights from best practice examples. Moreover, professional conferences and events are intended to strengthen this exchange. With the help of online marketing campaigns, founders are presented in the region and their successes are made better known. The manager of the Viadrina Founders Center emphasizes that: “As encouragers, we want to work with partners to build on existing offers and create an even more start-up-friendly environment. The aim is to strengthen entrepreneurial spirit and anchor start-ups in the region" (Gründungsökosystem an der Innovationsachse Spree-Oder, 2021). As part of the project, a scientific survey was carried out in 2021. On the one hand, the survey asked for assessments of start-up activities in the region, and on the other hand, suggestions and ideas were collected that are intended to help shape a start-up-friendly ecosystem in the region. Strengthening the start-up culture in the region between the Oder and Spree and showing start-up perspectives based on the research outcomes are the declared goals of the #InSpO future forum in 2022. Until the end of 2023, the project partners are working together on new solutions for sustainable entrepreneurial ecosystem.

4.4. Viadrina Compass Workshop Portal – Startup Support

Viadrina Compass Workshop Portal offers free workshops, events as well as an individual coaching for professional qualification throughout the year. The trainings are carried out by employees of the Founders Center in collaboration with external advisers and experts. They provide potential founders with regular input on topics relevant to setting up a venture and starting own business. The Viadrina Founders Center offers extensive topics from the interactive workshop on the business model generation, seminars and consulting on marketing strategies to funding and financing options that optimally prepare students for starting their company. Moreover, the employees provide assistance and advice to students regarding networking opportunities and career planning.

4.5. The Entrepreneurship Research Lab (ERLab) at the European University Viadrina

The Entrepreneurship Research Lab (ERLab) is a community of researchers at the European University Viadrina investigating on central aspects of entrepreneurial activities in organizations and entrepreneurial ecosystems (it has been operating since 2023). The goal of ERLab is to understand how ecosystems created by companies and other relevant stakeholders develop and implement sustainable innovation and social values. The research projects focus on relevant factors for the functioning of these ecosystems, and these include community, creativity and communication. The starting point of the research projects is the focus on success factors of entrepreneurial practice. Thanks to the cooperation with Campus Founders gGmbH in Heilbronn (in the state of Baden-Württemberg, Germany), as a practice partner, the ERLab gains access to an attractive and growing innovation ecosystem in one of the economically strongest regions of Europe. The ERLab aims to offer relevant benefits for entrepreneurs and ecosystems by stimulating the exchange between science and practice in the Brandenburg region as well as by generating synergies with the Heilbronn ecosystem. The Viadrina Founders Center acts here as an interface of researchers, teachers and students and integrates Viadrina's transfer and start-up ideas (Campusfounders, 2023).

4.6. The university ranking "Think Tank" of the Business Plan Competition Berlin-Brandenburg

The Business Plan Competition Berlin-Brandenburg (BPW) is Germany's largest and most successful regional start-up initiative. The free and practice-oriented support program gives participants the opportunity to work with more than 300 professional consultants to continuously develop a business concept. The BPW is aimed at anyone who has a good idea and is planning to implement it in Berlin or Brandenburg. The Viadrina Founders Center supports students every year in the development and submission of business plans on site as well as in the participation in the BPW. Moreover, the BPW awards the Think Tank ("Ideenschmiede") to the most active universities in Berlin and Brandenburg. The European

University Viadrina has already achieved first place five times in the BPW's "Think Tank" university ranking as the most successful university in the field of start-ups in all of Brandenburg (e.g. in 2018 and 2021) (https://www.b-p-w.de/de/hochschule/, 2023). As part of support for university start-ups, the Viadrina Founders Center cooperates with financial institutions, such as the Investment Bank of the State of Brandenburg (ILB) and the Investment Bank Berlin (IBB) which are the organizers of BPW. The banks provide tailor-made funding and financing options for start-ups in the form of grants, loans, guarantees and venture capital. Top place in the university ranking "Think Tank" of BPW for many years has been another confirmation of the Viadrina Founders Center contribution to the development of entrepreneurial mindset of students and the high level of professional support offered.

4.7. The university ranking in "Start-up Radar" - Top position as a founding university

In the University ranking "Start-up Radar" 2022 of the Donor's Association for German Science, funded by the Federal Ministry of Economics and Climate Protection, the European University Viadrina took the 4th place nationwide among 77 medium-sized universities for start-up support. It should be emphasized that the European University Viadrina has been in the top position for years (in 2019-2020 it took the 2nd place). The Viadrina Founders Center was able to convince again its contribution to strengthening the start-up network and development of the entrepreneurial ecosystem in the region. The high ranking of the European University Viadrina in the "Start-up Radar" 2022 certifies particularly good performance in the categories "start-up awareness and qualification" and "start-up anchoring". Here it occupies the top positions in a comparison of medium-sized universities in Germany (Start-up Radar, 2023).

4.8. The start-up area in the future coworking space "The One"

In its start-up program, workshops, events and consultations, the Viadrina Founders Center not only aims to encourage potential founders, but also to convert their ideas into a real business and form a strong community. Currently the Viadrina Founders Center is creating synergies with coworking spaces in Frankfurt (Oder) to offer common workspace for students and employees. An example of such cooperation are joint initiatives organized by the Founders Center with BLOK O, Kulturmanufaktur Gerstenberg, Roman & Fritz, Spree-Hub. The future coworking space "The One", co-created by the Founders Center at the European University Viadrina, is to contribute to even greater involvement of students in the implementation of their own business ideas and to provide appropriate infrastructure. The employees of the Viadrina Founders Center promote the implementation of a "Future Skills Makerspace" at the university. Together they design, develop and test ideas for Viadrina's future Coworking Space (planned opening in 2023).

Every ecosystem must be composed not of specific isolated actors but of the interactions among them. The Viadrina Founders Center acts as a catalyst for a variety of actors (e.g. universities, chambers of commerce, founding teams, start-up community, government institutions in the State of Brandenburg and local level, private business consultants) to encourage the creation of programs and favorable conditions that build awareness of the local start-up community, stimulate the flow of new founders but also support further development of established entrepreneurs. The manager of the Founders Center emphasizes that "without our students, with their diverse backgrounds and great business ideas, these start-up successes would not be possible" (2020).

Summarizing the research results, it should be emphasized that the wide range of services and initiatives offered by the Viadrina Founders Center brings the expected results in terms of building entrepreneurial attitudes and developing a sustainable entrepreneurship ecosystem.

5. Conclusions

In the studied university-based entrepreneurial ecosystem, the Viadrina Founders Center undoubtedly plays a key role as a driver, which operates in a highly complex manner, trying to connect the most powerful actors that create and support the entire ecosystem. The Founders Center supports both students, graduates and researchers, starting from finding the right idea and ending with practical preparation to establish a company. It offers free events and workshops, provides experienced experts, introduces potential founders to the start-up community and is the first point of contact for all projects and questions.

The rationale for providing a conducive environment for the incubation of academic start-ups is that they have significant spill-over effects that are beneficial to the emergence of other founders and start-ups in the same locality. In addition, they can increase the transfer of research results from universities to the market, stimulate productivity growth, create new jobs, and promote the internationalization of business. There is also evidence that growth-oriented start-ups are an important enabler for entrepreneurial ecosystems, increasing both competition and collaboration, promoting innovation, increasing the efficient allocation of resources and investing heavily in human capital. However, the study of the entrepreneurial ecosystem requires consideration of its origins, stimuli, as well as the processes by which it becomes self-sufficient.

The presented examples of good practice prove the great commitment of the Viadrina Founders Center, the implementation of well-thought-out ideas and well-organized activities for the development of the regional ecosystem. The awards and high rankings in competitions for the best founding university are a confirmation of the professionalism of employees and honoring the actions taken.

The Viadrina Founders Center as the "driver" of the university-based start-up ecosystem seeks to shape and strengthen networks and relationships between key stakeholders of the ecosystem in such a way that the academic support landscape can be stimulated and start-ups successfully created and developed. Nevertheless, to ensure the development of the sustainable entrepreneurial ecosystem, it is necessary to implement more systemic forms of support for key members. This requires e.g. moving away from enterprise-specific interventions towards more holistic activities that focus on creating and developing networks, interrelations, building new institutional capacity and fostering synergies between different stakeholders. The research results emphasize the importance of studying the interdependencies between the key actors of the start-up ecosystem in order to provide them with access to tangible and intangible resources enabling their development, and thus the sustainable development of the entire ecosystem. The future research line includes assessment of the significance and direction of the relationships between the key actors of the university-based start-up ecosystem. It is advisable to examine the interdependencies within the networks that affect the creation of new value at the regional level and the range of services and facilities necessary to create an environment conducive to the emergence and development of start-ups. This narrower focus allows for a more thorough examination of what kinds of internal organizational attributes and exogenous regional factors support scalable entrepreneurial endeavors.

Acknowledgements

I would like to thank the Manager, Employees and Associates of the Viadrina Founders Center for participating in the research and providing valuable feedback on the key stakeholders and good practices for the development of the university-based start-up ecosystem. Moreover, I would like to express my gratitude to Doctor Ramona Alt, Director of the Founders Center at the European University Viadrina, for the opportunity to complete the research internship in 2020 and 2021 as well as the Erasmus+ Staff Mobility in 2022 and 2023 in the Founders Center headed by her. The article processing charges were funded by Poznan University of Technology, Faculty of Engineering Management [project number: 0812/SBAD/4220].

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

BENEFITS THAT OFFERORS ACHIEVE THANKS TO COOPERATION WITH FINAL PURCHASERS VS. THE OFFEROR'S COUNTRY OF ORIGIN – THE FINAL PURCHASERS' PERSPECTIVE

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Purpose: The aim of the article is to identify the hierarchy of benefits perceived by final purchasers which offerors achieve by taking joint actions and to determine the importance of the offeror's country of origin as a variable differentiating purchasers' opinions.
Design/methodology/approach: The results of the cognitive-critical analysis of the world's literature on the subject indicate that there is a cognitive gap and a research gap with regard to the benefits that offerors achieve through cooperation with final purchasers in the context of their preferences regarding the offeror's country of origin. Striving to fill the gaps identified, six research hypotheses were formulated, which were subjected to empirical versification. For this purpose, surveys were conducted among representatives of Polish adult final purchasers. The data was subjected to statistical analysis using, e.g. the method of exploratory factor analysis, the chi2 test and the Kruskal-Wallis test.
Findings: Among other things, it was discovered that for the majority of respondents, the country of origin does not matter when it comes to their readiness to undertake joint actions. This variable turned out to differentiate the responses in the case of five out of thirteen benefits analysed. Homogenous groups of respondents showing similar preferences towards the offeror's country of origin and the willingness to cooperate were distinguished.
Originality/value: The conclusions drawn on the basis of the research have significant cognitive and application value. They enrich the theory of marketing and purchaser behaviour, providing valuable tips for managers. The implementation of these recommendations may facilitate the development of long-term mutually beneficial relationships with final purchasers in a way that meets their expectations related to cooperation with domestic and foreign offerors.

Keywords: final purchaser; offeror; benefits; cooperation; offeror's country of origin.

Category of the paper: research paper.

1. Introduction

One of the trends visible in the contemporary consumer market is the change in the range of behaviour undertaken by its key participants, i.e. the final purchasers. It includes not only shopping behaviours closely related to the traditionally understood role of the recipient, but also a growing spectrum of extra-purchase behaviours, including communication and creative ones, which make purchasers active participants in this market (Cui, Wu, 2017). Their dynamically growing involvement is part of the 'value co-creation' paradigm (Gemser, Perks, 2015), which is one of the functional foundations of the consumer goods and services market. Purchasers are increasingly getting spontaneously involved in the co-creation of an offer or respond to offerors' incentives addressed to them. In both cases, the relationship is strengthened (Roberts, Palmer, Hughes, 2022), which results in achieving mutual benefits not possible without establishing and consolidating the cooperation. These benefits are definitely greater (Chong, Hong, Teck, 2022) than the benefits achieved by purchasers and offerors following their traditional market roles. Cooperation between purchasers and offerors is a kind of 'game changer' for each. It is therefore important to recognise these benefits and their internal structure, as well as the aspects that shape them. The benefits achieved by offerors can be viewed from their perspective, but can also be analysed from the point of view of purchasers. This is the approach adopted in this article, as it results directly from the assumptions of the marketing concept. Taking into account the specificity of the phenomena that have occurred recently (the COVID-19 epidemic (Hodbod et al., 2021), and the war in Ukraine (Lim et al., 2022), which forced the contemporary market participants into rapid change, these benefits have been analysed through the prism of preferences relating to the country of origin of the offeror.

Yet, as attested by the subject literature, the effects of which are shown in the further part of this article, this variable has not been analysed in relation to the practical cooperation between the two parties. Therefore, a cognitive gap and a research gap lies fallow in this area. This article attempts to tackle this by addressing the following research problem: what benefits, in the opinion of the final purchasers, do offerors gain by cooperating with them, taking into account the offeror's country of origin? The aim of the article is to identify the hierarchy of benefits perceived by final purchasers which offerors achieve by taking joint actions and to determine the importance of the offeror's country of origin as a variable differentiating purchasers' opinions.

The article was structured to achieve the goal formulated and verify six research hypotheses. The article includes the introduction, literature review, presentation of primary research and its results, academic discussion, and the implications, limitations and directions o future research.

2. Literature review

The key participants in the modern consumer market are final purchasers and offerors. Their relationships vary, with long-term links consolidated as part of joint activities increasingly coming to the fore. They fit into the ‘value co-creation’ paradigm (Ramaswamy, Ozcan, 2018) based on the adoption of a new approach to creating values offered on the market, according to which both the purchaser and the offeror play an active role (Cossío-Silva et al., 2016).

Before proceeding to the essential considerations, key concepts should be defined. Final purchaser is defined in this article as a person who purchases a product. This term is deliberately used instead of the term ‘consumer’. In the literature on the subject, in considerations regarding joint value creation, it is the term ‘consumer’ that is usually used, possibly replaced with the term ‘client’ as its synonym (Xie et al., 2016). However, it should be remembered that a consumer is a person using a product, and a customer has a much broader meaning than a ‘consumer’ and ‘buyer’. This is due to the roles played in the decision-making process. This article is about cooperation between people purchasing products and offerors, and about identifying the purchasers’ point of view. In turn, ‘an offeror’ in this article refers to entities offering products on the consumer market, i.e. producers, retailers and service providers. Cooperation, in general terms, is a category used interchangeably with such categories as ‘joint value shaping’, ‘joint value creation’ (i.a. D’Andrea et al., 2019), and collaboration (Chatterjee, Rana, Dwivedi, 2022; Łaszkiewicz, 2019). In this article, cooperation and collaboration are treated as synonyms. Cooperation is understood as an action undertaken jointly with someone else, contributing to the achievement of the assumed goals.

The literature on the subject stresses unanimously that a prerequisite for maintaining a competitive position in this dynamic environment is hiring and retaining the best possible employees (i.a. Goldhaber, Patmore, 2013). These are assigned the role of ‘game changers’ who can contribute not only to maintaining the current market position, but above all to its improvement. Of secondary importance is the need to acquire and maintain genuinely loyal final purchasers. Yet, they can also fulfil the aforementioned role as a community sharing certain values and having marketing potential from the offeror’s perspective. The role of ‘game changer’ can also be fulfilled by a specific concept, for example the ‘consumer-centric’ concept (Saha, Mani, Goyal, 2020), the implementation of which allows focusing on purchasers as partners and marketing allies of the offeror. This follows from the very definition of ‘game changer’, i.e. someone or something that significantly affects the situation in which a given entity functions, and thus the results they achieve (https://dictionary.cambridge.org/… In the case of business, a game changer is identified as a person or concept leading to the transformation of previously accepted rules, processes, strategies, and as a result, the management of a given activity (https://marketbusinessnews.com/…).

Taking this definition into account, it can be assumed that the role of 'game changer' is also fulfilled by certain events or phenomena, including those that appear suddenly, and thus are impossible to predict and prepare for. These include, for example, the pandemic (as also written by Hodbod, Hommes, Huber, and Salle (2021) who describe COVID-19 also as a 'game changer') and the outbreak of the Russian-Ukrainian war (Lim et al., 2022). Both these events have had a clear impact on the functioning of virtually every country and every company in the world (in the case of the pandemic) or mainly in Europe (as far as the war is concerned). Moreover, they can be classified as destabilising or even destructive phenomena from the point of view of entire societies as well as individual market entities, including offerors and purchasers. One can also look at them from a different perspective, seeing them as a challenge, which is an opportunity to redefine the way of doing business on the market.

From the offerors' point of view, it was necessary not only to quickly adapt to the new market conditions, but also to quickly find new management solutions (Pollák, Konečný, Ščeulovs, 2021), adequate to the existing situation, which allow this situation to be turned into a market opportunity. On the consumer market, it is certainly easier to use this opportunity when adopting an open attitude towards final purchasers, who also clearly feel the effects of both phenomena mentioned above, adapting their market behaviour. It has become a kind of catalyst for their market activity, especially on the Internet. This was clearly visible in relation to shopping behaviour (the rapid growth of e-shopping (Chmielarz et al., 2022)), and also in the case of extra-purchasing behaviours including communication and creative behaviours, which together form a set of prosumer behaviours (Wolf, Ritz, McQuitty, 2022). Expanding the scope of previous activity by purchasers and/or undertaking completely new forms of market activity additionally motivates them to enter new areas of extra-purchasing behaviour, making purchasers more involved and aware market participants. Purchasers become potentially even more valuable partners for offerors, enriching their market, and thus competitive, potential. As can be seen, there is a mutual reinforcement of the 'game changers', i.e. objects (in the form of specific phenomena) and subjects (in the form of market participants).

In the situational context described above, an important manifestation of market activity is when final purchasers join the marketing activities of offerors. As participants in joint activities, they are referred to in the literature as key stakeholders (Loureiro, Romero, Bilro, 2020), constituting a radical change in the rules of operation which in turn gives them new opportunities. The inclusion of purchasers in this process can be regarded as an example of a 'game changer'. Thanks to their readiness for such behaviours, and especially actually undertaking them, purchasers as active market participants (Ritzer, Dean, Jurgenson, 2012) share their potential with offerors, contributing to the creation of a common market potential, which is invaluable due to its uniqueness and compatibility with the expectations of both parties. Establishing and developing cooperation provides significant mutual benefits (Luo, Ma, Chen, 2022). These are definitely greater than the benefits achieved without taking joint action (Chong, Hong, Teck, 2022), which is clearly felt both by active purchasers (Lee, Kim, 2018) and offerors. That is why offerors should actively encourage purchasers to cooperate (Arbabi

et al., 2022). Regardless of the context, these benefits are worth considering from the purchaser's perspective, which is the starting point for the concept of contemporary marketing. This is also the approach adopted in this article.

At the same time, it should be remembered that the combination of the phenomena mentioned above has had a particularly strong impact on offerors and final purchasers in Poland. Taking into account the social, economic and political overtones of these events, especially the war in Ukraine, when analysing the issues related to cooperation between final purchasers and offerors, it seems important to take into account the country of origin of the latter. It is worth asking the question: is this important for purchasers or is it simply an element that determines their attitudes and behaviour? So far, the literature on the subject has analysed the issue of the offeror's country of origin in relation to purchasing behaviour, as part of consumer ethnocentrism. Such studies were conducted, among others, by Camacho, Ramírez-Correa, and Salazar-Concha (2022), Bayraktar Köse, and Eroğlu (2021), and Berbel-Pineda, Palacios-Florencio, Santos-Roldán, and Hurtado (2018). The importance of the offeror's country of origin for other behaviours and issues related has not been focused on. Only a few publications have considered the importance of the offeror's country of origin in the context of prosumer behaviour (Baruk, 2019). The author has not found any source in which the offeror's country of origin would be considered in relation to the benefits they achieve through joint actions with final purchasers.

In addition, benefits achieved by offerors have so far been analysed primarily from the (general or detailed) perspective of enterprises. Where the focus has not been placed on specific benefits, the achieved benefits have not included examples. This approach is visible e.g. in the studies of Mulyan, Rudian, and Taufiq (2019), who focused on co-creating brands with purchasers and Turner, Merle, and Gotteland (2020), who referred to benefits achieved by offerors in the relational and loyalty context. Although Menet, and Szarucki (2020) studied benefits achieved by purchasers, one of the threads raised in their work referred to benefits that offerors achieve thanks to cooperating with purchasers, in which they found that these benefits are much greater when offerors and purchasers share the same culture.

Particular benefits analysed by other researchers include: improving products and reducing costs (Nemar et al., 2022), being more innovative thanks to the easier creation of marketing innovations (Moreira, Silva, 2014), creating innovative solutions as part of open innovation (Roberts, Palmer, Hughes, 2022), shaping long-term relationships with purchasers (Palmatier, 2008), building loyalty (Chong, Hong, Teck, 2022), increasing profitability (Chatterjee, Rana, Dwivedi, 2022), acquiring various elements of purchasers' marketing potential (Chatterjee, Rana, Dwivedi, 2022), being recommended by active purchasers (Rubio, Villaseñor, Yagüe, 2020), etc. However, the set of benefits analysed in this article has not been examined, much less considered in the approach proposed herein.

Therefore, we can talk about the existence of a cognitive gap and a research gap in this area. Striving to reduce the gaps was the main impulse to prepare this article and conduct empirical research. Taking into account the specificity and scope of the gaps discovered, the article

attempts to identify the hierarchy of benefits perceived by final purchasers which offerors achieve by taking joint actions and determining the importance of the offeror's country of origin as a variable which differentiates the purchasers' opinions. In the process of achieving this goal, the following six research hypotheses were tested, which were formulated on the basis of the results of the analysis of the literature on the subject:

H1 – the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of better meeting purchaser expectations;

H2 – the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of creating products and their attributes that better suit the purchasers;

H3 — the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of creating extra-product elements of a marketing offer that better suit the purchasers;

H4 — the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of creating a better image;

H5 — the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of creating better relationships with purchasers;

H6 — the offeror's country of origin preferred by final purchasers is a feature that differentiates in a statistically significant way the benefits which offerors achieve (as perceived by final purchasers), consisting of enhancing the marketing potential.

3. Methods

In order to achieve the aim of this article and to verify the research hypotheses formulated, empirical research was carried out using the method of online survey by means of the CAWI technique to collect primary data. The research was carried out in mid-2022 among 1,196 adult representatives of final purchasers in Poland. The geographic scope was nationwide and panel-based. Quota sampling was used. The socio-demographic characteristics (gender, age, education, and region) were dispersed proportional to the distribution of the trait in the general population, with a deviation of no more than 10 respondents in relation to the proportion for the distribution of the entire Polish population (based on GUS data and CAPI population studies).

The subject of the article covered two variables analysed from the point of view of final purchasers: benefits that offerors achieve thanks to cooperation with final purchasers and the preferred country of origin of the offeror that purchasers would like to cooperate with. The respondents were asked to specify their preferences regarding the offeror's country of origin (from Poland, from another country, the country of origin does not matter). During the research, respondents were also presented with a set of thirteen benefits that offerors achieve thanks to cooperation with final purchasers. These had been distinguished on the basis of the results of the analysis of the world literature on the subject (i.a. Chatterjee, Rana, Dwivedi, 2022; Dellaert, 2019) and the results of unstructured interviews preceding the survey, which had been conducted among ten people.

Each benefit was assessed by the respondents using an Odd Likert Scale, which is one of the fundamental psychometric tools in social sciences (Joshi et al., 2015). In this article, a five-step variant was used, in which rating 5 meant definitely yes, 4 - rather yes, 3 - neither yes nor no, 2 - rather no, and 1 - definitely no. The use of this scale is a prerequisite for the use of the average score analysis as well as exploratory factor analysis.

The primary data collected were subjected to quantitative analysis using the method of average score analysis, comparative analysis, exploratory factor analysis, and the Kruskal-Wallis (KW) test.

Exploratory factor analysis was used to reduce the number of primary data variables obtained from the surveys and to detect structures in the dependencies between these variables (Abdi, Williams, 2010). The Kruskal-Wallis test, which is a non-parametric equivalent of ANOVA (Dalgaard, 2008), was used to find the answer to whether the differentiation is statistically significant enough to say that the respondents' opinion determined by the analysed answer is significantly different.

Statistical analysis of the primary data collected was performed using the IBM SPSS Statistics Ver. 25.

4. Research results

The results of the research conducted indicate that each of the thirteen benefits which offerors achieve from cooperation with final purchasers received an average score of more than 4 out of a possible 5 (Table 1). In the case of six of them, the score exceeded 4.5. These were intangible benefits, differing in their specificity and divided into the following three groups: benefits related to meeting purchaser expectations, relational benefits, and image benefits. In turn, the benefits related to the acquisition of purchasers' potential by offerors in the form of their skills and ingenuity received relatively the lowest average scores, the value of which was lower than 4.2.

Table 1.
Benefits mentioned by respondents, which offerors achieve thanks to cooperation with final purchasers when creating marketing offers

Benefits	Indications %					Average score	Standard deviation
	5	4	3	2	1		
Possibility of creating a product that better meets purchaser expectations	79.2	19.1	1.1	0.4	0.2	**4.767559**	0.495487
Possibility of creating a promotional campaign to convince purchasers more effectively	66.3	28.8	3.7	0.8	0.5	**4.596154**	0.648101
Possibility of creating packaging that better encourages purchasers to buy a product	59.0	31.2	7.5	1.3	0.9	4.460702	0.768171
Possibility of developing a logo better associated by purchasers	53.8	32.9	9.4	2.8	1.0	4.358696	0.839964
Possibility of building a better image	65.1	29.1	4.5	1.0	0.3	**4.578595**	0.651751
Possibility of undertaking charitable activities better received by purchasers	46.0	35.7	14.0	3.3	1.1	4.222408	0.882579
Possibility of fully meeting purchasers' needs	62.0	32.0	4.7	1.3	0.0	**4.548495**	0.645673
Possibility of cost-free acquiring purchasers' knowledge	50.1	33.4	12.4	3.3	0.9	4.284281	0.870408
Possibility of cost-free acquiring purchasers' skills	43.1	34.1	15.8	6.0	1.0	4.122074	0.951624
Possibility of cost-free acquiring purchasers' ingenuity	46.4	33.4	14.5	4.2	1.4	4.192308	0.931894
Possibility of building good relationships with purchasers	63.6	29.0	6.1	1.3	0.0	**4.550167**	0.667218
Possibility of building true customer loyalty	54.8	33.9	8.7	2.4	0.2	4.408027	0.762556
Possibility of standing out on the market among other companies	62.1	29.7	6.0	1.8	0.3	**4.514214**	0.721898

where: 5 – definitely yes; 4 – rather yes; 3 – neither yes nor not; 2 – rather not; 1 – definitely not.

Source: own studies.

It should be noted that for each of the benefits analysed, the value of the standard deviation did not exceed one-third of the average score value. It follows that the values of average scores properly reflect the hierarchy of the benefits established on their basis (*Variance and standard deviation*).

The research approach adopted is based on analysing the perspective of representatives of final purchasers regarding the benefits which, in their opinion, offerors achieve thanks to the co-creation of marketing offers with purchasers in the context of their preferences related to the offerors' country of origin. As shown in Table 2, almost ten times more respondents would like to cooperate with offerors from Poland compared to the percentage of people willing to cooperate with offerors from other countries. By far the largest part of the respondents stated, however, that the country of origin of the offeror is not important to them.

Table 2.
Respondents' preferences regarding the offerors which they would prefer to cooperate with while creating marketing offers (%)

Offerors according to the country of origin	Indications %
From Poland	30.7
From other countries than Poland	3.2
Offeror's country of origin does not matter	66.1

Source: own studies.

It is worth finding an answer to the question: what is the importance of the respondents' preferences regarding the offeror's country of origin in terms of the perceived benefits which offerors can achieve thanks to cooperation with active purchasers? In the next stage of the analysis, efforts were made to identify the internal structure of the aspect studied and to compare the structure discovered for each group of people analysed. For this purpose, exploratory factor analysis was conducted for the total of respondents as well as for the three groups of people distinguished on the basis of their preferences regarding the country of origin of offerors they would prefer to conduct joint activities with. For the total of respondents, the value of the Cronbach's alpha test was 0.886; respectively, for the people who prefer cooperation with offerors from Poland, it was 0.804, for those who prefer cooperation with offerors from other countries, it was 0.812, and for the people who believe that the offeror's country of origin is not important, it was 0.815. The level of reliability in each case was thus high.

Based on the Kaiser criterion, three factors with eigenvalues greater than 1 were distinguished for each of the four groups of respondents analysed. In each case, they explain over 66% of the total variability of the aspect studied (Table 3). For each group of respondents, the first factor includes between three and five variables (Table 4) with factor loading values of at least 0.7. It means that they meet the condition for using factor analysis in social sciences (Watkins, 2018).

These variables are noticeably different if you compare their sets for each group of the respondents analysed. None of the variables constituted the set for every group. It is worth noting that the variables reflecting the relational benefits were included in the first factor identified for the total of respondents, for those who prefer cooperation with Polish offerors, and for those who prefer to cooperate with foreign companies. The second factor consists of three variables for each group of the respondents analysed, and these variables are also quite diverse in their specificity. Only in the case of the third factor, there is a clear similarity in its internal structure, regardless of the group of the people studied. In each case, it is made up of variables illustrating the benefits related to the acquisition of purchasers' marketing potential by offerors (Table 4).

Table 3.

Hierarchy of factors according to their eigenvalues determined on the basis of the Kaiser criterion (depending on the group of offerors preferred by the respondents)

Factor	Eigenvalue				Cumulated eigenvalue				% of total eigenvalues (variation)				Cumulated % of eigenvalues			
	tot*	pol#	oth^	unim~	tot	pol	oth	unim	tot	pol	oth	unim	tot	pol	oth	unim
1	3.200	3.209	3.902	3.076	3.200	3.209	3.902	3.076	24.615	24.681	30.013	23.663	24.615	24.681	30.013	23.663
2	2.844	2.762	2.881	3.040	6.044	5.971	6.783	6.116	21.879	21.247	22.163	23.382	46.494	45.928	52.176	47.045
3	2.662	2.665	2.418	2.665	8.706	8.636	9.201	8.781	20.475	20.504	18.601	20.503	66.969	66.431	70.777	67.548

* The Kaiser-Meyer-Olkin (KMO) random sampling adequacy measure is 0.886, which is greater than 0.5 (Watkins, 2018); Bartlett's sphericity test is significant (the variables are statistically significantly related); chi2 is 8356,026; p = 0.000;
# KMO = 0.886; Bartlett's sphericity test is significant; chi2 is 2470,818; p = 0.000;
^ KMO = 0.831; Bartlett's sphericity test is significant; chi2 is 325,800; p = 0.000;
~ KMO = 0.870; Bartlett's sphericity test is significant; chi2 is 5731,655; p = 0.000.
where: tot – the total of respondents; pol – people preferring cooperation with Polish offerors; oth – people preferring cooperation with offerors from other countries; unim – people who believe that offeror's country of origin is not important.

Source: own studies.

Table 4.

Results of factor analysis of the benefits which offerors achieve, according to final purchasers, thanks to cooperation in creating marketing offers, taking into account preferences regarding the offeror's country of origin

Variables analysed	Factors distinguished											
	1				2				3			
	tot	pol	oth	unim	tot	pol	oth	unim	tot	pol	oth	unim
Possibility of creating a product that better meets purchaser expectations	.541	**.766**	.342	.484	.379	.105	**.848**	.406	.009	.015	-.027	.022
Possibility of fully meeting purchasers' needs	.654	**.728**	.333	.344	.331	.295	**.734**	.622	.139	.113	.288	.137
Possibility of building true customer loyalty	**.817**	**.714**	**.710**	.105	.118	.241	.411	**.837**	.203	.211	.240	.194
Possibility of building good relationships with purchasers	**.759**	**.701**	**.743**	.162	.177	.265	.169	**.779**	.253	.234	.445	.251
Possibility of standing out on the market among other companies	**.726**	.641	**.724**	.237	.212	.205	.220	**.742**	.186	.270	.226	.154
Possibility of developing a logo better associated by purchasers	.166	.075	**.785**	**.829**	**.830**	**.872**	.263	.159	.146	.150	-.013	.132
Possibility of creating packaging that better encourages purchasers to buy a product	.201	.278	.576	**.868**	**.852**	**.782**	.429	.150	.104	.128	.082	.085
Possibility of building a better image	.471	.384	**.778**	.586	.597	**.718**	.309	.458	.164	.178	.270	.136
Possibility of creating a promotional campaign to convince purchasers more effectively	.302	.483	.407	**.819**	**.746**	.521	.526	.205	.075	.050	.363	.075
Possibility of undertaking charitable activities better received by purchasers	.456	.357	.493	.372	.359	.498	.031	.454	.227	.247	.535	.200
Possibility of cost-free acquiring purchasers' skills	.196	.171	.005	.120	.130	.169	.390	.213	**.911**	**.912**	**.789**	**.909**

Cont. table 4.

Possibility of cost-free acquiring purchasers' ingenuity	.185	.128	.318	.085	.114	.227	.134	.179	**.889**	**.878**	**.860**	**.898**
Possibility of cost-free acquiring purchasers' knowledge	.215	.207	.180	.121	.124	.082	**.762**	.216	**.875**	**.863**	.408	**.895**

where: indications as in table 3.

Source: own studies.

The factors identified as a result of the factor analysis can be identified with segments whose representatives show similar attitudes and/or behaviours within a given segment, while at the same time displaying different attitudes and/or behaviours compared to representatives of other segments (Zhang, 2019; Singh Minhas, Jacobs, 1996). Based on the results of the factor analysis, it is possible to group the respondents into homogeneous groups of people (Tables 5 and 6). This allows for a much better adaptation of the methods of impact to the expectations of representatives of each group identified, compared to the lack of differentiation of such activities.

Table 5.
Characteristics of representatives of segments of respondents identified

Preferred country of origin of an offeror	**Characteristics of segments identified**		
	1	**2**	**3**
Total	- Possibility of building true customer loyalty - Possibility of building good relationships with purchasers - Possibility of standing out on the market among other companies	- Possibility of developing a logo better associated by purchasers - Possibility of creating packaging that better encourages purchasers to buy a product - Possibility of creating a promotional campaign to convince purchasers more effectively	- Possibility of cost-free acquiring purchasers' skills - Possibility of cost-free acquiring purchasers' ingenuity - Possibility of cost-free acquiring purchasers' knowledge
From Poland	- Possibility of creating a product that better meets purchaser expectations - Possibility of fully meeting purchasers' needs - Possibility of building true customer loyalty - Possibility of building good relationships with purchasers	- Possibility of developing a logo better associated by purchasers - Possibility of creating packaging that better encourages purchasers to buy a product - Possibility of building a better image	- Possibility of cost-free acquiring purchasers' skills - Possibility of cost-free acquiring purchasers' ingenuity - Possibility of cost-free acquiring purchasers' knowledge
From other countries	- Possibility of building true customer loyalty - Possibility of building good relationships with purchasers - Possibility of standing out on the market among other companies - Possibility of developing a logo better associated by purchasers - Possibility of building a better image	- Possibility of creating a product that better meets purchaser expectations - Possibility of fully meeting purchasers' needs - Possibility of cost-free acquiring purchasers' knowledge	- Possibility of cost-free acquiring purchasers' skills - Possibility of cost-free acquiring purchasers' ingenuity

Cont. table 5.

Country of origin does not matter	- Possibility of developing a logo better associated by purchasers - Possibility of creating packaging that better encourages purchasers to buy a product - Possibility of creating a promotional campaign to convince purchasers more effectively	- Possibility of building true customer loyalty - Possibility of building good relationships with purchasers - Possibility of standing out on the market among other companies	- Possibility of cost-free acquiring purchasers' skills - Possibility of cost-free acquiring purchasers' ingenuity - Possibility of cost-free acquiring purchasers' knowledge

Source: own studies.

Table 6.
Segments of respondents identified

Preferred country of origin of the offeror	Segments identified		
	1	2	3
Total	Recognising relational and image benefits	Recognising attribute and communication benefits	Recognising the benefits of enriching one's marketing potential
From Poland	Recognising the benefits of meeting one's expectations and relational benefits	Recognising attribute and image benefits	Recognising the benefits of enriching one's marketing potential
From other countries	Recognising relational, image and attribute benefits	Recognising the benefits of meeting purchaser expectations and marketing potential	Recognising the benefits of enriching one's marketing potential
Country of origin does not matter	Recognising attribute and communication benefits	Recognising relational and image benefits	Recognising the benefits of enriching one's marketing potential

Source: own studies.

In the next stage of the analysis, an attempt was made to check whether the preferences regarding the offeror's country of origin make a statistically significant feature that differentiates responses reflecting the perceived benefits that offerors obtain from cooperation with final purchasers. For this purpose, the Kruskal-Wallis test was performed. Its results indicate differentiation in five out of thirteen benefits analysed (Table 7). These reflect the possibility of preparing more effective promotional activities, creating marketing attributes of a product (i.e. packaging), better meeting purchaser expectations, building a better image of the offeror, and enriching the marketing potential (in the form of acquiring purchasers' knowledge). The KW test made it possible to test the research hypotheses formulated (Table 8).

Table 7.
Analysis of the significance of differences between the respondents' answers regarding the benefits that offerors achieve thanks to cooperation with final purchasers according to the criterion of preferences regarding the offeror's country of origin

Variables analysed	Offerors according to their country of origin	Average range	Kruskal-Wallis test value	Level of significance 'p'
Possibility of creating a product that better meets purchaser expectations	pol	599.56	4.921	.085
	oth	513.72		
	unim	602.19		

Cont. table 7.

Possibility of creating a promotional campaign to convince purchasers more effectively	pol	599.33	7.431	**.024**
	oth	476.38		
	unim	604.14		
Possibility of creating packaging that better encourages purchasers to buy a product	pol	592.09	6.164	**.046**
	oth	486.50		
	unim	607.01		
Possibility of developing a logo better associated by purchasers	pol	593.69	2.081	.353
	oth	532.83		
	unim	603.98		
Possibility of building a better image	pol	597.36	5.979	**.050**
	oth	488.71		
	unim	604.45		
Possibility of undertaking charitable activities better received by purchasers	pol	611.39	1.290	.525
	oth	560.15		
	unim	594.41		
Possibility of fully meeting purchasers' needs	pol	609.66	7.396	**.025**
	oth	474.86		
	unim	599.42		
Possibility of cost-free acquiring purchasers' knowledge	pol	628.97	8.426	**.015**
	oth	492.79		
	unim	589.56		
Possibility of cost-free acquiring purchasers' skills	pol	619.77	3.971	.137
	oth	523.59		
	unim	592.32		
Possibility of cost-free acquiring purchasers' ingenuity	pol	609.98	1.499	.473
	oth	548.13		
	unim	595.65		
Possibility of building good relationships with purchasers	pol	610.45	4.967	.083
	oth	500.77		
	unim	597.77		
Possibility of building true customer loyalty	pol	597.00	2.931	.231
	oth	516.90		
	unim	603.23		
Possibility of standing out on the market among other companies	pol	598.64	5.247	.073
	oth	492.49		
	unim	603.67		

where: indications as in table 3.

Source: own studies.

Table 8.

Results of verifying research hypotheses formulated

Research hypothesis	Results of verifying research hypothesis
H1	Valid
H2	Valid for creating product packaging
H3	Valid for creating promotional campaigns
H4	Valid
H5	Invalid
H6	Valid for acquiring purchasers' knowledge

Source: own studies.

5. Discussion

According to the research conducted, a much larger part of the respondents preferred to undertake joint actions with offerors from Poland rather than from other countries. To some extent, this result is consistent with the results of other researchers. For example, Menet and Szarucki (2020) found that offerors achieve greater benefits if they cooperate with offerors representing the same culture. It is worth adding that their studies analysed the country of origin of purchasers, not offerors, focusing primarily on benefits achieved by purchasers. In addition, the research covered only international recipients of airline companies. Therefore, the subject and object of the research was different.

Studies conducted by Ercsey (2017) show that including purchasers in the creation of offers brings benefits to companies in the form of better meeting purchaser needs and strengthening the competitiveness. This is consistent with the results obtained by the author. However, those studies concerned only service providers and did not take into account the importance of their country of origin. In turn, Lorenzo-Romero, Andrés-Martínez, Cordente-Rodríguez, and Gómez-Borja (2021) showed that cooperation is conducive to building purchaser loyalty, which is consistent with the results presented in this article. Their research, however, concerned only e-buyers of fashion products; moreover, it was of qualitative nature, related only to retailers, and did not take into account a wide range of benefits or the offerors' the country of origin.

The results of the research conducted indicate that one of the benefits for the offeror cooperating with active purchasers is the acquisition of their marketing potential, including knowledge. This is confirmed by the results of studies conducted by other researchers, e.g. by Nardi, Jardim, Ladeira, and Santini (2019). However, these researchers did not examine the benefits obtained by offerors within the approach proposed herein.

As stated earlier in this article, based on the results of the analysis of the world literature on the subject, the author did not find any studies with an analogous or similar scope, or studies focusing on the importance of the offeror's country of origin in relation to any aspect of cooperation between final purchasers and offerors.

6. Conclusions

The research conducted allow to conclude that, according to the respondents, the main benefit that offerors achieve thanks to cooperation with purchasers is 'the possibility of creating a product that better meets purchaser expectations'. In the hierarchy of benefits identified, the top positions were also taken by benefits of a relational and image nature. Although for the

largest part of the respondents the offeror's country of origin did not matter as far as the willingness to carry out joint activities was concerned, almost every third person preferred cooperation with offerors from Poland rather than from other countries. The country of origin turned out to be a variable which statistically significantly differentiated responses to five out of thirteen benefits analysed. The factor analysis which took into account this variable made it possible to identify homogeneous groups of respondents with analogous preferences regarding the offeror's country of origin in the context of undertaking prosumer cooperation.

7. Implications, limitations of the research, and directions for future studies

The results of the research and the conclusions drawn on their basis are of significant cognitive and application value. They make a significant contribution to the theory of marketing and the theory of market behaviour related to the joint creation of value, filling the gaps identified during the analysis of the world literature on the subject. This is all the more important as practically no study was found in which the issues related to cooperation between final purchasers and offerors would be considered through the prism of the offeror's country of origin. Thanks to the research, the following was identified: the perceived benefits that offerors achieve thanks to cooperation with purchasers; the hierarchy of these benefits; preferences regarding the offerors' the country of origin in the context of undertaking joint activities; segments of purchasers showing similar preferences towards the offeror's country of origin and the opinions on the benefits they achieve; the importance of the offeror's country of origin as a variable differentiating opinions on the benefits that offerors achieve through joint actions.

The results of the research conducted and the conclusions drawn on their basis also have an application value. They enable managers to establish and properly shape marketing cooperation with final purchasers. They show the importance of the offeror's country of origin in terms of the willingness to engage in joint activities, which allows for the creation of incentives that would effectively encourage active purchasers to engage in these activities. As 'game changers', they can contribute to the achievement of many benefits, increasing the offerors' competitive power. Achieving this effect, however, requires looking at cooperation through the eyes of active purchasers and developing (preferably together with them) new business solutions based on partnership. To this end, it is worth adapting activities engaging final purchasers to their expectations resulting from the specificity of the segments identified.

Of course, the research has some limitations that result from the research approach adopted. These restrictions apply e.g. to the subject, object and geographical scope. The research covered only representatives of Polish adult final purchasers. Their demographic or economic characteristics were not taken into account. Undertaking further research on cooperation

between final purchasers and offerors in the future will allow for the gradual elimination of these limitations by expanding the subject of the research (to include minors), and the object (to include e.g. benefits achieved by active purchasers).

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

FEASIBILITY STUDY OF A HOTEL FRANCHISE BUSINESS MODEL

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Introduction/background: The study analyses the feasibility study of a hotel franchise business model using the example of a selected property.
Aim of the paper: The aim of the paper is to present the period of return on invested capital as a function of the occupancy rate of a hotel property.
Materials and methods: Case study on the example of a selected hotel franchise chain.
Results and conclusions: The paper provides an elaborate analysis of the period of return on invested capital based on the example of starting a business based on franchise cooperation with Marriott chain hotels.

Keywords: business model, franchising, hotel.

Introduction

Many concepts of business management have been developed over the years. Theories in the field of business organisation, business methods or management solutions are very rich and varied. Potential enterprises have the opportunity to implement solutions that are strictly tailored to their business, which significantly increases the chances of success.

However, it is not the management method, concept or technique that forms the basis of an enterprise's organisation, but the adopted business model, which clearly defines the specifics of the organisation's operation. Among the available business models, one of the most popular in recent years is the franchise model, which, by definition, increases the chances of success of a business.

The product of this study will be an analysis of the feasibility of a business model based on hotel franchising of the Marriott International brand of hotel that would be built in the immediate vicinity of the operation of the Central Communication Port, in the municipality of Baranów between Łódź and Warsaw.

This paper addresses issues in business models, feasibility studies, analytical methods used in business development.

The core of the study is an assessment of the potential benefits of launching the hotel operations of a hypothetical CPK Marriott company. The company in question would be established on the basis of a franchise agreement and would operate under an internationally renowned brand, which should directly translate into a relatively quick return on investment.

This paper is divided into 4 chapters, the first 3 of which provide an overview of the literature on the issues raised. The fourth chapter, on the other hand, contains the empirical part, in which the necessary data and strictly numerical data are presented, which allow clear conclusions to be drawn.

1. Business model - applications and challenges

An analysis of the available literature on the subject reveals that no clear definition of the term 'business model' has been given over the years. One of the basic definitions states that a business model is a kind of action plan, which is developed by a company in order to generate revenue and maximise operating profit. This approach to the definition of a business model allows it to be identified with activities aimed at increasing revenue and optimising costs. In addition, it is noted in this case that the business model also defines the relationships between the various market participants and provides information about how the companies in question operate, i.e. how they produce their goods and services, how they create value for customers and from which exact sources they draw their profits (Timmers, pp. 3-8).

A business model is a tool containing a certain set of elements and relations between them, schematically (more or less detailed) representing a business idea (Brzóska, 2009, pp. 5-23). It therefore represents a certain, rather static, model of the phenomenon, as opposed to a strategy expressing the way in which a company acts and behaves (often very flexibly) in relation to the changing environment and its interior. The relationship between strategy and business model is very close, but at the same time differently understood. Customer satisfaction is of key importance, as the fulfilment of shareholders' expectations depends on it" (Nogalski, 2009, p. 2; Gołembiowski, Dudzik, Lewandowska, Witek-Hejduk, 2008, p. 57). Closely linked to strategy is the business model, which reflects the means of achieving the right economic results, expressed by the relationships of revenue, costs and profit across the organisation.

The development of an effective business model by a given company is subject to certain rules. First of all, attention is paid to the uniqueness of the model. It should be constructed in such a way that it cannot be used by competitive companies (in practice, there are often situations in which an effective and efficient business model is copied by competitors to a greater or lesser extent). In addition, account should be taken of the fact that nowadays companies operate in a turbulent environment, and therefore the business model implemented in the organisation should be easy to redefine (Rudny, 2013, p. 65). In the process of developing

a business model, the following key elements should therefore be taken into account (Laudon, Traver, 2012, pp. 58-60):

- The management team - should be composed of people who have the necessary knowledge, competencies and qualifications, as this is the element that significantly influences the potential effectiveness of the implemented business model. Therefore, before forming a management team, the required experience and skills of potential members should be analysed in detail.
- Organisational development - what directions and scope of the company's development are envisaged at the stage of developing the business model, in order to align the organisational structure with these very assumptions.
- Market strategy - identifying ways to promote products and services in order to attract as many potential customers as possible.
- Competitive advantage - identifying the advantages a company will bring to the market, and whether these advantages are sufficient to achieve the desired competitive position.
- Competition - analysis of the competitive environment, including an analysis of its strengths and weaknesses.
- Market entry opportunities – identification of the market in which the organisation is to operate, including its size.
- Revenue model - identifying sources of revenue.
- Customer value proposition - defining the motives for customers to take up the company's offer.

Thus, in concluding the information presented in this section, it is important to see that a business model is more than just a company strategy or adopted management methods and concepts.

2. Essence of a feasibility study

A feasibility study, as the name suggests to some extent, is a study whose overarching objective is to assess the likelihood of a project's success or the achievement of a specific outcome. This study is carried out at the planning stage of a project and is formal in nature (Portny, 2013, p. 46). From the available literature on the subject, it is clear that a properly conducted feasibility study should provide answers to three fundamental questions, which consist of (Wirkus, 2012, p. 19):

- Is the project under consideration financially and socially sound?
- Will the project be long term and will the revenues from the completed investment cover the costs of implementation?

- Is the project feasible and, if so, what constraints should be taken into account in its implementation?

A feasibility study is a study to which three basic characteristics can be attributed (Philips, 2012, p. 65):

- Directness.
- Orderliness.
- Fact-based (objective or even subjective opinions do not affect the outcome of the study).

As seen above, one of the essential features of a feasibility study is orderliness. This feature is all the more important because a feasibility study, by virtue of its complexity, is to some extent a process, which is schematically illustrated in Figure 1.

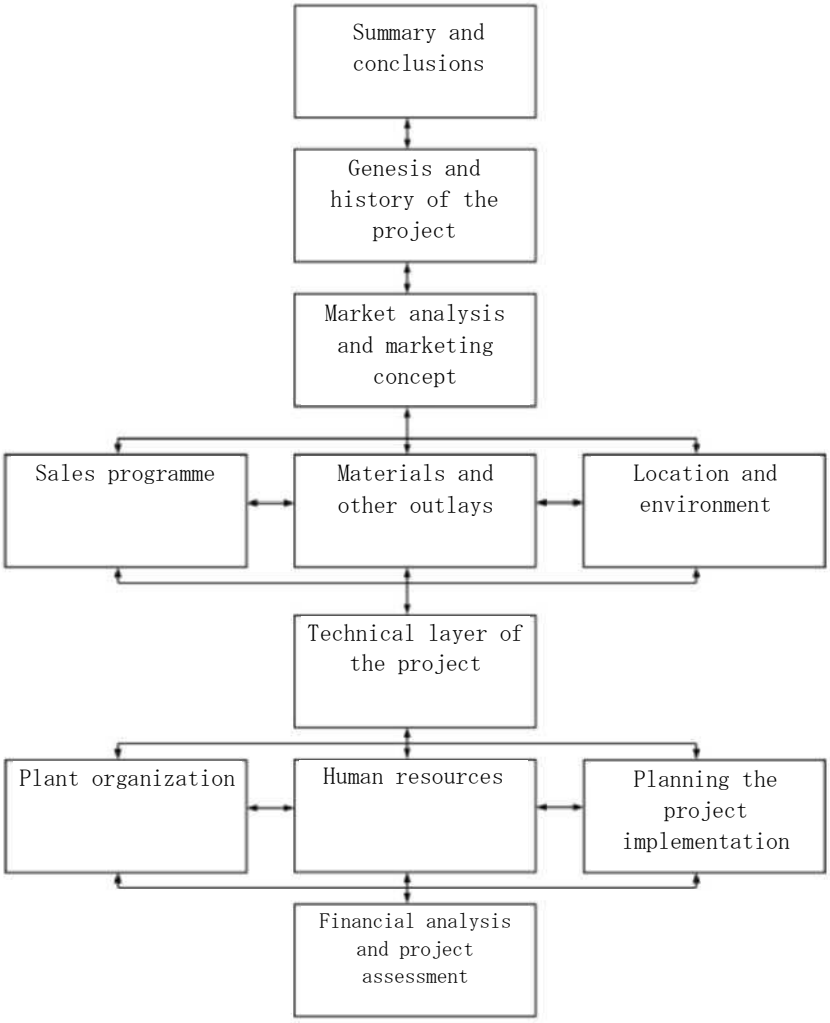

Figure 1. Structure of the feasibility study.

Source: Feasibility study - Management Encyclopaedia (mfiles.pl).

It is clear from the information in Figure 1 that a feasibility study is a multi-faceted study. In practice, it allows for an overall assessment of a potential project. As a result, it provides information on both the subject of the project, the benefits of its implementation, the expected results, potential risks, expected revenues, the payback period and much more.

The implementation of this study is therefore necessary every time a major investment is planned.

3. Selected analytical methods used in new business development

Analytical methods used in the field of case studies mainly include (Trotsky, 2013, p. 204):

- Multi-variant analysis.
- Ratio analysis, including analysis of liquidity, profitability, turnover, NPV and IRR ratios).
- Static and dynamic sensitivity analysis.
- Summary statement of costs and revenues.
- Income statement.
- QFD.
- Technology monitoring.
- Patent analysis.
- SWOT analysis.
- Benchmarking.

One of the simpler methods of analysis is the SWOT method.

In principle, the SWOT method is one of the basic concepts that make up the strategic management of a company. It allows the areas most important for the effective functioning of the company to be examined and analysed in detail. In addition, it is a kind of summary of the previously conducted theoretical strategic analysis of the company. Its greatest advantages are that it is highly transparent, easy to digest and precise. It contains only the most relevant information and omits areas that are less useful (Koźmiński, Piotrowskiego, 1996, p. 63).

The SWOT analysis consists of the following areas (Koźmiński, Piotrowskiego, 1996, p. 64):

- Weaknesses and strengths of the company.
- Opportunities and threats from the environment.

Although a SWOT analysis is not in itself a difficult task, it requires a prior (relatively thorough) examination of both the external and internal environment of the company.

The SWOT analysis is a relatively effective method for formulating a strategic plan. However, it does not take into account, or rather should we say does not indicate, certain areas, the examination of which is a necessary activity as they are directly linked to potential directions in the formulation of the strategy.

In the case of large projects, however, methods such as NPV analysis, IRR and financial ratios are mainly applicable, the most commonly used being profitability and liquidity ratios.

Table 1 below shows the calculation algorithms for the key liquidity and profitability ratios.

Table 1.
Calculation algorithms for basic liquidity and profitability ratios

No.	Indicator name	Calculation algorithm
Static liquidity ratios		
1	Cash solvency ratio	$\frac{Cash\ and\ cash\ equivalents}{Current\ liabilities}$
2	High liquidity ratio	$\frac{Current\ assets\ -\ inventories\ -\ short-term\ accruals}{External\ capital}$
3	Current ratio	$\frac{Current\ assets}{Short-term\ liabilities}$
4	Return on equity	$\frac{Net\ profit\ (loss)}{Sales\ revenue}$
5	Profitability of current assets	$\frac{Net\ profit\ (loss)}{Current\ assets}$
6	Profitability of total assets	$\frac{Net\ profit\ (loss)}{Total\ assets}$
7	Profitability of fixed assets	$\frac{Net\ profit\ (loss)}{Fixed\ assets}$

Source: Own study based on Kotowska, 2010.

4. Business model feasibility study on the example of CPK Marriott sp. z o.o.

The study will provide:

- Analysis of cumulative financial flows of costs and sales values assuming an average annual occupancy rate of 66% - Option I.
- Analysis of cumulative financial flows of costs and sales value assuming average annual occupancy rate of 75% - Option II.

Table 2.
Input data for the study - Option I

Fixed costs	35 000 000 PLN
Unit variable cost	31 210 PLN
Daily operating profit with 66% occupancy	42 808 PLN
Unit increments (days)	365
BREAK-EVEN POINT	**3 018**

Source: own study.

Table 3.
Input data for the study - Option II

Fixed costs	35 000 000 PLN
Unit variable cost	33 041 PLN
Daily operating profit with 75% occupancy	48 643 PLN
Unit increments (days)	365
BREAK-EVEN POINT	**2 243**

Source: own study.

Table 4.
Results of the study - variant 1

Days	Summary of sales	Total costs	Profit/loss
0	0 PLN	35 000 000 PLN	-35 000 000 PLN
365	15 624 920 PLN	46 391 650 PLN	-30 766 730 PLN
730	31 249 840 PLN	57 783 300 PLN	-26 533 460 PLN
1 095	46 874 760 PLN	69 1 74 950 PLN	-22 300 190PLN
1 460	62 499 680 PLN	80 566 600 PLN	-18 066 920 PLN
1 825	78 124 600 PLN	91 958 250 PLN	-13 833 650 PLN
2 190	93 749 520 PLN	103 349 900 PLN	-9 600 380 PLN
2 555	109 374 440 PLN	114 741 550 PLN	-5 367 110PLN
2 920	124 999 360 PLN	126 133 200 PLN	-1 133 840 PLN
3 285	140 624 280 PLN	137 524 850 PLN	3 099 430 PLN
3 650	156 249 200 PLN	148 916500 PLN	7 332 700 PLN
4 015	171 874 120PLN	160 308 150 PLN	11 565 970 PLN
4 380	187 499 040 PLN	171 699 800 PLN	15 799 240 PLN
4 745	203 123 960 PLN	183 091 450 PLN	20 032 510 PLN
5 110	218 748 880 PLN	194 483 100 PLN	24 265 780 PLN
5 475	234 373 800 PLN	205 874 750 PLN	28 499 050 PLN
5 840	249 998 720 PLN	217 266 400 PLN	32 732 320 PLN
6 205	265 623 640 PLN	228 658 050 PLN	36 965 590 PLN
6 570	281 248 560 PLN	240 049 700 PLN	41 198 860 PLN
6 935	296 873 480 PLN	251 441 350 PLN	45 432 130 PLN
7 300	312 498 400 PLN	262 833 000 PLN	49 665 400 PLN

Source: own study.

The cumulative cash flow analysis above shows that the investment will pay for itself after 3018 days of operation of the business, with an average annual occupancy of 66%. 3018 days translates into 8 years and 3 months.

Table 5.
Results of the study - variant 2

Days	Summary of sales	Total costs	Profit/loss
0	0 PLN	35 000 000 PLN	-35 000 000 PLN
365	17 754 695 PLN	47 059 965 PLN	-29 305 270 PLN
730	35 509 390 PLN	59 119 930 PLN	-23 610 540 PLN
1 095	53 264 085 PLN	71 179 895 PLN	-17915810PLN
1 460	71 018 780 PLN	83 239 860 PLN	-12 221 080 PLN
1 825	88 773 475 PLN	95 299 825 PLN	-6 526 350 PLN
2 190	106 528 170 PLN	107 359 790 PLN	-831 620 PLN
2 555	124 282 865 PLN	119 419 755 PLN	4 863 110 PLN
2 920	142 037 560 PLN	131 479 720 PLN	10 557 840 PLN
3 285	159 792 255 PLN	143 539 685 PLN	16 252 570 PLN
3 650	177 546 950 PLN	155 599 650 PLN	21 947 300 PLN
4 015	195 301 645 PLN	167 659 615 PLN	27 642 030 PLN
4 380	213 056 340 PLN	179 719 580PLN	33 336 760 PLN
4 745	230 811 035 PLN	191 779 545 PLN	39 031 490 PLN
5 110	248 565 730 PLN	203 839 510 PLN	44 726 220 PLN
5 475	266 320 425 PLN	215 899 475 PLN	50 420 950 PLN
5 840	284 075 120 PLN	227 959 440 PLN	56 115 680 PLN
6 205	301 829 815 PLN	240 019 405 PLN	61 810 410 PLN
6 570	319 584 510 PLN	252 079 370 PLN	67 505 140PLN
6 935	337 339 205 PLN	264 139 335 PLN	73 199 870 PLN
7 300	355 093 900 PLN	276 199 300 PLN	78 894 600 PLN

Source: own study.

The cumulative cash flow analysis above shows that the investment will pay for itself after 2243 days of operation of the business, with an average annual occupancy of 75%. 2243 days translates into 6 years and 1 month.

Summary

The hotel industry in Poland and around the world is constantly developing, as evidenced by all available indicators and observed trends. The popularisation of tourism, and the shortening of the distance problem through cheap flights, are opening up new possibilities and broadening the horizons of openness to new solutions. In the development of the hotel industry, on the other hand, special attention is being paid to franchising. This is because launching a hotel under a well-known brand provides a number of advantages, including simplifying the process of acquiring new customers. This is because well-known and proven solutions, as well as good opinions and trust, mean that customers are willing to use offers that are already familiar to them.

The results of the risk-adjusted cost-effectiveness analysis indicate that, assuming an average annual occupancy of 66%, the investment in the company will already have paid for itself after eight years and three months. On the other hand, assuming an average annual occupancy of 75%, the moment of return on the investment will occur after just six years and one month. After the hotel has been operating for a period of time to recoup its investment, the business must receive a level of 47% average occupancy to break even. This business model is forward-looking because the payback period of 6 to 8 years under various assumptions is negligible when compared to the period over which the hotel operates on average. Hotels are not built for 6 years, but for several times that.

In my opinion, the presented business model, based on hotel franchising, is worthy of attention, worth the investment allocated to the project, and will be a solid pillar against the competition as another premium hotel of the Marriott International brand developed in Poland.

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FRANCHISE NETWORK BUSINESS MODEL IN HOSPITALITY SERVICES

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Introduction/background: The study analyses the steps and requirements involved in starting a hotel business based on a franchise business model.
Aim of the paper: The aim of the paper is to show how an entrepreneur can start a business based on the franchise model using the example of establishing a partnership with the Marriott chain.
Materials and methods: Case study on the example of a selected hotel franchise chain.
Results and conclusions: The paper contains a compilation of the activities that need to be carried out when establishing cooperation on the basis of the franchise model.

Keywords: business model, franchising, hotel.

1. Introduction

Franchising has in recent years become one of the more commonly used methods among budding entrepreneurs. This is determined by the fact that the franchisor provides all the necessary information, experience, management methods and techniques as well as broadly understood know-how. Not without significance is also the fact that franchising makes it possible to start a business under an already known brand, which significantly simplifies the process of acquiring customers and promoting one's products.

In Poland today, there are a number of business opportunities available based on a franchise agreement. Among the most popular brands that establish cooperation on a franchising basis are:

- McDonald's.
- Leviathan.
- Żabka.
- Carrefour.

It is also important to emphasise that starting a business based on a franchise agreement is possible for both trade and services. In the case of trade, the offer of franchising includes, inter alia, sporting goods, children's goods, petrol stations and automotive goods, home and garden, food and industrial goods, telecommunication and household appliances as well as cosmetics and jewellery. In terms of services, franchising as a business model can be implemented, among others, in: tourism and hospitality, catering, finance and banking, education, consulting and accounting, healthcare or real estate.

As indicated above, the hotel industry can successfully use the method of franchising, which also seems to be increasingly appreciated in recent years. This assumption is reflected in the emergence of more and more hotel chains, which, in turn, clearly shows the interest in this business model of both entrepreneurs already operating (who want to expand their business), as well as entrepreneurs just starting their business in the hotel industry.

The study analyses the franchise business model using the example of a hotel belonging to the Marriott chain.

2. The essence of franchising

Franchising is essentially a method that determines the possibility of expanding markets for a particular type of business. The method of expanding markets, in this case, consists of developing a network of establishments carrying out a particular business activity on their own account. Participants in the network are given access to techniques, methods, tools and know-how, which contributes to the success of the franchisor. In numerous examples, franchising is used to operate hotel, catering, tourism and other businesses. There is also production franchising, focusing, for example, on the production of well-known beverages, as well as distribution franchising as an example. Distribution franchising involves the creation of a network of outlets that use the same sales techniques and the same sources of supply. This is the basis for department stores, market chains, household appliances outlets as well as grocery outlets.

The activities of franchise networks are mainly based on agreements that are concluded between the franchisor and the franchisee. The provisions of franchise agreements are determined on a case-by-case basis. This is due to the fact that there are various business profiles of entrepreneurs on the market. There are different contractual provisions that are used for agreements creating production networks, others for catering networks and still others for distribution or hotel networks. Some contractual components coincide and are used in all contracts of this type (Koch, Napierała, 2006, pp. 132-133).

All franchise agreements use a definition of the parties to the agreement. The parties to the agreement are the franchisor and the franchisee. The names network organiser and franchise permit beneficiary can also be used here (Kidyba, 2004, p. 725).

A franchise agreement is concluded when the network organiser grants the beneficiary permission to use the chosen business technique. The organiser also grants permission to use information that is related to the franchise agreement and to use symbols and signs that identify the specific network. In addition, the network organiser undertakes at the same time to provide assistance and guidance in connection with the establishment of the network outlet, while the beneficiary undertakes to operate the network outlet on its own account using the organiser's guidance and methods and recommendations, and to pay a fixed fee to the network organiser.

The most essential elements of a franchise agreement are the franchise permit. The franchise permit gives information on how to run the chosen business that has brought market success to the network organiser. The franchise licence usually contains precise information on the business technique. Mostly, such techniques are in the form of franchise packages. The packages are usually collections of recommendations and various business rules.

Another important element of the agreement is the possibility to allow the use of signs and symbols that identify the chosen network. This is an important element of the contract, as it gives the organiser the opportunity to establish itself in a larger territory with its brand and the beneficiary the opportunity to increase profits under the organiser's brand and benefit from its market position.

The franchise agreement is governed by a number of pieces of legislation consisting of:

- Civil Code.
- Industrial Property Law.
- Regulations issued under the Industrial Property Law regarding the use and protection of the trade mark.
- Act on Combating Unfair Competition with regard to the obligation to maintain business secrets, proper designation of companies and goods, not to obstruct market access, etc.
- Copyright and Related Rights Act.

In addition to national legal acts, the franchise agreement is also regulated by international legal acts. The legal act in question is European Commission Regulation No. 330/2010 of 20 April, 2010 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of vertical agreements and concerted practices.

3. Business model as a management tool

A business model is, in essence, a long-term method adopted by an organisation with the overriding objective of increasing resources and improving the efficiency of their use, which in turn leads to presenting customers with an offer that is superior to that of the competition, while of course ensuring the company's profitability. A good business model is, more broadly, an opportunity to gain a competitive advantage. A near-perfect business model, on the other hand, will also represent the ability to maintain the competitive advantage previously achieved (Afuah, Tucci, 2001, pp. 18-20).

The idea of developing and implementing business models originated in the sphere of creating innovations dedicated to the IT sector and was intended to be a less formal solution than strategy as a component of the strategic plan (Koźmiński, 2004, pp. 123-124).

Many definitions of a business model have emerged over the years. One of them states that it is a set of activities that an organisation carries out in order to generate specific benefits for the customer and to ensure a profit for the company. In doing so, it uses a variety of methods and commits the necessary resources (Afuah, 2004, pp. 2-17). According to A. Osterwalder and Y. Pigneur, the business model consists of all kinds of rationale behind the way in which a company creates value and provides and profits from such created value (Osterwalder, Pigneur, 2011, p. 18). The business model, contrary to appearances, is not a plan characterised by distinctiveness. On the contrary, it is a combination of the strategic concept of the enterprise and the technology of its practical implementation, understood de facto as the construction of a value chain, which in turn allows the efficient exploitation and renewal of resources and skills (Obłój, 2002, p. 98). The business model is in part an outline of the strategy to be implemented within the structures, processes and systems of the enterprise (Osterwalder, Pigneur, 2011, p. 20).

By analysing the definitions of a business model presented above, it can be seen that it should answer three basic questions (Obłój, 2002, p. 97):

1. What will the organisation do?
2. What are the core resources and competencies of the organisation?
3. How are these resources and competences configured in terms of day-to-day operations?

In view of the above, building the right business model is difficult and requires those involved to have a broad knowledge of the specifics of the industry, the key factors that create the value perceived by customers and the benefits they value. At the stage of creating a business model, there are a number of questions that need to be answered (Afuah, Tucci, 2001, p. 32):

1. Which target group is the product aimed at?
2. What values (benefits) is the product supposed to offer to customers?
3. What are the strategies for delivering these values?
4. How is this value to be created?
5. How should the product be priced?

The business model, on the one hand, builds sustainable competitive advantage but, on the other hand, is a challenge for companies (Szpitter, 2011, p. 199). An innovative mindset can become a determinant of competitive advantage and develop operational excellence, but is associated with market risks, hostile employee attitudes, and relatively higher operating costs (Szarucki, 2011, p. 194).

4. Franchising on the Polish hotel market

The Accor system is a large international consortium operating in the tourism market (mainly hotels, but also restaurants and travel agencies). Accor was created in 1983 through the merger of Novotel S.I.E.H. and Jacques Borel International. The initiative for its creation came from the representatives of the Novotel hotel chain that had existed in France since 1966: Gerard Peisson and Paul Dubrule. The Accor hotel system has been ranked among the world's top international hotel systems for years.

The Accor system is present on virtually all continents. Figure 1 identifies the countries in which Accor operates today.

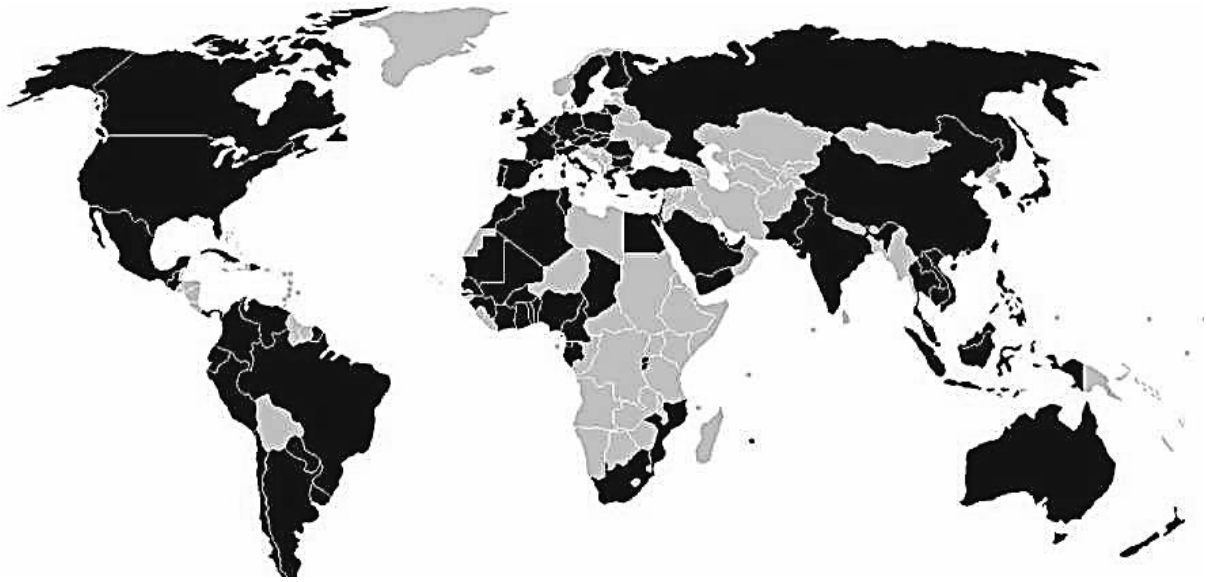

Figure 1. Countries where Accor operates (black).

Source: countries in which Accor operates - Search Google.

Today, hotels in the Accor system can be classified into three basic categories, which define the basic customer segments and consist of:

- Luxury and top class.
- Middle class.
- Economic range.

The table below identifies the most popular brands classified in each category.

Table 1.
Portfolio of brands that make up the Accor system

No.	Category	Identification of the selected brands
1	Luxury and premium class	SOFITEL LUXURY HOTELS
		SOFITEL Legend
		So SOFITEL
		pullman HOTELS AND RESORTS
		GRAND MERCURE
2	Middle class	adagio aparthotel
		Mercure HOTELS
		Suite NOVOTEL
		NOVOTEL
3	Economic class	adagio aparthotel
		ibis STYLES
		ibis budget
		ibis

Source: Own elaboration based on http://www.accorhotels-group.com/fileadmin/user_upload/Contenus_Accor/Franchise_Management/Documents_utiles/General_information/MAJ_2014/accor_en_bref_pl.pdf.

5. Franchise business model using the example of a Marriott chain hotel

Starting a hotel business based on the franchise model imposes on the investor (hotel owner) the need to conclude a franchise agreement with the chosen hotel chain. In the present case, we are referring to the Marriott hotel chain.

Within the framework of the said agreement, both the rights and obligations of both parties to the agreement are defined. Above all, the said agreement contains information on the franchise package that the Franchisor makes available to the Franchisee. The aforementioned package in the case under analysis includes, among other things, the following components:

- Provision of advertising and promotional campaigns to the Franchisee.
- Complaint handling.
- Defining standards and requirements for employee dress code.
- Principles of staff training.
- The hotel's decor and facilities.
- The right to use the company and its trademark (licensing).

Within the framework of the said agreement, the franchisor's obligations are also defined in detail, consisting of:

- Helping to run the business mainly through:
  - Promotion and national publicity.
  - Informing the Franchisee of planned promotional and advertising campaigns.
  - Provide training to staff employed by the organisation.
  - Hotel management consultancy.
  - Assisting with decorating and planning the hotel's décor.
- Providing the Franchisee with exclusive rights to operate the hotel in the area indicated in the agreement.

The franchisee undertakes to:

- Be self-employed for a period of 3 years, including:
  - Payment of remuneration for the franchise package received.
  - Payment of monthly and quarterly fees as set out in the body of the agreement.
- Use of the Franchisor's trademark.
- Not to transfer to third parties of the rights to all or part of a particular franchise package.
- Not to transfer to third parties the know-how provided by the Franchisor.
- To use the know-how obtained under the content of the contract only under the terms of the agreement.
- Not to carry out activities in competition with the Franchisor, in particular not to acquire shares in companies carrying out similar activities.
- To provide the Franchisor with information on infringements of know-how, its trademarks and other property rights.
- Permit the Franchisee to inspect the facility, inventory and accounts.

It is also important to highlight the fact that operating under the Marriott brand imposes on the operator the need to allow customers to join a loyalty programme, details of which are shown in Table 2.

Table 2.
Marriott hotel chain loyalty programme

BENEFITS	MARRIOTT BONVOY MEMBER 0-9 nights/year	MARRIOTT BONVOY SILVER ELITE 10-24 nights/year	MARRIOTT BONVOY GOLD ELITE 25-49 nights/year	MARRIOTT BONVOY PLATINUM ELITE 50-74 nights/year	MARRIOTT BONVOY TITANIUM ELITE 75-99 nights/year	MARRIOTT BONVOY AMBASSADOR ELITE 100+ nights/year and $20K in annual qualifying spend
Complimentary In-Room Internet Access *Enhanced Internet	●	●	●*	●*	●*	●*
Member Rates	●	●	●	●	●	●
Mobile Check-In/Services	●	●	●	●	●	●
Ultimate Reservation Guarantee		●	●	●	●	●
Points Bonus		10% Bonus	25% Bonus	50% Bonus	75% Bonus	75% Bonus
Late Checkout *Based on availability		●	● 2pm*	● 4pm	● 4pm	● 4pm
Dedicated Elite Support				●	●	

Source: https://www.marriott.com/loyalty/member-benefits.mi.

When offering a franchise under the banner of an external brand, using the Marriott Bonvoy loyalty programme as an example, the entrepreneur must provide all guests belonging to the programme with free internet, special, attractive rates for accommodation services and complimentary rates lower than those available on external, independent booking systems. All guests of the loyalty programme, regardless of status, must also provide Online Check In, consisting of the possibility to check-in the guest via an app on the phone. In this case, when the guest arrives at the property, an allocated room with prepared keycards allowing access to the room and a stay card will already be waiting for them. Only the signature on the registration card is required. All of this simplifies the check-in procedure to a minimum, and streamlines the entire process.

6. Summary and conclusions

The functioning of a company on the market requires that it has adequate financial resources. As a rule, these financial resources can come from various sources of financing, the basic classification of which allows a distinction to be made between internal sources and external sources.

Financing a business from internal sources is nothing more than self-financing in principle, which does not generate additional costs for the company. External sources, on the other hand, involve not only specific costs but also restrictions, which is why they are not available to every company.

One of the sources of business financing is franchising. Its characteristic feature is that it not only makes it possible to obtain additional funds for business development, but it also determines this development. Franchising is a solution that determines the creation of a new business unit operating under a given brand.

The subject of the analysis in this study was a hotel belonging to the Marriott chain. It is clear from the information presented in the study that operating a hotel under the brand of a well-known chain determines a number of both advantages and disadvantages.

Key benefits include:

- Support in the implementation of marketing activities.
- Provision of access to accommodation booking systems already in place.
- Access to people with the necessary knowledge, experience and competence.
- Opportunity to operate under a well-known and respected brand.

As mentioned previously, franchising also entails certain limitations (disadvantages). Among these, particular attention should be paid to the requirements in terms of operating strategy and management methods used. Although proven, not always desired by individual hotel owners.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

TECHNOLOGY ENTREPRENEURSHIP IN THE PROCESS OF FUNCTIONING OF ACADEMIC COMPANIES

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Purpose: The purpose of the present paper is to assess the impact of technology entrepreneurship on the entrepreneurial behavior of employees (which translates into the development of technology entrepreneurship of the organization) in the context of new present-day challenges.
Design/methodology/approach: The mentioned purpose was achieved by conducting qualitative research on selected photonics industry enterprises using the case study method. A comparative analysis of appropriately selected organizations allowed for formulating conclusions and recommendations concerning those organizations' further activity under conditions of heightened uncertainty.
Research limitations/implications: This paper contains the characteristics of technology entrepreneurship, academic firms, high-technology sector and case studies of three photonics firm in Poland. Finally, the conclusions and recommendations of discussed Polish photonic firm in Poland are evaluated.
Practical implications: The increased uncertainty resulted in a greater consolidation of employee teams, and also generated additional resources of entrepreneurial opportunities and behaviors, in addition, employees were inclined to build more flexible relations with employers.
Social implications: "Black swan"-type events forced the organizations to dynamic adaptation actions, which in turn intensified entrepreneurial activities both at the level of owners and employees. The senior management together with the owners of the companies was determined to undertake entrepreneurial activities in the area of reorganization of relations with employees.
Article Classification: Research article.

Keywords: technology entrepreneurship, academic companies, high-tech sector, photonic firms**.**

JEL classification: O3.

Introduction

Modern management is at a special moment. New, unprecedented challenges have overlapped with the existing conditions of increased uncertainty and risk. The coronavirus pandemic which swept the world in March 2020 and theoretically lasted until 2022 and whose the effects and manifestations we are still feeling, disrupted the operation of most organizations, including enterprises. The overheated supply chains and the numerous attendant consequences created an entirely new economic reality. On top of that, Russia's invasion of Ukraine in February 2022 and the ongoing full-scale conventional armed conflict has totally (and perhaps irrevocably) changed our perception of the world and economic reality. Returning to a relatively normal reality will be a process which will be drawn-out and very difficult, if at all possible.

A question which is of interest in this special context is to what extent enterprises operating in the high-tech sector are coping in the present time of extraordinary challenges. The phenomenon of technology entrepreneurship which has been gaining popularity for at least a decade makes it possible to evaluate the ways in which enterprises use technology opportunities resulting from development of science and technology and innovative technology solutions. An especially important role here is played by enterprises whose founders come from research and which are established for the commercial implementation of earlier scientific achievements (frequently the founders' own).

The objective of this paper is to evaluate the extent to which technology entrepreneurship, expressed through the entrepreneurial behaviors of the em0ployees and entire organizations, impacts the functioning of academic enterprises operating in the high-technology sector in the context of the challenges of the present day. It analyses the cases of three academic enterprises operating in the high-tech sector and representing the photonics industry. The research was conducted in 2022, after the Russian Federation's invasion of Ukraine. It attempted to answer the question of how the studied enterprises perceived these new conditions, and whether the change of the rules of the game constituted a threat or an opportunity for growth and operating more effectively in the totally changed conditions. The qualitative research performed using the case study method allowed for comparison of pairs of enterprises with origins in the academic sector and for capturing the influence of the organizations' and individual employees' entrepreneurial behaviors on the operations under specific conditions of new "rules of the game" in business activity.

Literature Review

Technology entrepreneurship and its conditions

In the conditions of the technological race and the shortening of product and technology life cycles, technology entrepreneurship is gaining particular importance as one of the key manifestations of entrepreneurship. Technology entrepreneurship is interdisciplinary and multi-faceted in character and can be considered both at the level of individual initiatives and innovative undertakings in the organizational dimension. It is a phenomenon that still arouses wide interest, both among theoreticians and researchers of management and quality science, as well as managers and practitioners (Chyba, 2021, pp. 62-67). Even though "Technology entrepreneurship" is a term which has been present in the world literature for over half a century (the first conference on the topic took place in 1970), the number of publications on the subject did not increase significantly until the second decade of the 21st century. The theoretical foundations of the concept appeared in "Technology Entrepreneurship," a special issue of Strategic Management Journal from 2012, edited by Ch. Beckman, K. Eisenhardt, S. Kotha, A. Meyer and N. Rajagopolan. (Beckman, Eisenhardt, Kotha, Meyer, Rajagopolan, 2012; Kordel, 2018, pp. 9-10). Attempts to define the concept were also presented by T. Bailetti (2012, pp. 2-25). The subject of technology entrepreneurship was also undertaken in many other papers, including by S. Muegge (2012, pp. 5-16), T. Bailetti et al (2012, pp. 28-34).

In recent years there many publications on the topic have also appeared in Polish. The term "technology entrepreneurship" is defined differently by Polish authors. According to S. Flaszewska and S. Lachiewicz (2013, p. 18) et al. "technology entrepreneurship can be understood as a process combining elements of academic and intellectual entrepreneurship with entrepreneurship of commercial and business support organizations and with entrepreneurship of owners, managers and employees implementing new technologies and accompanying innovations in the sense of application and distribution of their effects in the market environment". According to W. Grudzewski and I. Hejduk (Grudzewski, Hejduk, 2008, p. 80) "technology entrepreneurship is a prerequisite for company success. It implies the process of new product development, using modern technologies, flexible response to changes taking place on the market, as well as introducing innovations in all areas of the company's operation, as well as its co-operators". According to P. Kordel (2018, p. 37) "the phenomenon of technology entrepreneurship occurs when scientific or engineering development creates a key element of an opportunity, which is later transformed into a new investment. A technological venture, based on the latest engineering knowledge, is a direct result of technology entrepreneurship". Still quoting the above-mentioned author (Kordel, 2015, p. 272), "technology entrepreneurship, by combining social dynamics with the dynamics created by the development of new technologies, gives a new perspective on the development of the economy,

especially that part of it which is composed of high technology enterprises and which is used to be called the knowledge-based economy".

Technology entrepreneurship should be considered in the broader context of an organization's strategy, especially a company's development strategy. Therefore, measures of efficiency and effectiveness of technology entrepreneurship can be those measures that relate to competitive advantage (share of market, profitability ratios, etc.) (Chyba, 2016, pp. 103-104). An overview of selected definitions of technology entrepreneurship is presented in Table 1.

Table 1.
Technology entrepreneurship. Overview of selected definitions

Authors	Definition
Ch. Beckman, K. Eisenhardt, S. Kotha, A. Meyer, N. Rajagopolan	Technological entrepreneurship occurs when advances in science or engineering create a key element of an opportunity that then forms the core of a new venture, product or service, enterprise or even an entire industry.
P. Kordel	The central role in the phenomenon of technological entrepreneurship is played by technological opportunity, i.e. an entrepreneurial opportunity based on the development of technology. The process of technological entrepreneurship consists of the stage of formulating a technological opportunity and the stage of its exploitation.
W. Grudzewski, I. Hejduk	Technological entrepreneurship is a prerequisite for the success of an enterprise. It signifies the process of creating new products, using modern technologies, reacting flexibly to changes on the market, as well as introducing innovations in all areas of the company's operation, as well as at its subcontractors.
S. Flaszewska, S. Lachiewicz	The process of ensuring greater practical utility of scientific research results through effective cooperation between research and research and development centers, capital market institutions and the surroundings of business, as well as enterprises involved in the production and sale of technologically advanced products or services.

Source: own development based on Beckman, Eisenhardt, Kotha, Meyer, 2015; Kordel, 2015, pp. 271-282; Grudzewski, Hejduk, 2008, p. 80; Flaszewska, Lachiewicz, 2013, p. 18.

The concept of technology entrepreneurship should be placed in the field of strategic management issues, including innovation theory and entrepreneurship theory. Technology entrepreneurship is most applicable to high-tech industries, although it can also be applied to traditional industries. It is a process consisting of entrepreneurial actions by an innovation leader, team members, and members of the entire organization. It is a special process that is characterized primarily by creative, collaboration-oriented activities or processes, innovation, a willingness to take risks, and a positive orientation on their results, primarily for social benefit.

Among the factors influencing the technology entrepreneurship of an organization, internal determinants should be distinguished, i.e. the conditions of the internal environment of the organization (organizational culture, intellectual capital, etc.) and the technological potential of the company, including not only its technological portfolio, but also the creativity of employees, and in particular the effectiveness of R&D activities. Technological potential may or may not translate into technology entrepreneurship and market benefits for the enterprise. An important role should also be played by institutions in the company's environment that are set up to directly or indirectly support the entrepreneurial aspirations of the organization (scientific institutions, including: universities, R&D institutes, R&D units, as well as innovation and

entrepreneurship centers, training and consulting centers, etc.). When talking about technology entrepreneurship one should take into account the conditions of the internal environment and the organization's surroundings. Table 2 presents a list of determinants of technological entrepreneurship in a three-level perspective.

Table 2.
Technological entrepreneurship levels and their key determinants

Technological entrepreneurship levels	Key determinants
Environmental (external) determinants	Scientific institutions
	Centers supporting commercial implementation
	Commercial partners
Internal environment conditions	Organizational culture
	Intellectual capital
	Decision-making efficiency
Enterprise's technology potential	Technology portfolio
	R&D effectiveness
	Management's creativity and technology competences

Source: own development based on Chyba, 2015, pp. 87-96.

Technological entrepreneurship is strongly conditioned by the organization's environment, especially those entities that support the commercialization of new technology solutions. An important role is also played by the internal environment, including the specific characteristics and identity of the organization expressed by the created organizational culture, as well as the intellectual capital of the organization, with particular emphasis on its human capital. Also emphasized should be the importance of the technological potential of the company with its current portfolio (set) of technologies and the possibility of creating technologies thanks to the effectiveness of the R&D department and the creative activity of employees.

Determinants relating to the organization's internal environment play a significant role. Internal factors that determine technological entrepreneurship development include intellectual capital and organizational culture. The soft aspects of management, especially those mentioned above, are significant inputs into an enterprise's strategic resources. At the same time, the competences and resources at the disposal of enterprises are an important component of their technological potential. After all, it is difficult to build the technological potential of the company without the appropriate knowledge of employees, their technological competences, as well as creativity and commitment.

Barriers to the development of technological entrepreneurship can be both institutional and mental in nature. On the one hand, they result from the limitations of the political, legal and economic environment, and on the other hand, they are conditioned culturally and sociologically. Each country or region has its own specificity of entrepreneurship conditioned by history, culture, religion or finally resulting from local and family traditions. The limited volume of this article does not, in my opinion, allow for a broader development of these issues. However, it should be assumed a priori that such conditions play an important role.

Currently technological entrepreneurship is largely limited by the economic slowdown of the past several years. In such conditions, especially in the context of the idea of sustainable development of enterprises and the entire economy, the criteria for generating and implementing innovations undergo re-evaluation. According to the above idea, all innovations implemented should not only fulfil economic objectives by increasing revenue but also play a social and environmental-protection role. This means that technological entrepreneurship should also lead to the implementation of the goals outlined by the concept of sustainable development of enterprises. In crisis conditions, this is particularly difficult, taking into account the uncertainty and increased risks of business operations (compare Jafari-Sadeghi, Garcia-Perez, Candelo, Couturier, 2021, pp. 100-111; Mosey, Guerrero, Greenman, 2017, pp. 1-9; Giones, Brem, 2017, pp. 44-51; Bolzani, Munari, Rasmussen, Toschi, 2021, pp. 335-365).

Academic entrepreneurship and establishment of spin-offs

The concept of academic entrepreneurship appeared in Poland only relatively recently, mainly among people from the generally understood research and development sector and science administration, as an expression of new tasks and opportunities confronting the university sector, affecting the local, regional and global economy (Chyba, Grudzewski, 2011, pp. 108-109). The origins of this type of entrepreneurship in our country are connected with its political system transformation of the 1980s-1990s. According to W. Grudzewski and I. Hejduk (2000, p. 257), "academic entrepreneurship is defined as undertaking business activity by people involved in scientific activity and holding a specific position in academic circles. Academic entrepreneurship is conducted by people running a business on the basis of theoretical and applied research and development work". Academic entrepreneurship encompasses many areas and has a large impact on the development of innovative enterprises. It is the source of the most modern techniques and technologies transferred for practical industrial implementation (Grudzewski, Hejduk, 2000, pp. 257-258). The outcome of academic entrepreneurship is enterprises established by academics in order to commercialize earlier scientific and technological achievements (often their own). These enterprises are often referred to as spin-offs, spin-outs, or – when referring to newly established entities – start-ups. For a broader treatment on the concept and models of academic entrepreneurship, as we3ll as academic enterprises, see A. Kwiotkowska (2015), J. Korpysa (2016), A. Komarnicka (2020), K. Łobacz, P. Głodek (2020) and others.

The concept of spin-off as such does not raise any interpretative controversies (Chyba, Grudzewski, 2011, pp. 116-118). It is used to define an entity established as a result of a spin-off/separation from the parent organization (corporation) in order to undertake activities that would be difficult or even impossible to carry out within that organization. There is no major problem with the interpretation of the term spin-off when it is related to entities emerging as, so to speak, satellite of large corporations, intended mainly for the implementation of new, often high-risk technology projects. Spin-off companies (so-called university spin-offs) are the

principal stream of academic entrepreneurship and one of the main mechanisms of technology transfer and commercial implementation (Tamowicz, 2006, p. 9). Academic entrepreneurship, especially in Poland, is identified not only with spin-off companies, but also with the business activity of university students and graduates (Matusiak, 2005, p. 131). The broadest interpretation of the term spin-off includes "all types of transfer of technological knowledge from the company that developed the know-how to the entity that is to apply it in practice". The creation of such a spin-off is most often associated with the separation of the assets of an already existing enterprise. There are also spin-offs which do not involve establishing a new organizational unit. In corporate terms, a spin-off is a company created by separating a team, branch, department from another organization. A special type of spin-off companies are enterprises originating from universities and research and development institutions, increasingly called spin-outs (Guliński, Zasiadły, 2005, p. 18).

N. Nicolaou and S. Birley not only developed a flexible definition of the term spin-off but went further (Chyba, Grudzewski, 2011, pp. 120-122). Recognizing the considerable diversity of this phenomenon, they defined three types of spin-offs that differ in the way they engage and link key factors (human, scientific institution, ownership links) (Nicolaou, Birley, 2003, p. 340):

- orthodox – where the spinout involves both the academic inventor(s) and the technology spinning out from the institution;
- hybrid – which involves the technology spinning out and the academic(s) (all or some of those involved in the project) retaining their university position, but holding a directorship, membership of the scientific advisory board or other part time position within the company;
- technology – which involves the technology spinning out but the academic maintaining no connection with the newly established firm, although they may own shares or provide advisory services (Birley, 2002, p. 137).

The degree of differentiation, as well as the common elements of various approaches to definitions, are best reflected in studies conducted by the OECD in the late 1990s. Among the five factors characterizing spin-off companies, three elements distinguishing these entities were most often indicated:

- the founders include employees of a scientific research organization,
- the organization operates based on a licensed technology,
- the organization received capital support (in the form of an ownership stake aquis8ition) from the public sector.

Despite the convergence of components that are part of support programs for spin-off companies in different countries, they often differ in the way they are organized and the intensity of involvement of the public sector (STI Review, 2000, p. 17). From this perspective, in Europe for instance it is possible to distinguish four models of support:

- top-down (vertical) model – based on public agencies disbursing government funds for various purposes and programs; this model this model works best when launching large (national) programs during the initial development of the spin-off sector,
- network model – more horizontal and differentiated in terms of ownership; it is based on cooperation between private and public institutions,
- organic development model (termed "incremental" in the literature) assumes a slow, organic development of individual – mainly infrastructural – elements of the support system,
- „technopoly" – this model assumes the creation of a specific infrastructure that triggers strong impulses that change the internal culture of a scientific organization (Guliński, Zasiadły, 2005).

Another classification can be made, based on the criterion of the goal and resources assigned to a given support system. Three models of incubation of spin-off enterprises can be distinguished:

- the "weak selection" model based on low-level resources (infrastructure, finance) with the aim for launching as many projects/entities as possible; the effect is usually a large number of economically weak entities (with quantity dominating over quality),
- the "supportive" model, which supports the creation of spin-offs, understood as an alternative to the sale of licenses; since the point of reference is the benefit obtained from trading licenses, an important parameter in this model (which also determines the allocation of support) is the economic efficiency of the spin-off project,
- the "incubation" model which focuses on seeking the optimum moment for the spin-off entering the market.

Academic enterprises operate mostly in the high-technology sector. It is in this sector that technology entrepreneurship seems to bring about the most spectacular effects. This does not mean that traditional industries should be disregarded or underestimated, as academic spin-off/spin-out entities also operate successfully in them (see also El-Awad, 2022, pp. 1-14; Vekić, Daković, Borocki, Sroka, 2020, pp. 533-550; Nikoforou, Zabara, Clarysse, Gruber, 2018).

The importance of advanced technologies

A special role among the many different types of technology is played by advanced or high technology. This term has been used in science for several decades (Chyba, 2021, pp. 46-50). It is difficult to pinpoint the person who was the first to use it, although credit for popularizing the concept is usually given to R. Metz, the author of one of the most popular regular columns in the New York Times – "Market Place" which appeared during 1966-1982, attracting large numbers of readers (Skala, 2014, pp. 111-113). In informal terms, this signified those products (and then entire sectors of the economy) that were based on the latest achievements in science and technology. This conception remains generally valid; however, problems arise when it is necessary to precisely define what is classified as "high technology" and what is not.

The high-technology or high-tech enterprise sector is difficult to define precisely since many enterprises classified as high-tech go beyond the boundaries of industries identified according to the accepted classifications. These industries are frequently considered to arise at the intersection of science and industry and are founded on the processing of scientific research results in industry. This is also frequently the case with the academic enterprises which were the subject of the present research. According to A. Adamik and A. Zakrzewska-Bielawska (2014, pp. 12, 17) "a high technology enterprise is defined as an entity operating in the field recognized as high technology, combining the features of an innovative and knowledge-based enterprise and using modern information and communication technologies to a large extent".

The first attempts to attempts to systematize this area of the economy were made in the 1970s. The results of the first were published by the Organization for Economic Co-operation and Development (OECD, 1980, SITC/80.48), which followed the American classification and covered only foreign trade in high-tech products. This made it possible to make the first comparisons of countries in terms of the development of this sector of the economy. However, due to the excessive number of references to the US economy, the proposal was considered unsatisfactory. The subsequent classification conducted by the OECD concerned the dozen or so highly-developed countries for which data were available. The basic distinguishing criterion was the intensity of expenditure on research and development, i.e. the level of expenditure on research and development as a portion of the value of sales, which resulted in distinguishing three industry classes depending on the advancement of the technological level: high technology, medium technology and low technology. After a decade this approach was revised, with the number of categories increased to four (high technology, medium-high technology, medium-low technology and low technology) and the so-called Product approach being introduced, enabling enterprises to be included in the high-tech group based on their products, and not just belonging to the sector (OECD, 1984, DSTI/SPR/84-49). Based on data from over a dozen of the most developed countries, a list of initially 10, and then nine product groups was created, showing the level of technical advancement of the companies that create them.

As a result, according to the first "sectoral" criterion, the high-tech group includes entities that carry out their activities within two divisions and one subclass of the European NACE classification (Nomenclature Statistique des Activites economiques dans la Communaute Europeenee), which find their equivalents in the Polish Classification of activities (EKD):

- Division 21: Manufacture of basic pharmaceutical products and pharmaceutical preparations;
- Division 26: Manufacture of computer, electronic and optical products;
- Subclass 30.3: Manufacture of air and spacecraft and related machinery.

According to the "product" criterion, there are nine groups of high-tech products: products related to the aerospace industry; computers; electronic and telecommunications products; pharmaceuticals; scientific and research apparatus; electric machines; chemical products; non-electric machines; and weapons and ammunition.

Both the above criteria have their limitations and disadvantages. In the first case, some enterprises declare belonging to the high-tech sector, although in fact they do not manufacture products that fall within the high-tech category. On the other hand, some enterprises from other sectors do fulfill this condition. On the other hand, there are enterprises representing other sectors that fulfill this condition. The consequence of this may be an overestimation of technological intensity in some sectors with a simultaneous underestimation in others.

Two additional criteria are used to make the process of classifying enterprises as high-tech more credible. These criteria are used more locally than globally due to the lack of sufficient data for international comparisons. The first criterion is obtaining patents by the company or signing license agreements in areas recognized as high-tech. The second criterion is the level of employment of highly qualified research and technical personnel. According to the OECD, due to the lack of such data in a broader sense, only R&D intensity can be a useful criterion for international comparisons. All this makes it difficult to clearly define industries that belong to the high-tech category.

According to Z. Wysokińska (2001, p. 84) high-technology includes primarily the following areas:

- Information technology related to the collection, storage, processing, transmission and presentation of information – mainly computer and communication technology (hardware and software),
- Advanced manufacturing technology, including computer-controlled or microelectronics-based equipment used to design, manufacture and move products and the use of these technologies e.g. in the form of flexible machining centres, robots, automatically controlled transport vehicles or computer-controlled equipment for automatic delivery or storage of materials, parts, subassemblies and finished products.

High-tech industries are the most dynamically developing components of global industry. In addition, these industries, whose material and energy intensity is several times lower than those of traditional industries, play a key role in creating new jobs requiring high qualifications (Grudzewski, Hejduk, 2008, pp. 31-33).

Table 3 presents the classification of high technology areas and products according to the European Classification of Activities and the Organization for Economic Cooperation and Development (OECD).

Table 3.
Classification of high technology areas and products according to the ECA and OECD

Classification of high-technology areas according to the ECA, developed by the OECD	Classification of high-technology products according to the OECD
Manufacture of air and spacecraft	Aircraft and related equipment, spacecraft (including satellites) and machinery, spacecraft launch vehicles and their parts, non-electric motors.

Cont. table 3.

Manufacture of office equipment and computers	Typewrites and automatic word word-processing machines, optical photocopiers, contact copiers or thermal copiers, automatic data processing machines (computers) and parts and accessories therefore.
Manufacture of radio, television and communication equipment and apparatus	Devices for recording and reproducing images and sounds, printed circuits, fibre optic cables, electron tubes, diodes, transistors and other semiconductor devices, electronic integrated circuits and micromodules, piezoelectric crystals, microwave tubes etc.
Manufacture of basic pharmaceutical products and pharmaceutical preparations and plant-based materials	Antibiotics, natural and synthetic hormones, glucosides, antisera and vaccines, drugs containing antibiotics, hormones, other drugs not included in this classification. Certain macromolecular chemical compounds with special physicochemical properties.

Source: own development based Wysokińska, 2001, pp. 88-97; Chyba, 2017, p. 90.

Research methodology

Academic enterprises at a time of new challenges. Case studies

The challenges of the modern world, both the Covid-19 pandemic in 2020-2022, as well as, and perhaps above all, the full-scale armed conflict in Ukraine, launched in February 2022 by the Russian Federation, caused significant re-evaluations in the functioning of enterprises. This applies in particular to academic enterprises operating in the high-tech sector. The effects of these challenges will be shown using the example of organizations from the photonics industry. The surveyed enterprises represent various types of spin-off enterprises due to the degree of connection with their home research centers. Companies X and Y represent the type of technological spin-off, in which these connections concern only the genesis and the transferred technology. These are university spin-off companies that live a life of their own in business terms. In the case of Company Z, we are dealing with an intermediate type between a hybrid and technological enterprise, because the founders and leading researchers of this company maintain contact with their original research centre and follow scientific achievements on an ongoing basis.

Company X was founded in 1987 by a group of scientists from the Military University of Technology. It is an innovation enterprise operating in the high technology sector. It makes use of its own research and development resources. The company's customers are industrial enterprises that manufacture their own products based on its output and the research sector, which constructs scientific equipment. This last group includes enterprises working for the military. Since the company follows a market niche strategy, its sales are conducted through an international distributors' network.

The history of the company dates back to the 1970s, when a team of scientists from the Military University of Technology was the first in the world to show that photon far-infrared detectors can operate at ambient temperature. This contradicted the widely held view that such detectors could only work at the temperature of liquid nitrogen. The Polish scientists' successes were initially met with incredulity but repeated presentations of the correctly operating device properly functioning devices convinced the global research community of the team's potential. Due to the lack of a competitive industrial environment in Poland in the 1970s and 1980s, the invention could not be implemented domestically. Its enormous potential contribution to the development of modern optoelectronic equipment was appreciated by the Americans who expressed their willingness to utilize it. This allowed for a small level of export based on Military University of Technology production. The product was developed further and the offered selection was expanded to include electronic accompanying devices and accessories relating to infrared technology. In view of the growing international market and the continuing lack of interest in infrared technology in Poland in 1987 the company's founders established their own production company and in 1993 transformed it into a limited liability company. The company currently employs a highly-qualified staff including a professor and many PhDs and engineers.

Its main competitive advantage is its knowledge and technologies applied, since the product is characterized by a very high level of complexity. Knowledge management in the company is more intuitive than conscious in character. However, knowledge is being developed and managed effectively, since otherwise the company would immediately lose its competitive advantage and disappear from the market. The company's knowledge base is created by its owners, who have cooperated with each other for 30 years which is a clear advantage since it allows them to develop innovative solutions. The company holds many patents but no longer uses some of them.

The company is a world leader in the production of uncooled photon infrared detectors. Its mission is to replace cryogenically cooled mid- and far-infrared photon detectors with new generation detectors. The company provides:

- manufacture of infrared ration detectors,
- commissioned research and development work in the area of infrared technology,
- manufacture of optoelectronic equipment,
- construction and modernization of microprocessor-controlled measuring stations,
- technical consultancy,
- brokerage in the purchase of optoelectronic components, devices and systems.

The measure of the company's success is the constantly increasing demand for detectors from global and domestic equipment manufacturers. The company is constantly improving the detectors' parameters while decreasing their production costs. The company's multi-million investments are intended to ensure an ongoing improvement of its research and production potential and, consequently, the quality of the detectors produced.

Company Y was established in 1991 by employees of the University of Warsaw Faculty of Physics. It is a manufacturer of precision components, optical components and subcomponents for laser technology, medicine, lithography, telecommunications, metrology, aviation and the aviation and space industries. The company specializes in the production of prototypes and atypical precision elements. In addition to manufacturing, it provides services such as:

- repair, regeneration and modification of optical components,
- design and consultancy relating to individual optical components, subcomponents, assemblies and subassemblies, optoelectronic components and their application,
- optical measurements.

Initially (for the first two years) the company operated solely on the Polish market. However, during the economic transformation, the market of components and optical and optoelectronic components decreased significantly. The company's Polish customers were unable to withstand the competition of enterprises from the European Union, Japan and the USA. Faced with the virtual disappearance of the domestic market, the company expanded onto world markets (Weresa, 2007, pp. 161-165). It currently occupies a high market position, also internationally. It sells its products on practically every continent. It has no competitors in Poland and in Europe it is able to successfully compete with the best companies, manufacturing highly scientifically and technologically advanced products. Its customers are well-known European high-technology enterprises, including ASML. The company currently operates mainly on the foreign market.

The immediate reason for establishing the company was the lack of sufficient development prospects in the institute. The decision to establish an independent business was supported by the character traits of the founders, manifested in the tendency to take risks and take on new challenges. The initiative was not supported by Faculty, which, not seeing direct benefits for itself was also losing some of its research staff. The founders of the new enterprise had a good knowledge of the market, but the first period of the company's activity was not easy. Initially, the company, operating exclusively on the domestic market, was not profitable, and the profits in the first seven years were irregular. The company started operating solely on the basis of human capital. At the beginning, the funds for the equipment came from a private investor in the form of venture capital from abroad. Currently, the company's capital is entirely of Polish origin. The company faced many barriers to its development. The limited financing possibilities for new investment were a serious obstacle in its growth. The company's development depended on increasing sales.

Company Y is constantly working on innovation and improvement of its products. These are technologies of producing laser modulators and thin optical coatings and processing of optical elements. In addition to technological innovations, organizational and marketing innovations are also introduced. The company's employees implemented their knowledge gained during their scientific activities at the Institute of Physics in their business activities. This applies to both theoretical (scientific) knowledge and applied knowledge and knowledge

about the functioning of the market in which the company operates. The company implements its knowledge commercially through the sale of technologically-advanced products and services. It has a group of regular customers. They are industry-leading companies located virtually all over the world. However, the largest group is from Germany. These customers support the research conducted in the company. Company Y is based on internally-developed technologies. It does not propagate its knowledge through licensing. It follows the principle of protection of intellectual property developed within the enterprise. A similar principle is followed by the majority of companies from the advanced technology sector, as selling products based on proprietary technology brings greater profits and competitive benefits than the sale of the technology itself.

Company Z was founded in 2002 by employees of the Institute of High Pressure Physics of the Polish Academy of Sciences. He specializes in advanced laser manufacturing technologies. Like companies X and Y, it is an example of an entity with roots as an academic spin-off. The enterprise has used and continues to benefit from the help and support of so-called "Business Angels". Due to the niche nature of the business, it has difficulties in obtaining venture capital. The company has very limited possibilities of increasing the scale of production and therefore remains an entity operating in a narrowly specialized global niche.

One of the contemporary challenges for Company Z is operating in the field of quantum technologies with a very high level of technology development, which in the future may contribute to the development of so-called quantum computers. The company has a stable team of top-class specialists. Currently, it employs 25 persons, including 11 PhDs and 3 professors of physics. It is in the process of acquiring new specialists with appropriate experience in research work, preferably with at least a doctoral degree. This is due to the advancement level of the high-tech products it manufactures. The company maintains contacts with the parent Institute of High Pressure Physics of the Polish Academy of Sciences, mainly due to the need to exchange scientific experiences and recruit specialists with scientific degrees. Currently, it is an example of a technological spin-off, which runs a completely independent business, related to the mentioned research centre mainly through the history/genesis of the activity and recruiting new employees. R&D intensity in Company Z remains at a consistently high level.

Summing up, it can be said that the surveyed enterprises differ in the time they have operated on the market, which is also reflected in the style of management and the nature of links with the scientific community. There was a generational change in the management of Companies X and Y, which slightly changed the way of thinking, unlike in Company Z, which has been operating for the shortest time (since 2002) and under the same management.

The present paper was prepared based on results of qualitative research using the case study method. The author posed the following research question: Do current conditions and changes in the rules of the market game impact the entrepreneurial behavior of high-tech enterprises and if so, in what way? The research of three purposefully selected academic enterprises of the high-

tech sector, representing the photonic industry, was conducted in the spring and summer of 2022, after the Russian Federation's aggression against Ukraine.

The research concerns the impact of technology entrepreneurship and specific contemporary conditions on the entrepreneurial behavior of academic enterprises from the high-tech sector. In the present study the following definition of technology entrepreneurship was formulated: "Technology entrepreneurship occurs when scientific and technical development create a key opportunity which stimulates entrepreneurial behavior of the employees of the surveyed enterprises". The key issues in the area of technology entrepreneurship are:

- Technology entrepreneurship of the studied enterprises at the level of individuals and the organization.
- Key determinants of technology entrepreneurship in a given enterprise.
- Determinants of entrepreneurship in the two perspectives mentioned above – the economic cycle and the so-called "black swans".

The photonics sector enterprises selected for the study met the following criteria:

- At least 5 years on the market.
- 100% or majority Polish-owned.
- Development of own unique and world-class photonics solutions.
- Significant R&D expenditures as part of regular operations.
- Exports accounting for a significant portion of sales.

A comparative analysis of the selected enterprises was performed based on the survey results. The case study method allowed for comparing the analyzed enterprises in pairs, which is presented in greater detail in further portions of the present paper. The research will result in the formulation of conclusions and recommendations for photonics sector enterprises in Poland, aimed at enabling them to operate more effectively in conditions of global market competition. The procedure in relation to the case study is defined in the procedure presented in Table 4.

Table 4.
Stages of the case study process

Stage 1	Formulation of research question
Stage 2	Case selection
Stage 3	Development of data-collection tools
Stage 4	Field research
Stage 5	Analysis of collected data
Stage 6	Formulation of general conclusions
Stage 7	Confrontation with the literature
Stage 8	Study conclusion – generalization

Source: Czakon, 2006, p. 10; Czakon, 2020, p. 199; Chyba, 2021, p. 140.

The selection of cases is deliberate and is made on the basis of five basic criteria: data availability, the clarity of the case, diversity in multiple case studies, a critical phenomenon and a metaphor that directs the researcher to a specific course of the phenomenon under study (Czakon, 2020, pp. 200-201; Flyvbjerg, 2004). The first of these is the pragmatic criterion of data availability. It has allowed us to prepare the most thorough descriptions of enterprises that are particularly important from the point of view of answering the research question posed. The second criterion is the clarity of the case, an extreme illustration of the principles being studied, thus ensuring unambiguous interpretation. The third criterion is diversity. This requires that many cases be examined in such a way that they represent at least different circumstances or contradictory situations.

Repeated case studies should cover four to ten cases, which are most often compared in pairs. This gives from two to five pairs of comparisons of phenomena with a different progress or taking place in different industries, allowing for the formulation of generalizations largely free from the factors of circumstances or industry. The selection then consists of setting up pairs of cases, e.g. low technology – high technology; mature market – growing market; simple product – complex product; local enterprise – global enterprise.

The fourth selection criterion is a critical phenomenon, whose progress, which is extreme or different from commonly accepted views, allows for the formulation of generalizations. The fifth criterion concerns a metaphor that directs the researcher's attention to a specific progress of the phenomenon under study or makes it possible to assume a specific research position. For example, the metaphor of the life cycle requires a selection of cases in which it will be possible to observe the moment of emergence, and the development, maturity, decline and disappearance phases of a given phenomenon (Chyba, 2021, pp. 139-141).

Results and discussion

Table 5 presents the characteristics of the surveyed organizations and the determinants of uncertainty in the short and long term, as well as technology entrepreneurship in the macro- and microeconomic environment.

Table 5.
Characteristics of enterprises and determinants of uncertainty and technological entrepreneurship

	Company X	**Company Y**	**Company Z**
Established	1987	1991	2002
Number of employees	ca. 120	ca. 70	ca. 25
Company profile	The enterprise produces primarily MOCVD (Metal Organic Chemical Vapour Deposition) technology uncooled photon infrared detectors for industry, medicine and in the area of military technology; it conducts R&D work in the area of infrared technology.	The enterprise produces general-purpose precision optical elements. The technologies used cover the full production cycle of optical elements from almost all types of optical glasses, quartz glasses, optical ceramics and crystals, starting from cutting raw material in blocks or bars, through all standard technological processes such as: milling, grinding, polishing, MRF correction polishing up to comprehensive measurements, thin layers, framing and precise assembly of optical systems.	The company produces semiconductor laser diodes that emit light with a wavelength of 400-420 nm. This technology is based on the GaN crystal growth method under high pressure developed at the Institute of High Pressure Physics of the Polish Academy of Sciences and on many epitaxial crystal growth technologies such as MOVPE, MBE and HVPE
Impact of uncertainty factors in a short-term perspective (1 year)	**Positive** • Reorganization of the enterprise's work terms of procedures and interpersonal relations due to Covid. **Negative:** • Supply chain disruptions due to Covi	**Positive** • Reorganization of the enterprise's work terms of procedures and interpersonal relations due to Covid. • Mobilization of Employee mobilization resulting from the employer-employee relations during the pandemic **Negative:** • Significant decrease in sales due to Covid • Disruption of supply chains due to Covid • Abrupt change of the head managers of the enterprise and the resulting turbulence	**Positive** • Reorganization of the enterprise's work terms of procedures and interpersonal relations due to Covid. **Negative:** • Decrease in sales due to Covid • Stable access to production tools

Cont. table 5.

Impact of uncertainty factors in a long-term perspective (5-6 years)	**Positive** • Increased orders due to the armed conflict • Brexit has given employment opportunities to émigrés returning from the UK. **Negative** • • The rapid development of science and technology creates difficulties in making business decisions on investments and development. • Intensive increase in international competition leading to difficulties in hiring and retaining specialists. • Uncertainty in the stable functioning of the supply chain resulting from the characteristics of the global market and the occurring turbulence	**Positive** • Increased orders due to the armed conflict • Capital changes in the company • Enterprise reorganization due to the change of head manager. **Negative** • Intensive increase in Polish competition stimulated by public institutions and leading to difficulties in hiring and retaining specialists.	**Positive** • Increased orders due to the armed conflict • Rapid development of laser utilization possibilities **Negative** • Stable access to production tools
Catalogue of determinants of technological entrepreneurship at the micro- and macroeconomic level	Impact of technological progress Limitations in availability of development funding for the enterprise. Verification of the semiconductor production policy in the EU (EU Chip-act) The enterprise's place in the supply chain	Limitations in availability of development funding for the enterprise. Pressure of low margins Succession related to change in company management The enterprise's place in the supply chain.	Poland lacks a laser production ecosystem; this is due to a lack or traditions in this area. Lack of funding sources to enable an enterprise to get across "Valley of Death," i.e. the gap when it no longer receives public assistance but is not yet able to attract private investment Globalization of the labor market for workers with special skills.
Catalogue of management's and staff's entrepreneurial behaviours	Employees' better understanding for intensification and consolidation of activity in the face of unexpected threats Employees' increased involvement due to management's care for the staff	Large consolidation, integration of activities and mobilization of the team Employees' greater understanding of the need for personnel changes implemented by the management	Increase in employee involvement in entrepreneurial activities under the influence of the situation Employees' understanding for greater activity, while appreciating the management's efforts to maintain staff consistency

Source: own elaboration based on interviews with representatives of the enterprises studied.

Table 5, beneath the description of the enterprises, presents a catalogue of short-term uncertainty factors, due mainly to "black swan" events treated as presenting a high degree of uncertainty, i.e. Covid and the outbreak of war in Ukraine. The synthesizing research indicates

that in the short term, the occurrence of external uncertainties from Covid forced organizational changes in the field of business processes, procedures, in ways of performing tasks and in interpersonal relations. These were enforced changes aimed at adapting to new conditions, mainly in the area of supply chain management which collapsed temporarily, and the sales process. The pandemic in some ways limited the possibilities of information exchange in the development of cooperation due to the impossibility of maintain personal scientific and business contacts during conferences, fairs, scientific and industry seminars, trade meetings, etc. The period of the pandemic stimulated the enterprises to alter their management of highly unique and specialized human resources. Already before the pandemic, the labor market of Companies X, Y, Z was changing towards an employee's labor market, which was associated with increased investments in this part of Europe, both on the part of technological leaders and state-owned enterprises specializing in the military industry. However, it was only the pandemic period that forced employers to take active measures to retain employees as well as acquire new ones.

It should be noted that short-term uncertainties did not significantly weaken the enterprises' market position. On the contrary, they were largely seen as an opportunity. Technology entrepreneurship, also in conditions of increased uncertainty, creates new opportunities for cooperation in the supply chain, and also opens up completely new fields for cooperation that had not been developed before. As a of short-term uncertainty factor, the conditions of the pandemic period forced the management to reorganize and change in order to adapt to new conditions. The outbreak of war in Ukraine, as a deep uncertainty, is treated as a development opportunity which results from the acceleration of the militarization process in the region of Central Europe. In addition, the opportunity for the surveyed companies is to take over the existing orders placed by EU companies in Russia and to develop on the Ukrainian market.

Table 5 also presents a catalogue of long-term uncertainty factors. By synthesizing the research, they indicate that the first important factor of long-term uncertainty is the rapid development of science and technology, which forces companies to conduct constant and dynamic activities aimed, on the one hand, at determining which scientific and technological solutions are appropriate for the implementation of orders, and on the other hand, in what areas to do investments. It is worth noting that the EU policy regarding the production of semiconductor components has changed by introducing the EU Chip Act. The European Chip Act will increase Europe's competitiveness and resilience in semiconductor technologies and applications, and help achieve both the digital and green transformation. The second important factor of long-term uncertainty is the limited access to investment capital among companies in the photonics industry. The lack of a long tradition and culture of the photonics industry in Poland causes limitations in the creation of the ecosphere in the photonics industry, which would stimulate, on the one hand, the development of the local photonic industry, and on the other hand, create circumstances and good models for financing new investments. Additionally, the low-level location of the surveyed enterprises in the value chain may not be conducive to

increasing the chances of finding financing. There are limited possibilities of financing investments in the photonic industry, including allowing you to jump over the "valley of death" or the financial gap when the project no longer has public funds and the private sector is not ready to get involved financially. The third important factor of long-term uncertainty is the smooth succession between successive generations of business owners who have knowledge and experience in running a business in such unique areas.

The entrepreneurial behavior (or lack thereof) of employees and entire organizations is largely the basis for the success or failure of enterprises. Table 1 presents the key determinants of entrepreneurship and a catalogue of entrepreneurial behaviors. The studied Enterprises X, Y and Z pointed to various determinants; nevertheless, some shared opinions can be identified. The factor raised by all entities was the issue of limiting (or even lack of) the availability of financing for the development of the enterprise. This would allow for overcoming a difficult moment for companies, known as the "valley of death".

Another issue is the entrepreneurial behavior of employees under the impact of unexpected events, known as "black swans". Here we can observe a high level of agreement in the opinions of the employees of all the enterprises. All the organizations experienced an increase in the commitment and creativity of employees, which proves they understood the seriousness of the situation. Representatives of companies X and Z took steps to protect and maintain the numbers of their employees, which the latter appreciated. In the case of company Y, in the period preceding the analyzed events, there were significant personnel changes, which contributed to the increase in technology entrepreneurship of the employees, who undertook numerous creative and innovative activities.

The difficulties from the company's point of view are seen rather in terms of uncertainty about market needs and a reduction in the level of investment. The pandemic conditions have in some way limited the possibilities of information exchange in the development of cooperation due to the impossibility of direct scientific and business contacts as part of conferences, fairs, scientific and industry seminars, etc. The problem is still difficult access to loans, limited dialogue with the business environment and the lack of an appropriate financial ecosystem. The possibility of an armed conflict on an international scale is perceived rather as an opportunity due to the specific characteristics of the products offered and cooperation with the defense industry.

In the case of Company Y, the pandemic and the military threat are perceived less optimistically. Protecting workers in pandemic involved additional costs for the company. According to Company Y’s president, “the pandemic hit the company hard”. The potential armed conflict is perceived as more of an opportunity due to the company’s cooperation with the arms sector. The opportunity for the company is the withdrawal of its competitors from Russia and the possibility to expand operations in Ukraine. The aforementioned short-term conditions (Covid, armed conflict) prompted the company's employees to greater integration, consolidation of activities and stronger mobilization and motivation of the team. The processes

of integrating employees with the organization have intensified and the understanding of the company's mission and strategic goals has deepened. The company's problem at the moment is the need for greater automation of production processes, which would enable an increase in the scale of production due to the growing demand and favourable economic conditions for the company's products.

In the case of Company Z, the impact of uncertainty in relation to the so-called "Black swans" manifested itself mainly in impeding direct physical contact with potential users of its products, which, by affecting the effectiveness of research and development activities, translated into the functioning of the supply chain and, as a result, diminished the effectiveness and efficiency of market activities. With regard to the armed conflict, in the long term Company Z sees its effects as a development opportunity. This makes Z's way of thinking similar to the previously analyzed companies X and Y. In this case, adopting the strategic perspective may increase the company's sense of uncertainty by limiting access to modern devices that use new methodologies for the use of modern technologies. This concerns primarily the uncertainty resulting from the lack of sufficient information about new devices, as well as the lack of fuller communication between the leading scientific and research centers.

Conclusions

Modern management, conducted in conditions of increased uncertainty, has recently become even more difficult, mainly due to unexpected events, sometimes referred to as "black swans," which belong to the category of deep uncertainty. The most significant factors are the COVID-19 pandemic, which swept the world in spring 2020, and the armed conflict in Ukraine, caused by the aggression of the Russian Federation and the related threat of an international armed conflict. The research conducted shows that the uncertainties of various levels influence the entrepreneurial behaviour of high-tech companies. The entrepreneurial behavior of employees and entire organizations is the basis for the success or failure of the studied companies in the photonic industry. "Black swan"-type events forced the organizations to dynamic adaptation actions, which in turn intensified entrepreneurial activities both at the level of owners and employees. The senior management together with the owners of the companies was determined to undertake entrepreneurial activities in the area of reorganization of relations with employees, sales activities aimed at winning new contracts, reorganization, including the reduction of operating costs, and ensuring financial liquidity. Additionally, the increased uncertainty resulted in a greater consolidation of employee teams, and also generated additional resources of entrepreneurial opportunities and behaviors, in addition, employees were inclined to build more flexible relations with employers.

The research points to the following conclusions:

1. Short-term as well as long-term uncertainty factors are significant determinants of uncertainty affecting the entrepreneurial behaviour of a high-tech company. In the initial phase of uncertainty a "black swan", entrepreneurial behaviour is meant to ensure the company's survival and protect its resources. As the uncertainty level rises, entrepreneurial activities may move towards taking advantage of the emerging opportunities for the development of the enterprise, which results mainly from changes in the enterprises' surroundings.
2. The Covid pandemic has had a certain impact on disrupting the operation of high-tech companies' supply chains. On the other hand, however, the threat of an international armed conflict caused by the aggression of the Russian Federation against Ukraine, resulted in many competitors leaving Russia and Ukraine, which creates an opportunity for the studied companies to develop the "liberated market area" and, consequently, to expand into new markets.
3. The products of the studied companies, to large extent products of a niche character, are currently attracting increased market demand. The development of the defence industry and increasing expenditure on modernizing and rearming the armed forces is creating additional sales opportunities for products manufactured by companies in the Polish photonics industry.
4. The Russian Federation's current policy on the conflict in Ukraine, its attempts to make certain countries dependent on gas and oil supplies from the Russian Federation, and turbulence related to the supply of gas and oil to EU countries are increasing many countries' determination to become independent from gas and oil supplies from Russia. Thus, the companies studied are faced with an opportunity to enter the green energy market.
5. The studied photonics sector high-tech enterprises make use of the results of the latest research conducted in Poland and abroad. The strongest ties with their research centre of origin existed in the case of Company Z (hybrid-technology type) and to a lesser extent in Company X and Company Y (technology spin-offs).
6. Noteworthy are the conditions related to the uncertainty resulting from the financing of investments in the development of high-tech enterprises in the photonic industry. In addition, the lack of tradition in this industry in Poland and the lack of a photonics industry ecosystem mean that the number of financial institutions willing to invest in this industry is limited. It should be emphasized that the proposed investment financing conditions may differ significantly from the expectations of business owners, which results from the perception of risk factors and uncertainty of financial institutions.

Summing up, it should be emphasized that in the analyzed entities uncertainty had a significant impact on entrepreneurial activity at every organizational level. Paradoxically, due to the nature of the business and the products offered, the impact of unusual occurrences,

sometimes referred to as "black swans," had a positive effect on the analyzed entities and can be seen as an opportunity for development and building further technological and competitive advantages on the global market.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

SHAPING WORKING CONDITIONS IN THE PERSPECTIVE OF EMPLOYEE INTERESTS

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Purpose: The aim of the paper is to fill a gap in the research into employees' interests by determining the importance ascribed by employees – as part of their interests – to safe and hygienic working conditions, as well as determining possible directions for changes to elements that make up these conditions.
Design/methodology/approach: Due to the ambiguity of the concepts occupational health and safety and working conditions, as well as the differences in how aspects of these conditions are perceived, it was also considered justified to first identify how their essence is perceived in the subject literature.
Literature studies and empirical research were used. In this article, reference was made to the results of empirical research conducted among workers:

- in the years 2018-2020. Information was gathered using a questionnaire. The PAPI (*Paper and Pencil Interview*) techniques was also used. Additionally, the research made use of in-depth, informal interviews,
- in the years 2020-2022 using informal interviews.

The research conducted in the years 2018-2020 used a questionnaire addressed to a randomly selected sample of workers employed in businesses registered in the Lower Silesian voivodeship.
Findings: The results of the survey prove that occupational health and safety ranks first among the cafeteria of their interests considered by respondents. Interests from the point of view of employees were presented. It is also worth considering the perspective of employers.
Research limitations/implications: Limitations of the conducted research were pointed out, as well as further research directions.
Practical implications: The article proposes a new, adequate to the changes in the realities of the functioning of enterprises, the inclusion of the components of working conditions exposing in it, in addition to those already described, the elements of ICT conditions.
Social implications: Monitoring the interests of employees provides the basis for creating enterprises operating on the basis of the principles of sustainable HRM in the Polish reality.
Originality/value: The added value is to define the place of occupational health and safety among the interests of employees. The value is a new look at the material working conditions.

Keywords: interests of employees, occupational health and safety, working conditions, employers.

Category of the paper: research paper.

1. Introduction

The challenges currently facing business managers concern more than providing quality goods and services with economic rationality in mind. The social dimension of business is gaining increasing importance. This includes responsibility for the company's stakeholders. It is about, among other things, the desire of managers to satisfy the interests of employees and, as a result, to improve the quality of their lives. These interests are understood as the benefits of performing work for a particular employer or as the expectations of employees towards the employer.

In the literature - for a long time now - it has been stated that employees are the primary group of stakeholders (Stuart, 2002). This states that it is extremely important to be aware of employees' expectations (interests) (Maxwell, Knox, 2009). At this point, it is worth noting two of the numerous concepts, namely Employee Relationship Management (ERM) and the concept of Corporate Social Responsibility (CSR). The concept of Employee Relationship Management (ERM) emphasizes the emotional context of the employee's individual relationship with the employer (Strohmeier, 2013). On the other hand, a concept that "meets", as it were, the expectations of companies pursuing both economic and social goals, "listening" to the interests of stakeholders (including employees), is CSR.

The literature states that a key area of socially responsible activities within the framework of the CSR concept implemented for the benefit of an organization's employees is the provision of safe and healthy working conditions (Ruiz-Frutos et al., 2019; Macassa et al., 2021; Segal et al., 2003; Zwetsloot, Starren, 2003; Pawłowska, 2009).

The success of efforts to ensure that employees realize their interests in ensuring a sense of security of working conditions in reference to the realization of the CSR concept, will depend to a large extent on the conviction of employers and employees about the advisability of applying these measures. Considering it, the place given in the hierarchy of employees' interests to their interests in creating safe and hygienic working conditions is important. The actual approach to respecting these interests in companies is also critical.

Working conditions are most often perceived as factors that are present in the environment, connected with the nature of the work and the environment where the work is performed (Pocztowski, 1998). There are most often two groups of these factors, i.e. tangible (including material ones, such as machines and workstation equipment, physical, e.g. lighting, microclimate, and noise, chemical, e.g. organic and inorganic chemical compounds in the work

environment, and biological, e.g. pathogenic microorganisms present in the human work environment) and intangible (e.g. working time, social activity, interpersonal relations). A specific connecting factor between the above-mentioned elements of working conditions is occupational safety and health (Cierniak-Emerych, Pietroń-Pyszczek, 2019).

A characteristic element of the modern-day reality of company operation, and the reality of creating professional working life, is the ability to carry out work under conditions of a lack of stability and certainty of employment, and sometimes also the certainty of the location of the workplace. This is accompanied by technical and organizational changes in the conditions for completing tasks. The development of technology has resulted in specific changes to jobs, including the equipment used. As a result, there has been a change in the threats to the health and well-being of employees. This includes, for example, factors affecting health and well-being related to the use of new technologies, the ever-increasing number of hours working with information and communication devices etc. This can have specific effects on the physical and psychological health of employees. In a broader context, it can also affect the perception among employees of the issue of ensuring them safe and hygienic working conditions (occupational health and safety – OHS). Doing so, it can influence certain perceptions of working conditions in the hierarchy of workers' interests.

The main assumption of this paper is that ensuring employees safe, hygienic working conditions should be seen as an important part of employees' interests. The aim of the paper is to fill a gap in the research into employees' interests by determining the importance ascribed by employees – as part of their interests – to safe and hygienic working conditions, as well as determining possible directions for changes to elements that make up these conditions.

The following research questions were formulated:

1. What place does occupational health and safety (OHS) occupy in the hierarchy of employee interests?
2. What aspects of working conditions related to OHS do employees consider to be the most important in the hierarchy of their interests?
3. Are employee interests related to ensuring safe and hygienic working conditions respected by employers?

Due to the ambiguity of the concepts occupational health and safety and working conditions, as well as the differences in how aspects of these conditions are perceived, it was also considered justified to first identify how their essence is perceived in the subject literature.

For the needs of the research, studies of the subject literature were used, as well as empirical research in the form of a questionnaire conducted in the years 2018-2022.

2. Literature background

Occupational health and safety – working conditions

A popular thesis in management theory is that in order for a person to be actively and creatively engaged in their work, they must experience physical and psychological comfort in the place where they carry out such work. If this is the case, then for those commencing work, of particular interest – alongside the amount and structure of remuneration – should be that occupational health and safety is ensured. This requires an appropriate approach to shaping individual aspects of working conditions.

Safety is a need (a primary interest) whose provision is reflected in A. Maslow's classic pyramid of needs. The term safety is difficult to clearly define as it is interdisciplinary by nature. In the subject literature, safety is at times defined differently, for example for the needs of various scientific disciplines (Cierniak-Emerych, Gableta, 2022). According to one definition, safety should be linked to the ability to avoid harm resulting from risk, danger or threats (Cambridge Dictionary, 2021).

In management literature, under the term occupational health and safety (OHS), the issue considered is that of not exposing employees to the effects of dangerous and harmful factors related to working conditions. This refers to burdensome physical or psychological factors that are a danger to workers' health and well-being while they are carrying out work-related duties. Eliminating or minimizing such threats is meanwhile linked to the specific approach – also subject to change – preferred by the employer and employees for shaping working conditions.

In foreign publications, instead of proprietary definitions of working conditions, researchers relatively often use accepted definitions e.g., the European Foundation for the Improvement of Living and Working Conditions (Eurofound), or the International Labor Organization (ILO). Eurofound, for example (Eurofound, 2016), presents a relatively broad understanding of working conditions, relating this term not only to the work environment, but also to specific issues connected with employment conditions, indicating such issues as (Sajkiewicz, 1995):

- organization of work and activities related to work,
- health,
- safety and well-being,
- working hours,
- training,
- skills and opportunities for employment,
- balance between professional and private life,
- remuneration (TFUE, art.153).

The definitions of working conditions cited in Polish scientific papers are often of a proprietary nature, but are quite generalized (Cierniak-Emerych, Gableta, 2022). One commonly cited definition is that by A. Pocztowski, which states that working conditions are the total sum of factors that occur in a company related to the character of work and the surroundings in which it is carried out (Pocztowski, 1998). Following this example, it is worth drawing attention to a certain evolution of this definition towards it becoming more detailed (see the years 1998 and 2013). In the definition from 2013, it is stated that working conditions comprise the total sum of physical (material) and psychosocial factors that have their source in the work environment and affect the people carrying out work (Pocztowski, 2013). The author therefore distinguishes between the physical (material) and psychosocial factors that affect workers. Addressing the aspects indicated in the cited definitions, at the same time it must be noted that among the psychosocial, or rather social, aspects quite varied sets of factors are mentioned (Cierniak-Emerych, Gableta, 2022).

Research into individual aspects of working conditions is conducted at the European level, among others by the European Foundation for the Improvement of Living and Working Conditions (Eurofound, 2011). This institution's reports, as well as those of the International Labor Organization and the European Agency for Safety and health at Work are related, for example, to identifying changes to working conditions and the effects of these changes. In particular, this refers to changes in the perception of material working conditions and taking into account new, previously unknown threat factors. On this basis, among material working conditions (Table 1) – apart from the traditional physical, chemical, operational and biological components of these conditions – information and communication technology components were also identified (Cierniak-Emerych, Gableta, 2022).

Table 1.
Components related to material working conditions

Material working conditions				
physical	chemical	biological	operational	information and communication technology

Source: own elaboration in (Cierniak-Emerych, Gableta, 2022).

Nowadays, many people work more than twelve hours a day using a laptop or smartphone. The common use of information and communication technology devices is becoming ever more irrespective of the type or character of work, both for office work as well as in the field of production. This is conducive to a rise in the negative effects of such devices on the health of workers. As proven by scientific research, using such devices can result in serious health problems. This includes dizziness and nausea characteristic for a condition diagnosed by Coventry University and already referred to as 'cybersickness' (The Cyberpsychology Lab, 2018). Here, it is also worth drawing attention to so-called technological dependency (Lin et al., 2017) related to person – technical device relations. The issues indicated can therefore not be ignored, but should, as it would seem, be included under material working conditions.

In the last two decades, serious changes have also taken place in the field of non-material working conditions. A specific feature of company operations in the modern world is the implementation of flexible working hours, which can lead to the development of new forms of pressure and control over employees on the part of employers. This refers to the 'obligation' to carry out work duties related to using flexible working hour (Corwin, Lawrence, Frost, 2001). Another important accompanying issue is the use of teleworking or remote working.

Contemporary management realities also have a considerable influence on the psychological health of workers. This is not only related to the Covid-19 pandemic, which to a degree compounded not only the importance of ensuring material working conditions, but also the psychological aspects of work in the context of creating safe and hygienic working conditions. It is worth drawing attention here in particular to so-called workers' feeling of psychological safety, expressed in the degree of perceived interpersonal threat to employees resulting from negative behaviour on the part of members of the group or team in which an employee functions (Cierniak-Emerych, Gableta, 2022). As a result of this, so-called psycho-social risk management increases in importance (Wierzowiecka, 2022).

Working conditions - a perspective on research undertaken in the literature

A review of articles in foreign journals provided in the Web of Science and Scopus databases was conducted to identify scientific publications dealing with the topic of working conditions. A search using the keywords working conditions identified a total of 99,270 publications. Subsequently, restrictions were applied to the selected articles by eliminating records that were not in open access, in a language other than English and from outside the field of management. In addition, the exploration was narrowed down to publications from journals with the highest Impact Factor, which was identified from information made available on the journals' websites. The articles selected in this way were subjected to a detailed content analysis. The subsequent stages of record identification, together with the search criteria, are shown in Table 2.

Table 2.
Stages and criteria for identifying articles in the systematic literature review 2011-2022

Search criteria	Databases and the number of selected articles	
	Scopus	Web of Science
Number of publications with working conditions keywords in the period 2011-2022	69 078	30 192
Number of open access publications	18 446	8277
Number of publications in the management area	942	378
Number of publications in English	843	170
Number of publications in four journals with the highest Impact factor	57	11
Total number of publications selected for content analysis	68	

Source: own research.

Analysis of studies included in the Web of Science and Scopus databases showed that most publications related to the working conditions of individual professional groups, including: cleaners (Lundberg, Karlsson, 2011), IT industry workers (Legault, Chasserio, 2012), hotel industry workers (Lugosi, Ndiuini, 2022), clothing factory worker (Mena, Suddaby, 2016), comedians (Butler, Stoyanova Russell, 2018), and women from poor districts in South Africa (Stumbitz, Jaga, 2020). Working conditions were also studied during the COVID-19 pandemic for: migrants (Giordano, 2021), working mothers (Guy, Arthur, 2020), women employed in agriculture and the production sector (Sarker, 2021), and academic teachers (Yildirim, Eslen-Ziya, 2021). Against this background, it is worth underlining that a review of the literature addressing issues of working conditions and the aspects thereof demonstrated that there is still a lack of studies dedicated to directly addressing working conditions and related aspects from the viewpoint of workers' interests, as well as addressing desirable changes to these aspects.

3. Empirical research methods

In seeking answers to the research questions formulated in the introduction to this article, reference was made to the results of empirical research conducted among workers:

- in the years 2018-2020[1]. Information was gathered using a questionnaire. The PAPI (Paper and Pencil Interview) techniques was also used. Additionally, the research made use of in-depth, informal interviews[2],
- in the years 2020-2022 using informal interviews.

The research conducted in the years 2018-2020 used a questionnaire[3] addressed to a randomly selected sample of workers (this included both those on full-time contracts as well as e.g., fixed-term contracts) employed in businesses registered in the Lower Silesian voivodeship. On the basis of data from EURES (the European Employment Services Network), it was determined that the number of workers in employment (in the Lower Silesian voivodeship in the company sector) in 2018 was 484,100. For the needs of the research, a random sample was selected of n = 274 from the total population of workers employed in businesses registered in the Lower Silesian voivodeship. Assuming a maximum estimation error of 6%, a level of significance of $\alpha = 0.05$, and an estimated fraction size of 0.5 for a finite population of N = 484,100, the minimum sample size is n = 267. The randomness of the sample was achieved using a random operation in the form of a database of workers employed in

[1] The research results presented here are part of broader research into employee interests and how far they are respected by one of the co-authors of this article, and presented in a broader context in a monograph (Cierniak-Emerych, Gableta, 2022).

[2] Cooperation with the IPC Sp. z o.o. Research Institute was used at this stage of the research.

[3] The questionnaire covered a range of interests. For more information on the questionnaire, see (Cierniak-Emerych, Gableta, 2022).

businesses registered in the Lower Silesian voivodeship from a population of workers defined for the purposes of the research.

In terms of gender, the research respondents were made up of 50.4% women and 49.6% men. As regards age, 24.5% of respondents were below 30 years of age, while one in four respondents were between the ages of 31 and 40. The most numerous group was of people aged 41 to 50 years of age, making up 28.8% of the total study group.

In the years 2020-2022, given the changes that occurred in everyday life, including the Covid-19 pandemic, informal interviews were conducted with respondents who had previously taken part in research. Those who agreed to participate were selected for the study (around 30% of those who answered the research questionnaire).

4. Discussion of results

In answer to the first of the research questions (What place does occupational health and safety (OHS) occupy in the hierarchy of employee interests?), it was found that health and safety was in first place among the spectrum of interests considered by the employees (96.3% of respondents' answers). In second place were interests related to ensuring remuneration adequate to performed duties (96% of answers), while in third place with 92% of answers was a good work atmosphere. Workers were also interested (81% of answers) in the opportunity to have an influence on the organization of working hours (Table 3). The above indications regarding safety and hygiene at work were also confirmed by parametric results for the sample. The average for answers to the question on the level of importance of OHS was 4.54, with a standard deviation of 0.593, a median of 5.0 and a dominant of 5.0. Meanwhile, the value of the asymmetric coefficient was -1.095.

In research from 2020-2022, occupational health and safety was also considered by respondents as their most important interest. In this context, it should be added that occupational health and safety somewhat increased in importance among employees' interests in comparison to research conducted in 2010-20124 that also concerned employees' interests. The research used a similar spectrum of interests, and was also conducted on a group of workers from businesses operation in Lower Silesia. At that time, occupational health and safety was in second place in the hierarchy of interests.

[4] A. Cierniak-Emerych and A. Pietroń -Pyszczek were members of the research team. For more information on the research results see: *Interesy pracowników i ich respektowanie* (Employee interests and the degree to which they are respected), (2012), ed. M. Gableta, Wrocław University of Economics Publisher, Wrocław.

Table 3.
Interests considered important and very important by the employees surveyed

	Interests	% of indications
1.	Health & safety and good sanitary working conditions	96.3
2.	Remuneration commensurate with responsibilities	96.0
3.	Good working atmosphere	92.0
4.	Clear criteria for evaluating tasks performance	91.2
5.	Adequate flow of information and good communication	88.7
6.	Assistance from superiors and co-workers	86.7
7.	Opportunity for professional development	85.6
8.	Influence on the selection of remuneration components	85.4
9.	Transparent rules for promotion	85.0
10.	Indefinite period of employment	85.0
11.	Employment protection (protection against dismissal)	83.9
12.	Training at the employer's expense	81.7
13.	Impact on the working time organisation	81.0
14.	Influence on the selection of co-workers	80.0
15.	Health benefits at the employer's expense	78.0
16.	Protection of social benefits	75.6
17.	Formal procedures for giving opinions	74.5
18.	Assistance with layoffs	68.7
19.	Participation in management (consultation)	87.5
20.	Assistance from trade unions/employee councils	64.9
21.	Participation in management (participation in decision-making processes)	62.8

Source: Cierniak-Emerych, 2023.

The research conducted confirms the importance of working conditions as an interest of employees. It should be remembered that studies show that despite the interest in working conditions, occupational health and safety, despite research on the state of working conditions, there are still many situations that endanger the lives and health of workers due to poor working conditions. Reports from the International Labor Organization show that there are 2.9 million deaths each year due to occupational accidents, and 2.32 million people die each year as a result of work-related illnesses (ILO, 2022). Studies show that extended working hours, for example, prevent a worker from adequate recovery, (Sánchez, 2017). In turn, excessive workload and extended working hours result in an increased risk of stroke (Kivimäki, Kawachi, 2015). All of this also affects work efficiency. Improving working conditions positively affects the health and well-being of employees (Belloni, Carrino, Meschi, 2022; Bratberg, Holmås, Monstad, 2020). It should therefore be important to continuously monitor the interests of employees regarding working conditions and their individual elements. The elements of working conditions and their impact on workers' health and lives are subject to change.

In terms of the second research question, it was found that in the opinion of workers (from the research conducted in the years 2018-2020), the most important aspects of working conditions for them were material aspects, including operational (workstation equipment) and physical (temperature, lighting, noise), as well as issues of organization of working hours (especially the issue of using flexible working time solutions, and including preparation and finishing time in total hours worked). In terms of operational aspects, employees also paid particular attention to the issue of use of ICT devices and the length of time they were used,

as well as their negative effect on both physical and mental health. In the years 2020-2022 meanwhile, they additionally emphasized the importance of biological factors, which was connected to the COVID-19 pandemic. Here, they also pointed to the importance of individual and collective protection equipment and their use by employees, as well as their provision by employers. In addition, in both research periods, emphasis was placed on the importance of psychological working conditions, including the creation of psychological comfort in the workplace, which is something that is still underappreciated by some employers.

Workers' attention to elements of working conditions related to the use of ICT devices confirms, so to speak, the legitimacy of singling out this issue among the components of material working conditions. Research findings increasingly point to the negative effects of, among other things, the excessive and inappropriate use of ICT devices at work. Their use increasingly leads to the replacement of existing relationships between people by relationships between workers and ICT devices. These effects are already being seen as addiction or phonoholism. These issues cannot be ignored in the design of working conditions at company level. As indicated in the literature, the failure to satisfy the interests of employees (Ali, 2016), including those related to health and safety at work, can lead to the search for employment with other employers.

This consideration of the last of the research issues provides in part an answer to the third research question: Are employee interests related to ensuring safe and hygienic working conditions respected by employers? The research results from the years 2018-2020 proved that almost all of the respondents (96.7%) had safe and hygienic working conditions ensured at the workplace. This was confirmed by slightly fewer respondents (84%) in the research from the years 2020-2022. It may be that one of the reasons for such a result was that the research period included the COVID-19 pandemic.

However, the seemingly high percentage of respondents' indications of providing them with safe and hygienic working conditions may raise some questions. After all, data from the Central Statistical Office show that in the first quarter of 2023, 14300 people in Poland were reported to have been injured in accidents at work (including 40 people while performing remote work). This was 28.7% more than in the first quarter of 2022. In addition, the number of injured persons per 1,000 employees (accident rate) also increased from 0.82 to 1.00. (GUS, 2023). Therefore, caring for the proper formation of working conditions in the enterprise should be an ongoing task for both employers and researchers. These conditions, and mostly the interests of employees related to them, require constant monitoring.

5. Summary

Ensuring company employees, a feeling of safety related to suitable working conditions, including eliminating or limiting threats to their health or well-being, while at the same time striving to ensure the efficiency of work-related tasks, requires improvement in material, non-material and psychological aspects of the working environment. Several years ago, it was postulated that in the coming years there could be a significant decline in psychological aspects, mainly due to an increase in work-related stress (Eurofound, 2016), including that resulting from the popularization of the use of ICT devices. It is therefore important not only to give considerable importance to the creation of safe and hygienic working conditions, but also to continuously monitor the changes occurring in workers' interests, related, among others, to the ongoing appearance of new threats in the work environment. It is equally important for employers to respect the interests of employees in terms of ensuring them a feeling of occupational health and safety.

The considerations discussed here are certainly not an exhaustive exploration of the issue, in part due to the limitations related to the length of the text. Specific issues have therefore only been indicated and may also have been treated incompletely, which will be addressed in further research studies. One of these imperfections is the fact that the considerations, here the interests of workers, are only presented from the point of view of employees. In further studies, it is planned to also address the viewpoint of employees' interests related to working conditions from the perspective of employers.

The considerations presented here are therefore the starting point for broader studies and analysis on the research subject. A particularly interesting area of continued research would seem to be changes occurring on the labour market related, for example, to the diversity of workers in terms of age, cultural conditions, the post-COVID-19 situation and finally migration, especially from Ukraine.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

HUMAN FACTORS IN SIMULATION MODELLING OF EVACUATION DURING MASS EVENTS

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Purpose: The goal of this research work is to present the possibility of applying the simulation modelling of evacuation conditions software in the preparation of a mass event management plan. These software allow the introduction of dimensional characteristics of agents, but their consideration is most often implemented in a simplified manner or ignored. Using a selected example, the methods of including the dimensional characteristics of persons during analyses are presented.
Design/methodology/approach: The paper presents the preparation stages of the simulation modelling process of crowd flows using the example of an open air event. The paper is preceded by a review of research into the determinants of crowd flows and good practices and guidelines for organising and managing mass events. The result of the research is a presentation of the application possibilities of simulation modelling taking into account human dimensional characteristics in decision support during the planning of mass event organisation.
Findings: The results of the study provide a demonstration of how to integrate the simulation modelling involving anthropometric criteria into the management process of mass events.
Research limitations/implications: The results of the research are presented using a selected example. By increasing the number of variants of event scenarios, it will be possible to identify detailed relationships between the modelled parameters and develop guidelines for managers of mass events.
Practical implications: The application of simulation modelling to the analysis of crowd movement during the organisation of mass events, makes it possible to predict the threats that may occur in emergency situations. The results of the research will expand the catalogue of criteria considered during evacuation modelling to include anthropometric data.
Social implications: Based on the analysis of the literature, there are shortcomings in the research basis of the guidelines considered during the planning of mass events. They are based in many aspects on experience and require a structured methodical and analytical approach during planning.
Originality/value: Research work on evacuation modelling has so far not emphasised the importance of the impact of changes in dimensional characteristics on simulation results. This paper presents a method of considering anthropometric data during simulation modelling.

Keywords: crowd moving, evacuation modeling, anthropometric data, crowd management.

Category of the paper: Research paper, conceptual paper.

1. Introduction

The problem of evacuation or movement of large concentrations of people (crowds) is the subject of simulation analyses involving events, facilities or areas such as:

- religious mass gatherings (Basak, Gupta, 2017; Zhao et al., 2019; Farook et al., 2020; Owaidah, 2021);
- passenger cruise ships (Hu, Cai, 2022);
- airport terminals (Yang, Tang, Wang, 2022; Jasztal, 2022);
- train and metro stations (Shiwakoti, 2020);
- stadiums (Mahmudzadeh et al., 2020; Gravit et al., 2022; Ivanusa, 2023);
- cities, neighbourhoods, streets, etc. (Zhao et al., 2021; Yoshimura, 2023; Ronchi, 2019; Onelcin, 2013).
- open air events (Strongylis et al., 2019; Still, 2000; Kapałka, 2016), itd.

Crowd movement is one element of proactive crowd management. Crowd management is a systematic plan for achieving the goal of orderly movement and gathering of people. When organising a mass event, a crowd management plan should be prepared taking into account: crowd density, behaviour and circulation (arrival, duration and departure) (Keys to Crowd Management Planning, 2020; Bishop, 2020; Eckes, 2012). The effectiveness of crowd management is impacted by (Sharma et al., 2018):

- effective event planning,
- crowd monitoring and control (crowd control refers to actions implemented after incidents get out of hands, such as responding to prevent injury, restricting or limiting behaviour or responding to an unexpected emergency (Keys to Crowd Management Planning, 2020)),
- gathering information after the event,
- reporting on lessons learnt for more effective systems in the future.

The crowd management process is often aided by techniques for automatically monitoring the number and density of people (Yang, 2022; Sottile, 2022; Herrmann, 2012; Royo, 2022). In addition, a number of models of crowd behaviour based on experiments from the biological and physical sciences can be distinguished (Kok, 2016).

When organising mass events, it is indispensable to comply with legal requirements. According to the Act of 20 March 2009 on the safety of mass events (Journal of Laws 2023, item 616), it is possible to determine the area of the land on which the event is organised based on the information contained in the definition of the area allowing for the holding of a mass event: ... *a separate, appropriately marked area in the open air, complying with hygiene and sanitary conditions in accordance with the requirements provided by law and having infrastructure ensuring the safe conduct of the mass event, in which the number of places for people is determined at the rate of 0.5 m^2 per person.* The expected density is therefore

a maximum of 2 persons/m^2. According to the "Guidelines for district fire brigades of the Mazovian Voivodeship", when organising a mass event in an open area, it is necessary to:

- divide it into sectors, with appropriate areas separated from each other by escape routes 4.5 m. wide, for no more than 2,000 seats and 6,000 standing places;
- mark sectors with capital letters of the alphabet A, B, C;
- sectors to be divided into 6 sections - a section may not have more than 350 seats and 1,000 standing places;
- label the sections with Arabic numerals 1 to 6;
- sections in the sectors are separated by 3 m wide aisles;
- fence off sectors - in cases where sectors are fenced off with metal fences or wooden structures, at least two exits of an appropriate width (approx. 20-40 % of the values assumed for buildings) should be provided, with the possibility of quickly clearing them - excluding the front lines of sectors and the sides of sectors adjacent to the main escape route; the rigging separating sectors and sections - attached to posts - should be easily removable;
- the main access road to the central ritual or event venue should be at least 6 m wide.

A number of research papers have analysed the relationship between crowd speeds and crowd density (Yugendar, Ravishankar, 2019; Vermuyten et al., 2016; Kang et al., 2015; Nelson, Mowrer, 2002). It has been observed that walking speed can depend on individual characteristics (own pace, independent of others) at crowd densities of up to about 0.54 persons/m2. If the crowd density exceeds about 3.8 persons/m^2, there will be a stoppage of the crowd until enough people leave the congestion and the density decreases (Nelson, Mowrer, 2002; Kang et al., 2015). In addition, age, gender, density and having luggage are important criteria affecting crowd speed (Yugendar, Ravishankar, 2019). Many classifications of crowd density are distinguished in the literature. One of them considers five categories (Farook et al., 2020):

- Very low density (VLD): $\leq$ 0,43 persons/m^2,
- Low density (LD): 0,43-0,72 persons/m^2,
- Medium density (MD): 0,72-1,08 persons/m^2,
- High density (HD): 1,08-2,17 persons/m^2,
- Very high density (VHD): $\geq$ 2,17 persons/m^2.

With density, the evacuation rate changes. This has been presented in many literature sources (Table 1).

Table 1.
Examples of the relationship between density and speed of crowd movement

Item	Data source	Crowd density [person/m^2]	Speed of movement [m/s]
1	Kang et al., 2015	1 2 3 4 5 6	1,4 0,7 0,47 0,35 0,28 0,23
2	Nelson, Mowrer, 2002	0,54 1 2 3 3,76	1,2 1,03 0,66 0,28 0
3	Still, 2000	0,5 1 2 3 4 5	1,34 1,34 0,91 0,61 0,45 0,36
4	Oberhagemann, 2012	0,8 0,8 to 1,2 1,2 to 1,7 1,7 to 2,5	1,23 to0,84 0,82 to 0,49 0,52 to 0,4 0,35 to 0,3
5	Vermuyten et al., 2016	Maximum free-walking speeds when the density goes to zero (data based on a review of studies of many authors)	1,3 1,61 0,6 1,4 1,25 1,34

Source: own elaboration based on: Kang et al., 2015, Nelson, Mowrer, 2002; Still, 2000; Oberhagemann, 2012.

The parameters in Table 1 were partly a result of analyses conducted in buildings but with large spaces and can also be applied to simulation modelling in open spaces.

A number of evacuation models are used in crowd evacuation analyses (Zheng et al., 2009):

- cellular automata models (CA),
- lattice gas models (LG),
- social force models (SF),
- fluid-dynamic models (FD),
- agent-based models (AB),
- game theoretic models, and
- approaches based on experiments with animals.

These models provide, among other things, the opportunity to take into account the relationship that binds groups of people in a crowd. When mapping crowd behaviour (Zheng et al., 2009):

- pedestrians are treated as homogeneous individuals or heterogeneous individuals (groups) with different characteristics;
- the behaviour of a collection of individuals results from individual interactions between multiple individuals or the collection of individuals is treated as a whole;
- crowd movement is characterised in normal or emergency situations.

The most heterogeneous models are AB (agent-based models). Their use is particularly beneficial for modelling emergency situations (Bonabeau, 2002). They make it possible to represent many individual characteristics related to evacuation behaviour. These include anthropometric characteristics. Visualisations in computer applications for evacuation modelling present people as (Dahlke, 2020; Dahlke, Idczak, 2021):

- circles (Pathfinder Verification and Validation, 2020),
- ellipses (Zou, Xu, Gao, 2010),
- combination of three mobile, flexible circles (Chooramun, Lawrence, Galea, 2012; Korhonen, Hostikka, Heliövaara, Ehtamo, 2010; Thompson, Marchant, 1995).

Many studies on evacuation models use an ambiguous description of the dimensional features. The maximum dimensions in the top view are most often based on:

- shoulder width (Pathfinder User Manual, 2020);
- shoulder breadth (Still, 2000, p. 32) - Shoulder breadth (bideltoid) – maximum horizontal shoulder width, measured to the convexity of the shoulder muscles (Pheasant, 2003, p. 37); - Shoulder breadth (biacromial) – horizontal distance between the arms, measured between the anthropometric points of the acromion (Pheasant, 2003, p. 37);
- shoulder breadth maximum (Nowak, 2000);
- elbow to elbow breadth (Gedliczka, 2001).

In the anthropometric atlases containing the dimensional characteristics of the populations of individual countries, a steady increase in values can be observed due to living and nutritional conditions, among other factors. The variability of these characteristics can have a significant impact on the results of simulation modelling. However, such studies have been conducted on the example of buildings (Dahlke, 2020). In the research presented in the following chapters, the author presented the possibilities of using an application for simulation modelling of evacuation conditions taking into account dimensional characteristics in the process of supporting the preparation of a plan for open air events. The way in which variants for the division of the site into sectors and sections can be analysed and how to create applications in a mass event management system is presented.

2. Methods

The Pathfinder application (Pathfinder User Manual, 2020; Pathfinder Verification and Validation, 2020) was used for the simulation analyses of the movement conditions of people during a sample mass event. At the outset, the primary purpose of the analysis must be assumed. This could be, for example, the dispersal of people after the mass event or evacuation after an emergency. In the second case, the scenarios would depend on a number of factors and, in an open area (undeveloped), could take into account the possibility of crowd dispersal (even in star form). This paper will present the first case, involving the exit of the crowd after the gathering. Several assumptions are made at the outset:

- an existing example of the site will be mapped, but its use will be based on theoretical scenarios;
- the site will be divided into sectors and sections respecting the recommendations of the National Fire Service: up to 6,000 people standing in sectors and up to 1,000 people standing in sections (Warunki bezpieczeństwa pożarowego…, 2003);
- during the analyses, it was assumed that 32,000 people would gather at the sample site in six sectors.;
- variants of the density of people in sectors and sections according to legal requirements and for examples of literature analyses (Table 2) will be analysed; on this basis, variants of the dimensions of the section sides were determined, assuming that one of the sides would be 30 m long;
- a sector layout extended along the central road was proposed (Fig. 1);
- there are 3 m wide roads between sections and 4.5 m wide roads between sectors; a 6 m wide road leads through the centre of the square;
- sectors and sections are fenced off with barriers and there are two exits - each 3m wide - from the section to the escape route;
- people go home using designated evacuation routes, despite the possibility of crossing;
- three routes of dispersal from the study area were considered;
- the width of the exit routes from the site, were: Exit 1: 6 m, Exit 2: 11.9 m and Exit 3: 6.03 m (Figure 1);
- the dimensional characteristics of the people and their walking speeds were adopted according to anthropometric atlases and literature data and are included in Table 3 (the analysis included an example of a random distribution of people aged between 14 and 65 years).

The following steps were taken to perform the analysis:

- selected map of the area where the mass event will be organised (www.geoportal.gov.pl);
- simulation scenarios were developed (density of people in sectors and sections (Table 2); characteristics of the population modeled during the simulation were determined for the age groups selected in the initial assumptions (gender, dimensions (according to Nowak, 2000), walking speed); percentages of each age group were adopted (Table 3));
- a map of the site was prepared in AutoCAD (site outline; division into sectors and sections; roads between sectors and sections (Figure 1)) for each scenario;
- importing maps/graphics from AutoCAD into Pathfinder;
- preparation of graphics for simulation (extraction of surfaces and introduction of persons/agents) (Figure 2);
- performing simulations and collecting data for analysis;
- data analysis.

Table 2.
Areas of sectors and sections for crowd densities selected for simulation

Scenario No.	Crowd density [persons/m^2]	Area of the sectors [m^2]	Area of the section [m^2]	Section side length in [m], with the width of the second of the side equal to 30 m
1	0.43	13953.49	2325.58	77.52
2	0.54	11111.11	1851.85	61.73
3	0.72	8333.33	1388.89	46.3
4	1	6000	1000	33.33
5	1.08	5555.56	925.93	30.86
6	2	3000	500	16.67
7	2.17	2764.98	460.83	15.36
8	3	2000	333.33	11.11

Source: own elaboration based on: Farook et al., 2020; Kang et al., 2015, Nelson, Mowrer, 2002; Still, 2000; Oberhagemann, 2012.

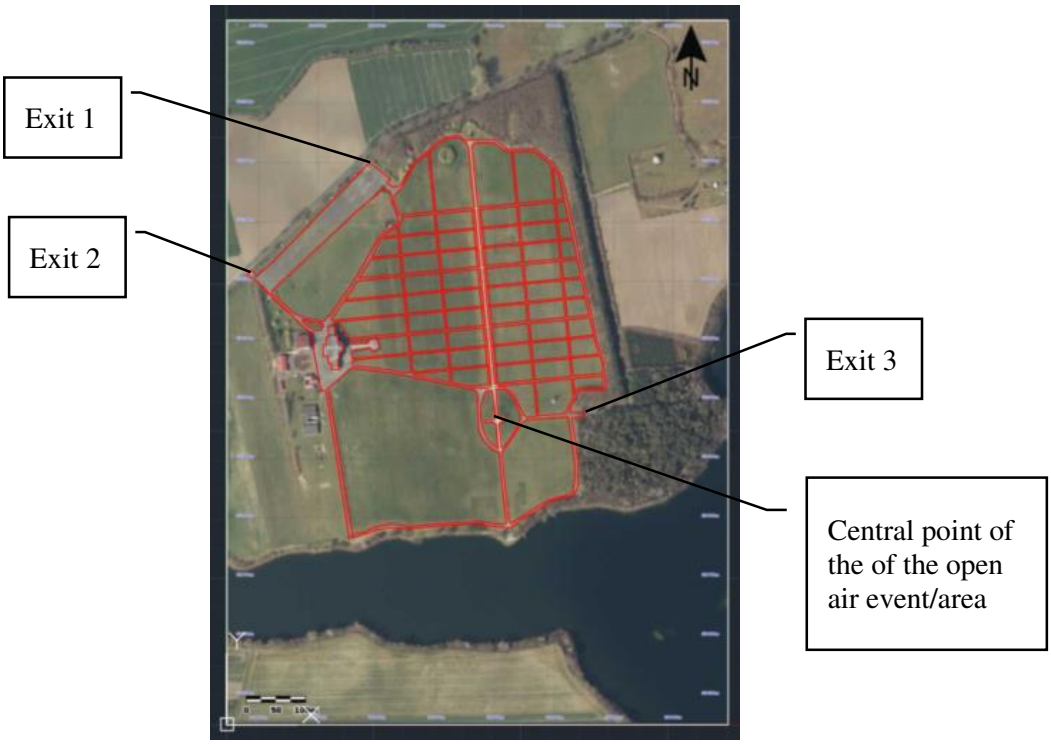


Figure 1. Example of how to divide a site into sectors and sections and how to make an outline of escape routes in AutoCAD.

Source: own elaboration based on the map from the platform www.geoportal.gov.pl.

When planning the distribution of sectors and sections on the map of the study area, a decision was made to divide it into rectangular sections. For analytical purposes, it was assumed that one side of the section would be 30 m long. At the initial stage of consideration, it was determined that the effect of crowd density in the sections on evacuation times would be investigated. Assuming different crowd density values, the areas of sectors and sections were calculated (Table 2). This made it possible to determine the length of the second side of the section. When planning the layout of the sections, it was assumed that the longer side of the section would be located on the side of the central point of the open air event (Figure 1). As the size of the sections and sectors decreased and the crowd became denser, changes were made to the row and column layout for densities of 1.0 and 1.08 persons/m^2 (Figure 2e and 2d). In each example analysed, the number of sectors was 6 (36 sections - except for scenario 1, where 35 sections were designated).

By distributing the agents in each section, the automatic ordered group insertion function was used at a given computational density. The total number of agents was 32,000.

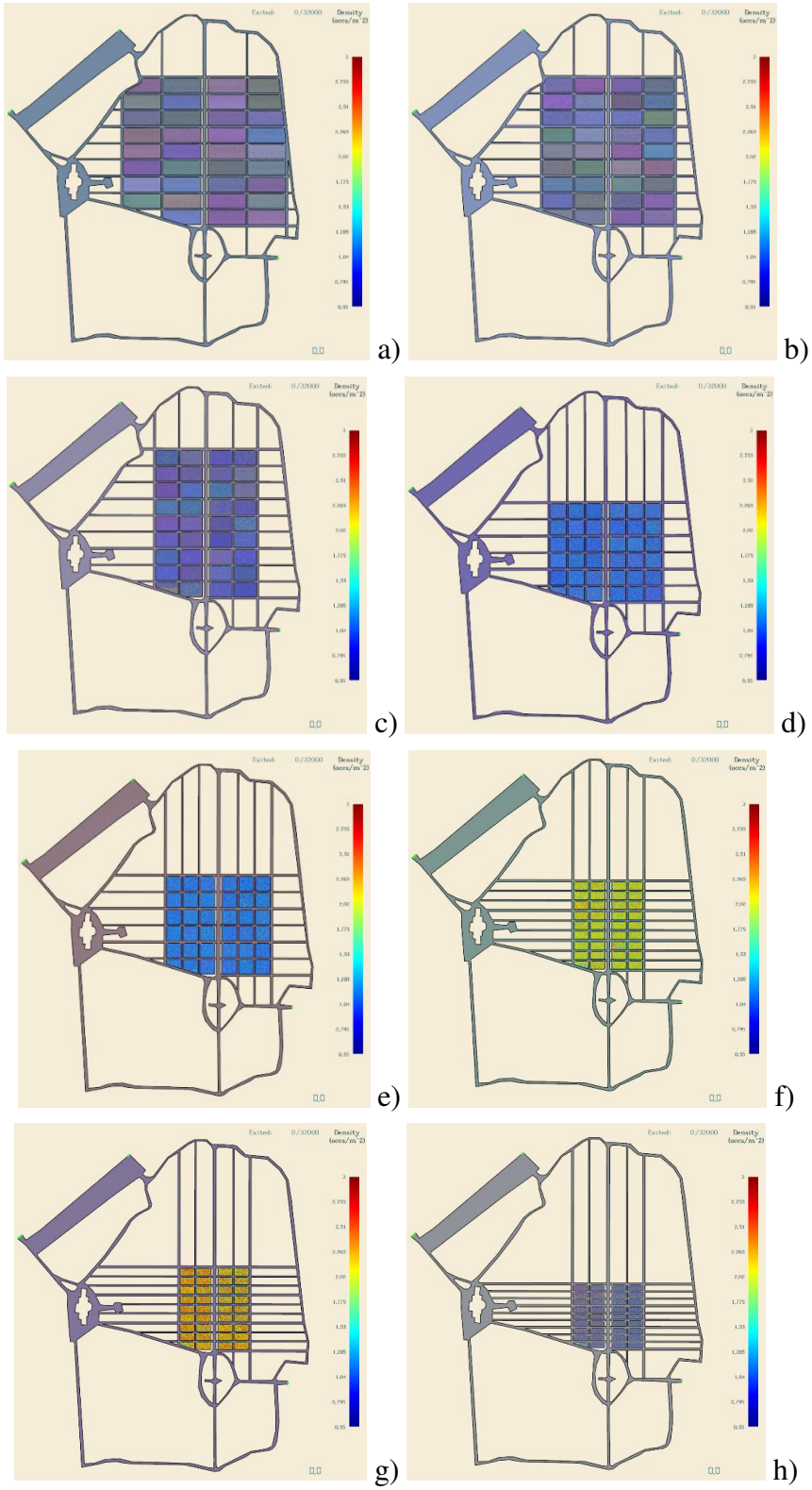


Figure 2. Variants for the distribution of sectors and sections for the analysed scenarios (Table 2); a) density 0.43 persons/m^2; b) density 0.54 persons/m^2; c) density 0.72 persons/m^2; d) density 1.0 persons/m^2; e) density 1.08 persons/m^2; f) density 2.0 persons/m^2; g) density 2.17 persons/m^2; h) density 3.0 persons/m^2.

Source: own work in Pathfinder software.

It was assumed that people would leave the square by heading to the three exits (Figure 1) via designated routes (not cross-country). The choice of exit will be made automatically.

Table 3.
Anthropometric features by simulation scenario

Item	Age group	Population percentage	Name of anthropometric feature	5th percentile female [cm]	50th percentile female [cm]	95th percentile female [cm]	5th percentile male [cm]	50th percentile male [cm]	95th percentile male [cm]	Range of speed [m/s]
1	♂: 19-65 ♀: 19-60	5	- shoulder breadth maximum: - chest depth: - stature:	39.5 20.8 153.6	45.3 25.6 163.4	52.5 31.1 174.0	45.6 21.7 166.0	51.8 26.0 177.8	58.8 30.4 189.0	0.72-1.13 0.61-0.853
2	♂: 14 ♀: 14	19	- shoulder breadth maximum: - chest depth: - stature:	34.9 14.2 154.9	39.7 16.6 164.5	44.1 18.9 174.4	33.8 15.5 152.8	41.0 18.0 167.3	48.2 20.5 181.0	0.932-1.5 0.89-0.99
3	♂: 15 ♀: 15	19	- shoulder breadth maximum: - chest depth: - stature:	35.1 14.5 155.9	40.3 16.8 166.4	45.2 19.1 177.2	35.6 15.9 161.0	42.4 18.7 174.1	49.2 21.5 187.5	0.932-1.5 0.89-0.99
4	♂: 16 ♀: 16	19	- shoulder breadth maximum: - chest depth: - stature:	35.2 14.7 156.7	40.7 17.2 167.6	45.4 19.7 179.7	38.3 16.5 165.5	44.2 19.4 178.3	50.1 22.3 188.5	0.932-1.5 0.89-0.99
5	♂: 17 ♀: 17	19	- shoulder breadth maximum: - chest depth: - stature:	35.9 14.9 158.0	40.8 17.3 168.1	45.4 19.9 180.4	38.5 16.7 167.7	44.9 19.6 179.9	50.8 22.3 191.7	0.932-1.5 0.89-0.99
6	♂: 18 ♀: 18	19	- shoulder breadth maximum: - chest depth: - stature:	36.9 15.4 159.2	41.2 17.4 168.6	46.2 19.9 181.1	40.8 16.9 170.8	45.8 19.6 181.2	51.5 22.5 192.1	0.932-1.5 0.89-0.99

Source: Own work based on: Dahlke, 2020; Gedliczka, 2001; Nowak, 2000; Yugendar, Ravishankar, 2019.

In the simulation model implemented in the Pathfinder application, agents were assigned dimensional characteristics and speed (Table 3) randomly according to a normal distribution.

3. Results

For each deployment scenario (Figure 2), simulation results were obtained:

- total time to leave the area (Table 4);
- graphs of the flow of people through the various exits (Figure 4);
- animation with surface plots of crowd density variation over time (Figure 3).

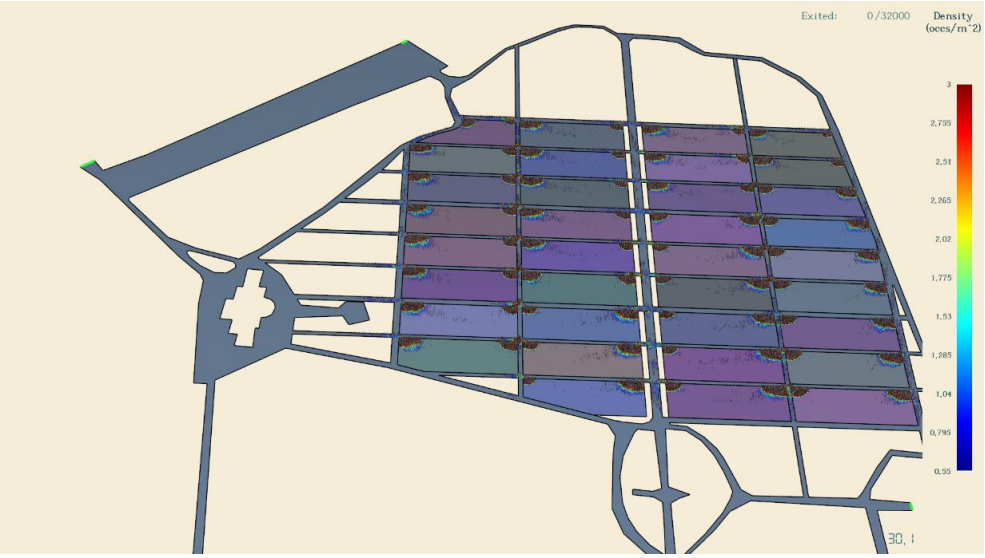


Figure 3. View of an example simulation with area plots of the variation of crowd density in the area under analysis over time.

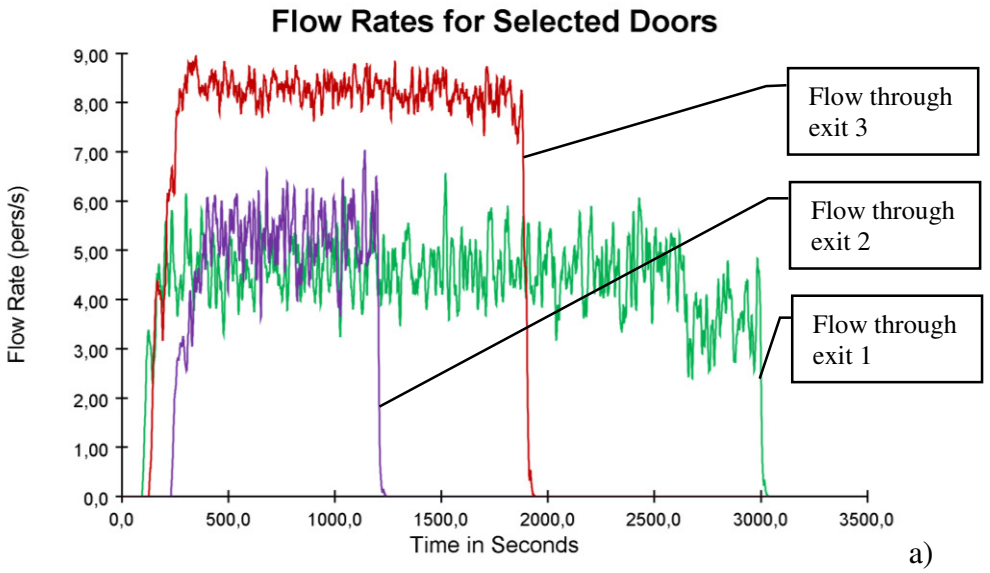
Source: own work in Pathfinder software.

Table 4
Total crowd exit times

Scenario No.	Crowd density [persons/m^2]	Number of section rows along the central road	No. of exit through which the flow takes the longest	Total time to leave the open air event site [s]
1	0.43	4	1	3036.3
2	0.54	4	1	3015.8
3	0.72	4	1	3125.8
4	1	6	3	2606
5	1.08	6	3	2648.3
6	2	4	3	3180.3
7	2.17	4	3	3196.3
8	3	4	3	4065.8

Source: Own work.

The results of the crowd exit times presented in the table above (Table 4), facilitate the selection of the sector density variant. The shortest leaving times were obtained for a density of approximately 1 persons/m^2. The results of the two cases analysed were influenced by the different arrangement of the sections (six vertical rows instead of four). However, the remaining data show an increasing trend - as the crowd density in the sections increases, the time to leave the area increases.


Flow Rates for Selected Doors
Flow Rate (pers/s)
9,00
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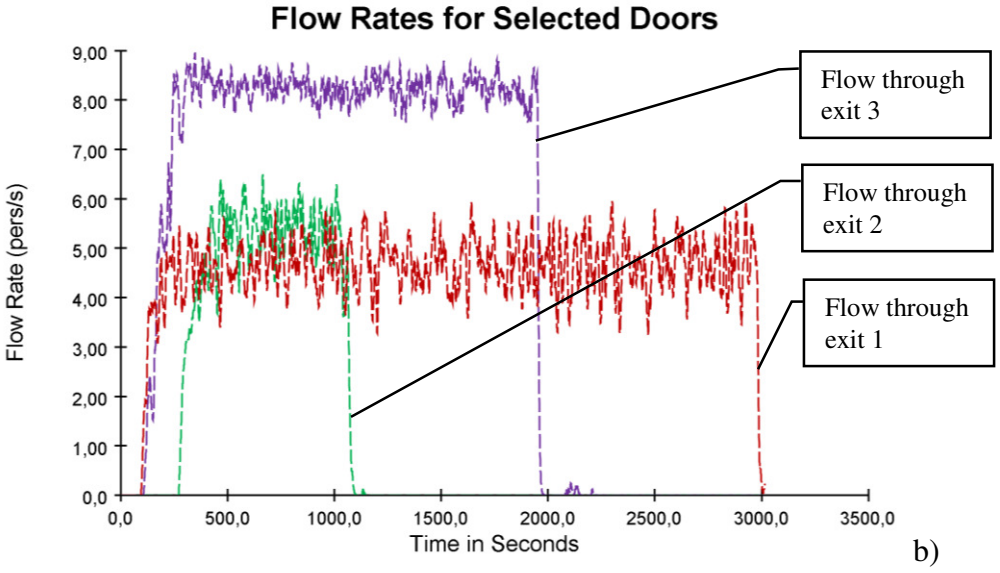
2000,0
2500,0
3000,0
3500,0
Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

a)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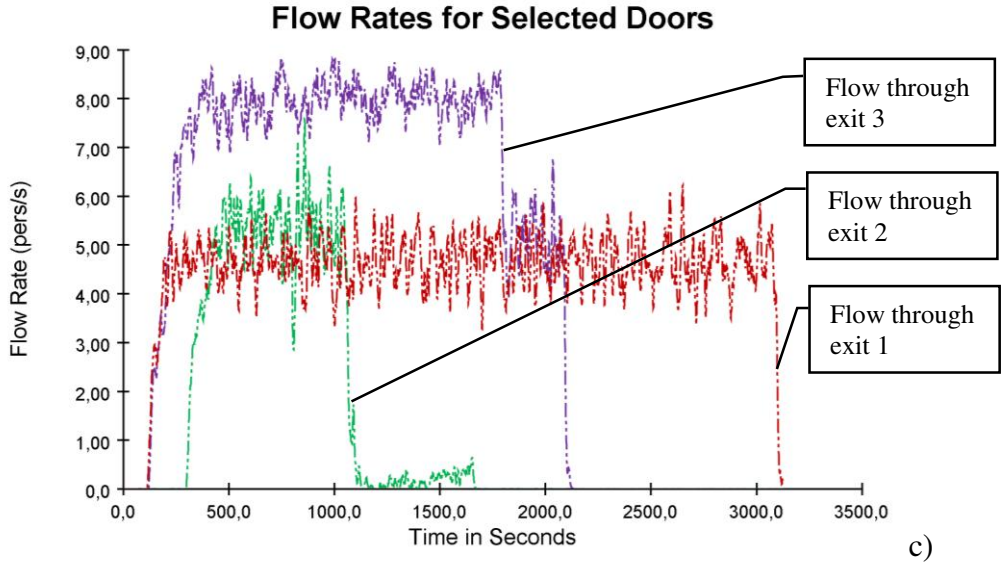
Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

b)


Flow Rates for Selected Doors
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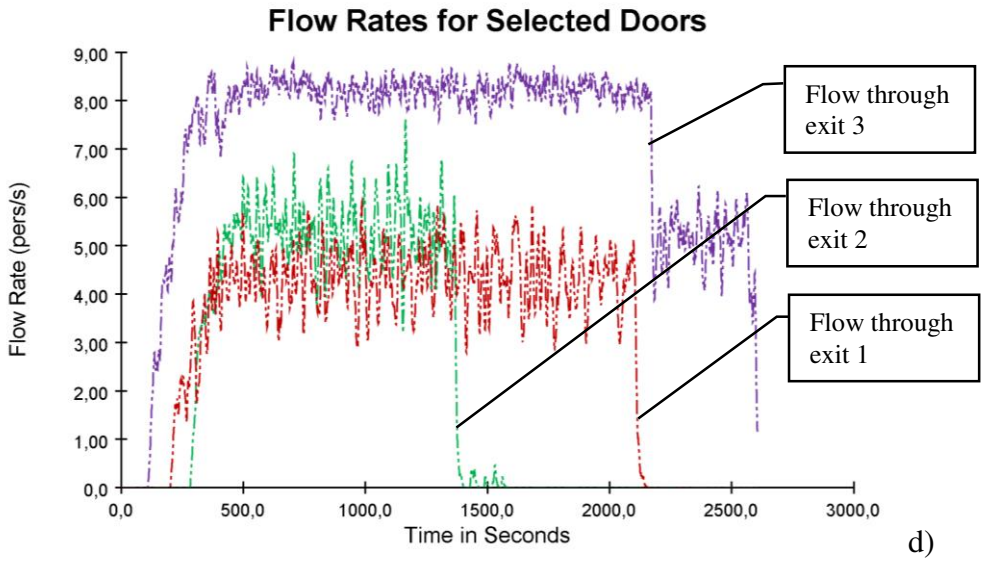
Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

c)


Flow Rates for Selected Doors
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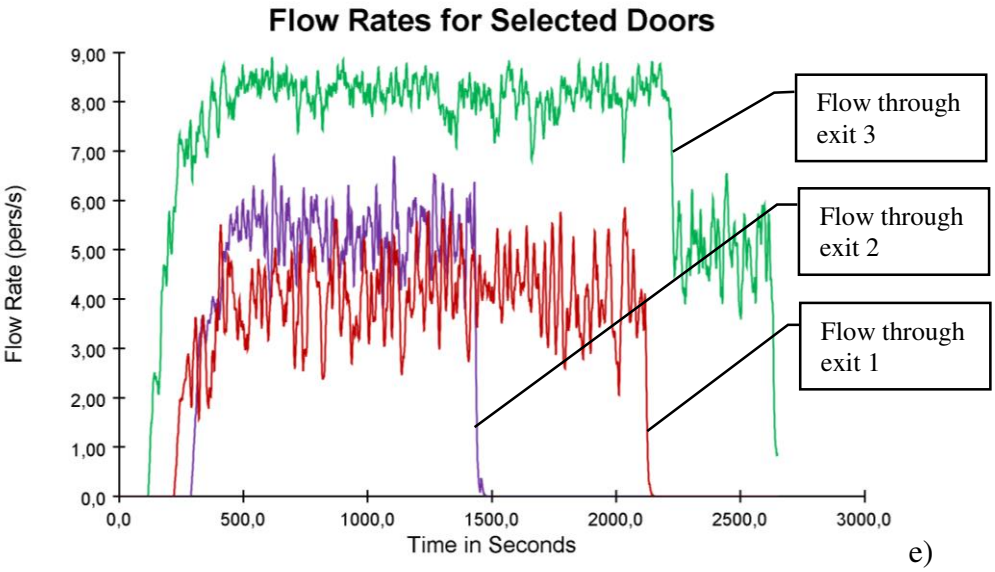
3000,0
Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

d)


Flow Rates for Selected Doors
Flow Rate (pers/s)
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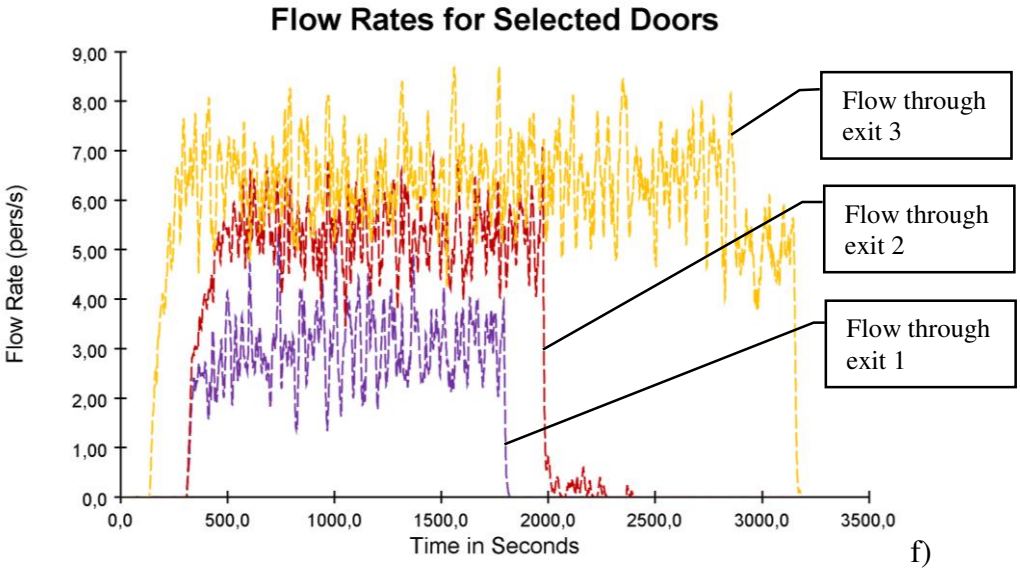
Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

e)


Flow Rates for Selected Doors
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Time in Seconds
Flow through exit 3
Flow through exit 2
Flow through exit 1

f)

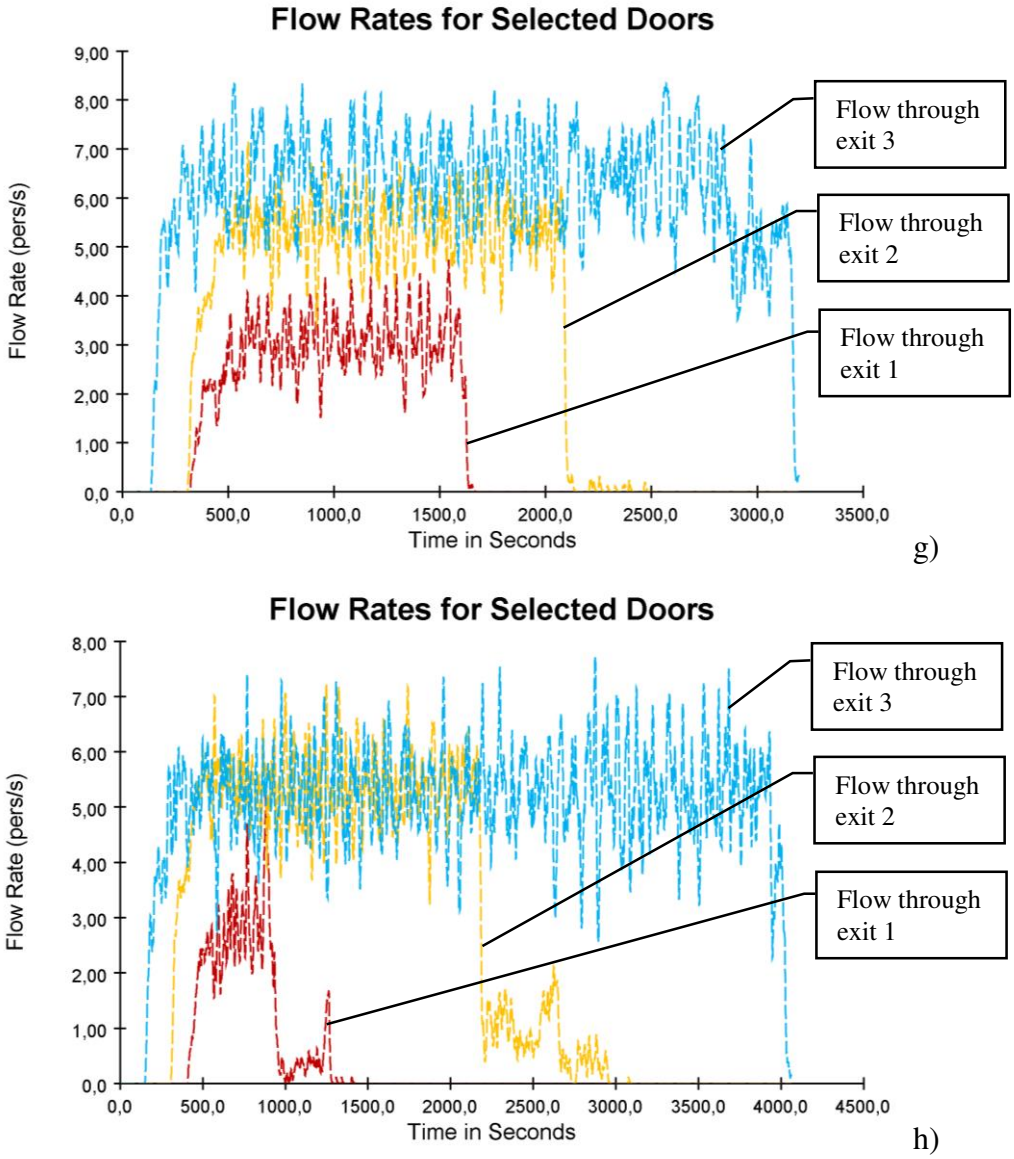

Figure 4. Graphs of agent flows through the three exits of the analysed site for crowd density scenarios (Table 2) made in the Pathfinder application; a) density 0.43 persons/m^2; b) density 0.54 persons/m^2; c) density 0.72 persons/m^2; d) density 1.0 persons/m^2; e) density 1.08 persons/m^2; f) density 2.0 persons/m^2; g) density 2.17 persons/m^2; h) density 3.0 persons/m^2.

Source: own work in Pathfinder software.

In the graphs presented in the figure above (Figure 4), it can be seen that the time taken to pass through exit 3 increases in succession. The width of this exit is similar to that of exit 1. The concentration of the crowd around the central part of the square has made exit 3, as the nearest exit, the preferred exit for leaving the open air events area.

4. Discussion

The analysis of the conditions for crowd dispersal after the end of open air events and the conclusions drawn from it presented usefulness for decision support in the planning of the various stages of mass event management (infrastructure preparation, crowd control and dispersal after the end). Depending on the initial assumptions, the results of the analyses of the hypothetical example analysed may change. Conditions may change when, for example:

- we will consider emergency evacuation;
- we will allow moving off designated ways;
- we will enable the rapid removal/opening of barriers between sectors and sections;
- we will take into account the capacity of the roads outside the study area;
- we will include a plan for the activities to be performed by participants in open air events in sectors and sections;
- we will take into account crowd control measures, such as order announcements controlling dispersal to exits from the mass event area.

Each of the above conditions needs to be mapped in a scenario and modelled in a computer application.

The timing of the crowd leaving the area was mainly influenced by the (Figure 5):

- positioning of the sectors in relation to the exits of the area;
- Pre-density of the crowd, which caused congestion to occur more quickly and slowed down the flow of people.

Attempting to justify the decrease of evacuation times at initial crowd densities of around 1 persons/m^2, by differing sector distribution, may not be the only argument. Many research papers report maximum crowd flows at densities exceeding 1 persons/m^2 and reaching a maximum for around 1.8 persons/m^2 (Oberhagemann, 2012; Nelson, Mowrer, 2002).

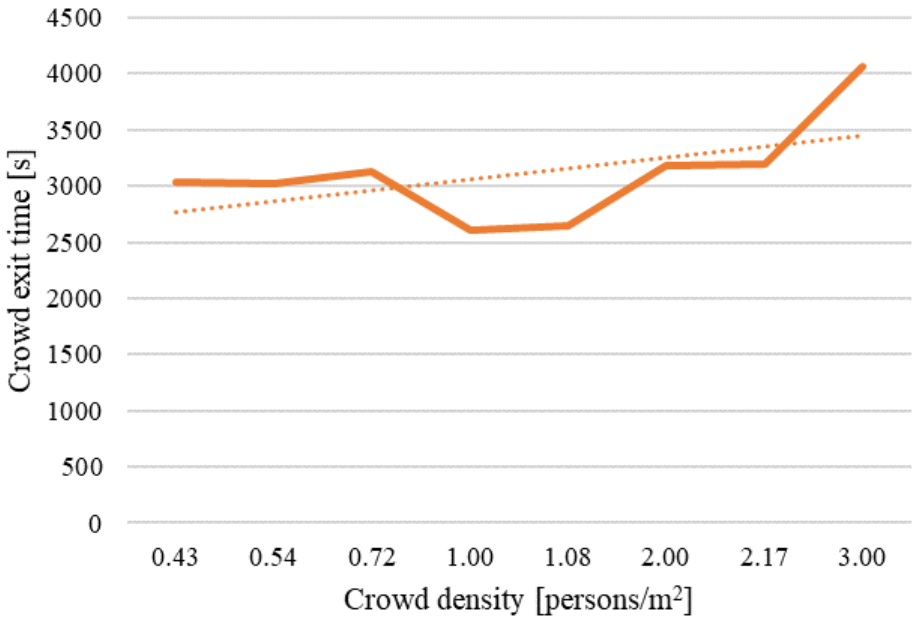

Figure 5. The correlation of the time of the crowd exiting the square to the initial density of people in the sections (the dotted line in the graph indicates the trend line).

Source: Own work.

In the modelling process, an important aspect is also the consideration of the dimensional characteristics of the crowd (Dahlke, 2020). Therefore, it is necessary to identify the target group of the mass event during simulation studies. Anthropometric atlases of the population contain data categorised by age group, enabling data applications in simulation modelling. Dimensional data of individuals have been included in many research works, but in a rather simplified form (Oberhagemann, 2012).

5. Summary

The research results presented in the previous chapters were obtained using agent-based modelling. Tools of this type are characterised by time-consuming (many hours) generation of simulations for a crowd of many thousands (Kountouriotis, 2014). The examples presented are characterised by the complexity of the criteria to be considered during modelling. These criteria are related to the mapping of crowd behaviour, architectural and infrastructural aspects in the simulators (Sharma, 2018). The multivariate nature of the scenarios requires multiple simulations to be prepared in order to draw conclusions about ensuring the safety of participants at mass events. One additional criterion to be considered is anthropometric.

Modelling results are an important decision-support element in crowd management. They provide data that facilitate emergency preparedness planning.

Findings from the research have enabled directions for further research to be observed. These include:

- analysis of the criteria considered in scenarios of events requiring evacuation due to emergencies;
- analysis of the impact of the width of sector and section exits and terrain on evacuation times;
- analysis of crowd dispersal conditions after leaving the open air event site;
- analysis of crowd control activities during evacuation or leaving the area after an open air event (directing crowds to exits based on behavioural observations).

These activities will help to improve security and crowd control measures at open air events.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

STRATEGIC BALANCING OF EXPLOITATION AND EXPLORATION IN A SHARED SERVICE CENTER: A RESEARCH STUDY ON PROCESS-PROJECT ORGANIZATION RELATIONSHIP

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Purpose: This paper explores the challenge of balancing exploitation and exploration in finance shared service center (SSC) from a process-project organization perspective. The study aims to identify strategies for achieving ambidexterity in German SSC and emphasizes the role of process-project oriented organization in facilitating this balance.
Design/methodology/approach: A case study approach was used to analyze SSC in a large multinational organization employing over 600 people. Interviews with 10 managers, team leaders and experts, as well as an analysis of organizational structures, process architecture and projects documentation were conducted to gather data.
Findings: The study found that successful ambidexterity in SSC requires a contextual approach that considers both process and project management, with an emphasis on collaboration and knowledge sharing. Dynamic capabilities such as agility and adaptability were also found to be crucial in achieving a balance between exploitation and exploration.
Research limitations: The study's findings are limited to a single SSC in a large multinational organization, and the generalizability of the results may be constrained.
Practical implications: The paper provides insights into the challenges and opportunities for achieving ambidexterity in SSC and offers practical recommendations for managers seeking to achieve this balance in their organizations.
Originality/value: This study contributes to the literature on achieving ambidexterity in SSCs by providing a process-project organization perspective and highlighting the importance of dynamic capabilities in balancing exploitation and exploration. The results presented represent a continuation of the study carried out at the same SSC in 2021.

Keywords: Ambidexterity, Shared Service Center, Ambidexterity, Process-Project Organization, Strategic Balancing, Exploitation and Exploration, Contextual Ambidexterity.

Category of the paper: Research paper.

1. Introduction

The turbulent nature of the of socio-economic changes in the market environment generates a state, in which organizations focus their activity on the attempts to pursue highly flexible systemic management formulas enabling dynamic response to exogenous (i.e., such external factors as the processes taking place on a macro scale) and endogenous factors (the impulses generated inside an organization) (Cf.: Zakrzewska-Bielawska, 2016). The digitization of enterprises changes the nature of work in organizations into ever stronger cooperation with technology, reducing manual work's workload towards interdisciplinary and creativity-based work. Digital transformation constitutes one of the considerable faced by traditional companies, affecting all corporate functions, procedures, processes, operations, services and products (Bouncken et al., 2021; Dehnert, 2020). According to Afriliana and Ramadhan (2022), implementation of digital transformation can help companies maintain their performance, efficiency, and compliance. The nature of management is thus changing, due to the increase in the level of employees' education, their greater empowerment, and the increased performance of the repetitive and operational activities via technology, which means that people may be shifted towards exploration activities, inter alia, aimed at processization through the use of exploitation activity technology. A product as a service often becomes unique, while the technology of Industry 4.0 enables mass adaptation, at a lower cost, to individual consumers' requirements. As such, the process and design organizations generating value, based on creativity - exploration, are becoming more and more suitable, while the process (exploitation) layer becomes automated, as to reduce the costs of creative activities, e.g., the prospect of developing individual patterns - cocreation of products by customers. It should be emphasized here, that the assumptions of a process and project organization necessitate integration of the concepts and methods of both business process management and project management (Cf. Sliż, 2021).

The article addresses the challenge of dynamic balancing the exploitation and exploration spheres in finance shared service centers (SSCs), from the perspective of process-project organization assumptions. The research problem has been centered around the question of how SSCs can simultaneously optimize existing processes while also exploring new improvement opportunities? The main aim of the paper is to exemplify a process and project mature organization and characterize the exploitation and exploration activities, and, consequently, reconstruct an organizational structure that allows discounting of the benefits resulting from the dynamism of business processes and projects. Research methods such as literature review, participant observation, as well as semi-structured interviews with managerial and expert position employee were used to achieve the objective. The study is a continuation of the empirical investigation carried out in 2021 (Sliż, 2021). The article attempts to identify and assess the changes throughout the period of 18 months. The re-verification enables a comparison of the state during COVID-19 with the post-pandemic conditions of 2023.

Overall, this article provides insights into the challenges and opportunities for achieving ambidexterity in SSCs and presents practical recommendations for managers seeking to achieve this balance in their organizations. In addition to the focus on SSC, this article offers a unique contribution by examining the role of a process and project organization in facilitating ambidexterity within service organizations. The study highlights the importance of balancing exploitation and exploration in main service processes and offers insights into how organizations can leverage technology, to optimize existing processes while also exploring new opportunities for service innovation.

This study is organized into five sections. Section 1 provides an introduction to the research problem and aims. Section 2 reviews the literature on ambidexterity, business process management (BPM) and project management integration, with a focus on balancing exploitation and exploration. In Section 3, the study provides an overview of a large multinational organization with over 600 employees and its finance shared service center (SSC). Research methods employed in this case study are also discussed in this section. Section 4 presents the findings of the case study, particularly on strategies for achieving ambidexterity in SSCs. Finally, Section 5 concludes the article by discussing its contribution to scholarly knowledge and practical implications for managers seeking to achieve a balance between exploitation and exploration in SSCs.

2. Theoretical background

2.1. Ambidexterity – exploration and exploitation dilemma

Ambidexterity is perceived as the ability of the firm to carry out exploration and exploitation at the same time (Anzenbacher, Wagner, 2020). In the balanced perspective, ambidexterity can be described as midpoint, or an optimal point on a continuum, with exploitation and exploration lying at the two ends. While in the combined perspective, exploitation and exploration are considered independent activities, where their maximized level can produce a high degree of ambidexterity (Kassotaki, 2022). The implementation of ambidexterity requires a combination of organizational routines, resources, or capabilities that, to some extent, contradict each other: organizational efficiency (exploitation) and organizational flexibility (exploration) (Raisch et al., 2009). The ambidexterity concept has evolved since its emergence in scientific research from structural construct described by Duncan (1976) and Tushman and O'Reilly (1996) to contextual ambidexterity - its focus is put on the multitude of ways that organizations seek to manage the tensions involved in doing two different things at the same time (Birkinshaw, Gupta, 2013). Initial scholar's efforts focused on organising ambidexterity within a firm’s boundaries (Tushman, O’Reilly, 1996). In studies

ambidexterity is considered as a source of sustainable competitive advantage (O'Reilly, Tushman, 2008; Luo et al., 2018, Ragazou et al., 2022; Ashrafi, Zareravasan, 2022; Ed-Dafali et al., 2023) or a strategy that enables companies simultaneously pursing differentiation and cost advantages for achieving long-term success (Liu et al., 2020) and this leads researchers to investigate how entrepreneurial orientation influences differentiation–cost advantage ambidexterity (Chen et al., 2023). Over time researchers have introduced ambidexterity research in a geographic context (Roth, Corsi, 2023). It may bring promising insights not only into how a multinational ambidexterity strategy can provide organisations, that operate in complex innovation networks, with a global competitive advantage (Ciasullo et al., 2020), but also specifically into how international small and medium-sized enterprises (ISMEs) improve adaptive marketing capabilities through ambidexterity (Su et al., 2022).

As Gulati and Puranam (2009) claim organizations are attempting to address many types of dualities, such as efficiency and flexibility, adaptability and alignment, integration and responsiveness, and exploration and exploitation. Raisch et al. (2009) perceive ambidexterity as a new research paradigm in organization theory and try to explore four "central tensions" that need to be addressed to enable further progress in research on ambidexterity. Scholars seek answers to specific questions: Should organizations achieve ambidexterity through differentiation or through integration? Does ambidexterity occur at the individual or organizational level? Must organizations take a static or dynamic perspective on ambidexterity? Can ambidexterity arise internally, or do firms have to externalize some processes? As exploration helps a firm identify new market opportunities and build new capabilities, exploitation allows a firm to utilize current market opportunities and improve its existing capabilities (Benner, Tushman, 2003). He and Wong (2004) emphasize that exploration and exploitation require substantially different structures, processes, strategies, capabilities, and cultures to pursue and may have different impacts on firm adaptation and performance. Scholars point that exploration is associated with organic structures, loosely coupled systems, path breaking, improvisation, autonomy and chaos, and emerging markets and technologies. While exploitation is associated with mechanistic structures, tightly coupled systems, path dependence, routinization, control and bureaucracy, and stable markets and technologies (Ancona et al., 2001). Different ambidextrous strategies may be distinguished in order to manage different tensions. The first one is temporal separation or sequentional ambidexterity (Benner, Tushman, 2003; Duncan, 1976) - it can be achieved through separating explorative and exploitive in time. The second one is structural ambidexterity (O'Reilly, Tushman, 2004) that aims at reaching such tensions simultaneously through the allocation of different processes into separate sub-units or change management team, each with distinct cultures, structure, control systems and incentives, by ensuring at a managerial level the synergic integration and maximization of the economies of scale and scope of each unit. In other words structural ambidexterity is achieved through a structural separation of exploration and exploitation oriented work (Chen, 2017; O'Reilly, Tushman, 2013). Moreover, structural ambidexterity

places high demands on top management, where the integration is expected to take place (Chen, 2017). And the third one is contextual ambidexterity. It concentrate on both exploitive and explorative tasks that are performed within the same organizational entity/structure – mainly by the same people. The contextual ambidexterity can be reconceptualized into a productive process for change, which can be beneficial in changing industries (Pregmark, 2019).

Strategic balancing between exploration and exploitation activities in turbulent and unpredictable environment requires dynamic capabilities. Innovation capacity is one of the main factors ensuring the survival of the organizations. The appropriate organization structure for innovation is the organic structure. The innovation may be easily developed in ambidextrous organization structures supporting both radical and incremental innovation (Gürkan, Tükeltürk, 2017). While technological capacity is one of the main antecedents in efforts to achieve the organizational ambidexterity (Yunita et al., 2023). The authors of the article special focus lie among others dynamic capabilities that affect ambidexterity, especially: collaboration (Hoessler, Carbon, 2023) knowledge sharing (Haider et al., 2023; Yang, 2021), strategic agility (Kowalik, Pleśniak, 2022; Alamsjah, Yunus, 2022; Liang et al., 2022), and adaptability (Lin, 2023; Bhatti et al., 2022). The impact of these dynamic capabilities on dealing with the tension between exploitative and explorative activities will be further discussed in the empirical part of the article.

2.2. From ambidextrous organization to process-project organization concept

The literature on the subject shows a growing number of publications devoted to process organizations and project organizations. So far, these issues, just as BPM and project management, have developed in parallel with the increasing voices of both researchers and managerial personnel representatives, regarding the search for attempts to integrate the concepts and methods of process and project management (Cf. Nowosielski, 2018). A process-project organization is identified as a complex system based on a coexistence of processes and projects within the exploitation and exploration layers of an organization, leading to synergies between these operational categories. The essence of the described concept of a process-project organization lies in the integration of process and project management concepts and methods as well as in the implementation of the assumptions of organizational ambidexterity. This call for an organization subdivision into the layers of exploitation (focused on increasing the added value within genotypic activity) and exploration (focused on implementing innovative activity in search for new areas of added value generation). Correspondingly, it necessitates an extension of the process and project typology, to include the category of exploitative and explorative processes and reactive and proactive projects. Particular attention should be paid to explorative processes, which can be identified as carriers of improvement, optimization, and innovation in an organization. Considering the current state of knowledge on explorative business process management, the boundary between these categories is quite blurry and calls

for determination of further research directions on the subject of the methods involving identification, formalization, measurement of both categories and, as a result, the management of explorative processes (Sliż, 2021). Implementation of the concept of ambidexterity, which per the definition presented constitutes its foundation and directs management activities towards balancing the organization's exploitative and explorative activities, in order to achieve market supremacy, ought to be indicated as an important component of a process-project organization. Tushman and O'Reilly (1995) define an ambidextrous organization as one characterized by the ability to implement incremental (exploitative) and revolutionary (explorative) changes. According to Lubatkin et al. (2006), it is an organization that is able to use its existing competencies and new opportunities with equal (the same) agility. This illuminates two dimensions of organizational ambidexterity (Bierly et al., 2009; Donate, Guadamillas, 2011; Guisado-González et al., 2017; Caniëls et al., 2017). The former is aimed at extending current knowledge, seeking greater efficiency, and implementing improvements that enable incremental innovation, whereas the explorative dimension involves refinement of new knowledge and search for variation and novelty, which are needed for more radical innovation (Atuahene-Gima, 2005). Examples of such contradiction management include: efficiency vs. flexibility, evolutionary vs. revolutionary change (Simons, 1991) or global vs. local integration (Devinney et al., 2000).

Implementation process-project organization based on the ambidexterity concept requires seeking integrative and holistic organization models. A systems-oriented view of environment, organization and management regards an organization as a complex value creation system that is embedded in a dynamic environment. Moreover systems-oriented view understand the dynamics that appear in interdependences not only between the organization seen a complex value creation system and it’s environment, but also among the organization’s elements. On the basis of systems theory and cybernetics the St. Gallen Management Model (SGMM) was developed to create an integral framework for explaining organizations and all their complex interrelationships and diverse environments (Ruëg, Stürm, 2019). The basic assumptions of the SGMM authors was to make business-science theory more relevant to practitioners by integrating existing management practices into one model (Ulrich, Krieg, 1972). As Höhn (2012) notice subsequent additions to the model appear to have been inspired more by changes in management theory than by practical observations. However, the New St. Gallen Management Model is not simply a collection of conceptual frameworks it comprises of two complementary perspectives on the interplay of environment, organization, and management. The task perspective focuses on a business-oriented conceptualization of organizational value creation as a key management task. The practice perspective complements the task perspective by illuminating the basic resource-related, cultural, and communicative prerequisites for management to become effective (https://www.sgmm.ch/en/) According to the SGMM, the internal core of an organisation is structured by (Mock, Zipper, 2020):

- structuring forces: strategy, structures, culture,
- processes: management, business, support,
- modes of development: renewal, optimization.

This core is encapsulated in external (Mock, Zipper, 2020):

- interaction issues: strategy, norms and values, concerns and interests,
- environmental spheres: society, nature, technology, economy.

Taking above into account, authors consider the New St. Gallen Management Model as a concept which allows integration of exploration and exploitation activities in the process – project organization. In other words, integration of business process management and project management is possible in accordance with the concept of an ambidextrous organization.

Expanding on the integrated process-project approach in organizational management presented earlier in this article, it can be defined as a concept involving dynamic balancing of exploitation and exploration, utilizing processes and projects in the implementation of an organization's strategy, based on ambidexterity assumptions. The balancing of two layers involves consideration of all subsystems of the organization, but also alignment of the organizational structure with the type of approach in achieving ambidexterity. Thereby, the assumptions of process-project organization (Sliż, 2021) are akin to the essence of an ambidextrous organization. One can even claim that every process-project organization is an ambidextrous organization, yet not every ambidextrous organization is a process-project organization. Moreover, in the era of the digital economy, observing the complexity of organizations and the growth of interest in Industry 4.0 and 5.0, it should be emphasized that the core of this type of organization lies in modern ICT technologies. This research area needs to be further explored, if only in the context of identifying the technologies supporting achievement of ambidextrousness in an organization.

3. Materials and methods

The research carried out constitutes part of an ongoing project addressing the issues of process and project management concept and method integration, extending it with components pertaining to ambidexterity and ICT technology. The organization selected for examination and described in this paper was qualified on the basis of a quantitative research carried out to assess the degree of process and project maturity (See: Sliż, 2021). For this purpose, two maturity assessment models - MMPM (process maturity) (Sliż, 2018) and H. Kerzner's PMMM (project maturity) (Kerzner, 2001; 2003) - were used. As per the measurement methodology adopted, the entity described in this publication has been classified at level 4 of process maturity, i.e., a state in which in the organization business processes are identified, formalized or explored, measured and managed in accordance with BPM principles. In terms of project

maturity, the organization was also qualified at level 4, i.e., a confirmed state of: quantitative and qualitative analyses implementation, establishment of organizational roles and units responsible for project implementation (e.g., project management office), as well as focus on process improvement and knowledge diffusion in the organization, realized through training (See: Kerzner, 2001).

The first study on this type of organizations was carried out in June 2021, based on a quantitative survey, and described in the paper (Sliż, 2021). After over 18 months, an attempt was made to continue the empirical investigation in the post-pandemic era (after the COVID-19 pandemic). This enabled, in particular, the observation of the development or regression of activities aimed at implementation of process-project organization assumptions, but also outlines additional supporting potentials and limiting factors in the implementation of this type of solution.

The organization examined is an international enterprise identified as a Finance Shared Service Centre (SSC). It operates with German capital and is located in Poland. Currently, the SSC under analysis employs more than 600 people, therefore, in terms of employment size (number-of-employees criterion), it is identified in Poland as a large organization. Its core activity entails provision of financial and accounting services for other branches of the company. The organization's functioning is oriented at delivering process results in accordance with customer expectations, in external (main processes) and internal (sub-processes) terms. Moreover, as per the information obtained from the managerial personnel, the organization is certified for quality management ISO 22301 and 9001. unit of measurement.

4. Results

4.1. Exploitation activity in the SSC examined

Employing the assumptions of the MMPM descriptive model of organizational process maturity assessment (See: Sliż, 2018), it has been confirmed, via semi-structured interviews and a research questionnaire, that in the organization examined, processes are identified and formalized in the form of descriptive documentation and a graphical process flow map. This applies to core processes and sub-processes. Auxiliary processes are also explored using process mining, based on the data generated in SAP. The survey interviews, conducted with the organization's employees, provided information on and allowed familiarization with the functioning of an INTRANET IT tool developed, which allows improvements to be read and submitted in formalized process maps. All SSC employees have access to this tool, regardless of their position. Throughout 2021-2023, no differences were discerned in this regard. The organization remained at the same level 4 of process-project maturity (See: Sliż, 2021).

The division of processes in the SSC examined was made according to the hierarchy criterion. This means that in the entity under analysis, processes are divided into managerial, core and auxiliary processes. The SSC utilizes a system of process measures, with particular emphasis on measuring the level of external and internal customer satisfaction. It should be noted here that the incentive subsystem utilizes the data generated by the internal customer satisfaction assessment system. The level of satisfaction determines the size of an employee's annual bonus, which, according to managers, positively affects the management of relations within the organization (between departments and teams). As of 2022, the external and internal customer satisfaction evaluation system is being adapted to include cooperation with the implementers of the processes that have been outsourced. According to the employees surveyed, this is all the more important since some of the employees working in SSCs have been transferred to external companies.

Processes are continuously monitored via dedicated IT solutions and analyzed with respect to such parameters as: process execution time, process flexibility, the quality of the effect generated, and the cost. When process analysis shows states that negatively affect the level of customer satisfaction, corrective actions are initiated, which can be aimed at e.g., a change in the course of action in a given process or correction of its level of autonomy. It is also worth noting that, within the space of the SSC examined, processes are compared with one another in terms of the parameters adopted, and inter-team transfer of good practices takes place on internal benchmarking basis, via the use of workshops. The BPM process management method has been implemented in the organization. This is primarily reflected in the identified, formalized and measured process architecture, the implementation of a market relations mechanism inside the organization, the implementation of modern information and communication tools supporting process management, the implementation of a planned training cycle on process management, the establishment of organizational roles characteristic of a process organization, and the focus on generating process results consistent with customer expectations.

In the last 2 years, efforts are being made to implement chatbots, enabling the reconfiguration of the employee specialization dimensions towards activation of employees in projects, through the use of their expertise, to enable process automation and robotization. In summary, the interviews with employees did not reveal any differences in the functioning of the exploitation layer in the period between the first (2021) and second surveys (2023), as its implementation has been primarily driven by core activities. A dynamic increase in the interest in assessing the potential of implementing such ICT technologies as Robotic Process Automation, Artificial Intelligence, Process Automation, ChatBots to increase the performance metrics studied by the systems has been observed. This is closely linked to the exploitation layer assumptions in the organization under study. The exploitation processes carried out in the

studied surveyed include order to cash, purchase to pay, hire to retire, accounting to report and accounts payable. In the SSC examined, exploitation processes are characterized by a high potential for standardization and robotization. These processes are also highly repetitive and routine, with a high share of procedures.

4.2. Exploration activities in the SSC examined

In the context of exploitation and exploration layer functioning in an organization, it must be stated that, these layers are neither identified nor formalized in the entity examined, nevertheless, the implementation of operational categories (processes and projects) indicates that the organizational part of the SSC under analysis is divided into a layer of genotypical (exploitative) activities and a layer linked to innovation, research and improvement of the sphere in which added value is hitherto generated. No differences have been noted in this regard since 2021.

In 2023, process and project development in the exploratory layer has been noted, compared to the survey conducted in 2021, to which such processes as Business Intelligence Process (analysis of financial and operational data), Risk Management Process (enabling identification and assessment as well as management of financial risks in the organization), Process Improvement Process (enabling identification of processes or process steps with high potential for optimization, with a focus on robotization and implementation of modern ICT technologies), compliance management process (enabling monitoring and management of process execution compliance with GPO assumptions) were qualified. The interview with executives revealed that, at this stage, implementation of a new nomenclature could cause misunderstanding among employees, therefore, exploration is equated with project activities, and exploration activities are identified as projects. Likewise, no use of term exploration process was observed.

In the sphere of operational category permeation within the exploratory layer, in contrast, such new projects have been identified as financial processes standardization, outsourcing, integration of process execution with external contractors, implementation of a chatbot to handle internal email correspondence.

Based on the interviews with employees in 2021, a sample project of a new VAT Operational Process (VTO) development was presented. The VTO process is meant to check for legal and tax compliance of the accounting performed as part of the Accounts Payable Process (AP). The VTO process is entails two stages. In the first stage, control activities are carried out in terms of formal liability compliance, while in the second, liability compliance is verified in terms of the tax specificity of the country in which it arose. In addition to operational activities, VTO process executors also organize trainings for AP process executors, on the tax law in force in particular countries, as well as on the requirements concerning the outputs

generated in the AP process, which constitute inputs to the VTO process. The main objective of the project described was to design and implement a new VAT Operational Process, whereas the sub-objectives included codification of knowledge on the legal conditions in the countries serviced by the shared service center examined, identification of common elements in the legal regulations, determination of the level of process standardization, design of process documentation, design and implementation of a verification mechanism. To implement the project described, competencies were reviewed across the organization. This means that, in this regard, activity was undertaken to find the necessary competencies within the shared service centers located in other countries but operating under the same organization. The employee interviews indicated that an interdisciplinary project team was established for this purpose, consisting of both project area (exploration layer) representatives and exploitation process (exploitation layer) implementers. A project manager was appointed to lead the team. The teams were membered by the employees appointed, based on their competence, knowledge and language skills, to implement the process designed. Substantive support was provided by accountants representing various countries. The team also included a trainer, whose task was to manage the diffusion of knowledge on the legal and tax aspects. It should be emphasized that the team's activities were supported by an expert employed through an external consulting organization (e.g., EY or PwC). The example presented shows the so-called market of competences functioning within the entire organization; in case of a lack of suitable competences, they are obtained outside the organization. The project teams are of interdisciplinary character and comprise employees who carry out both projects and processes (Sliż, 2021).

4.3. Ambidextrous organizational structure in the SSC examined

The structural dimension has been widely described in the context of ambidexterity in the works: (Stelzl et al., 2020; Güttel, Konlechner, 2009; Mirow et al., 2008). For the purpose of this study, an attempt was made to reconstruct the organizational structure, based on the available documentation and the interviews with managerial level and expert position employees. As a result, functional areas (departments) were identified within the vertical layer, and business processes and projects were identified within the horizontal layer. The SSC analyzed is characterized by a matrix organizational structure, the assumptions of which are presented in Figure 1.

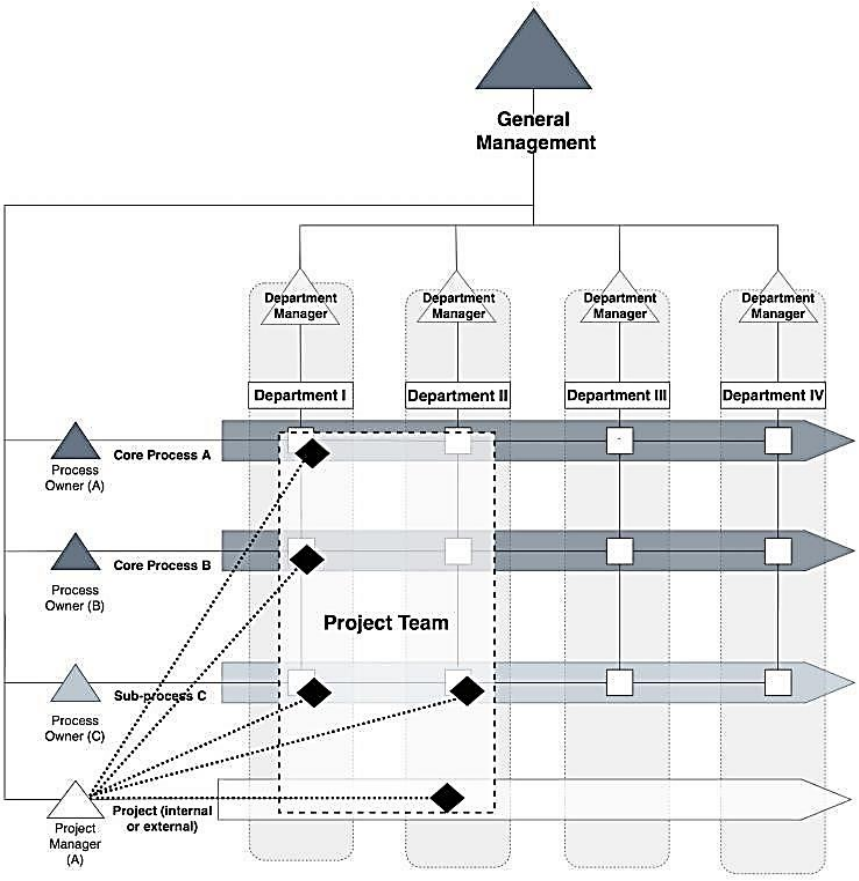

Figure 1. A conceptual diagram of organizational structure in the organization examined.
Source: Own research carried out in 2021-2022.

In the organization examined, it was assumed that the role of department managers is to supply, on market terms, the resources needed for the processes and projects under implementation. This in particular applies to human resources, material resources and the resources generated in the organization and its environment. The role of process owners and project managers, in turn, is to generate, respectively, process and project results, in accordance with the adopted objectives, and to monitor the course of the implementation thereof. Process owners and process experts also use process mining, importing data from Systems Applications and Products (SAP), in order to generate process improvement and optimization. It is worth emphasizing that within the structural dimension, the support potential is provided by the organizational roles established, which are specific to the state in which the methods for managing these operational categories have been implemented. The following such roles have been identified: process owner for core processes and sub-processes, process expert, project manager, and project coordinator. It should be noted that the role of an expert in the SSC analyzed is oriented towards intra-team knowledge diffusion and trainings for process implementers. What is more, within their prerogatives, experts are able to report improvements, both in the process in the implementation of which they are involved, as well as in other processes in the organization.

The survey carried out in 2023 revealed a flattening of the organizational structure, in relation to 2021. The centralization and standardization dimensions are being leveled, which favors the implementation of ambidexterity and process-project-organization assumptions. It also results from the outsourcing of selected processes to external companies and SSCs located in Asia. The structure increasingly targets projects (the exploration layer), while exploitation activities are assessed from an economic perspective, as an outsourcing potential. An additional factor affecting the focus on exploration in the SSC surveyed is the increase in the implementation of ICT solutions in exploitation processes.

5. Conclusion, implications and limitation

5.1. Reserach conclusion

The study results presented provide evidence that the conceptual assumptions regarding the integration of process and project management, described in the works (Reiss, 1992; Zehrer, 2002; Gareis, Stummer, 2006; Bitkowska, 2019; Nowosielski, 2017), are reflected in business practice. Based on the study, three generalizing conclusions were formulated.

Based on the identification of the processes, activities and technologies employed in the exploitation layer of the SSC under study, the concept of exploitative business process has been defined as a planned sequence of activities carried out to ensure the operation of the organization in the exploitative layer, focused on the performance of the core organization (genotype business). In a service organization such as SSC, these include the day-to-day operational activities of order processing, payment settlement, bookkeeping, preparation of financial reports. The main metrics used to assess such processes involve parameters such as efficiency, turnaround time and compliance with customer requirements, which provides high application potential for the use of modern technologies and IT tools, with a particular focus on process mining techniques. Explorative business process (ErBP), in turn, is an operational category similar to exploitative business process (EiBP) identified with the classical meaning of business process. In contrast to this conception, the purpose of ErBP entails implementation of activities aimed at generation of a tangible or intangible effect (process result) in the form of a new idea, opportunity, information, and knowledge for business activities. The implementation of ErBPM takes place in an environment saturated with technology, knowledge, research and development, experiments involving risk-taking to discover solutions to existing problems in the organization, or transfer of generated knowledge to the exploitation layer to improve and/or optimize the implementation of business processes. The differences between the above described operational categories present in the organization examined are summarized in Table 1.

Table 1.
Differences between exploitative and explorative processes in the surveyed SSC

Differential criteria	Exploitative process	Exploratory process
Process implementation objective	Maintaining the organization's core business, increasing the efficiency of genotype business execution.	Search for new areas to generate added value in the organization.
Dimension	Achievement of short-term goals.	Achievement of long-term goals.
Level of standardization	High level of process repeatability.	Low level of process repeatability.
Implementation time	Cyclical.	Occasionally one-off.
Type of activities in the process	Routine. Highly repeatable.	Creative, modified during implementation.
Measures	Efficiency Performance Quality Cost Customer satisfaction	Flexibility Level of innovation Assessment of ability to implement new ideas Risk assessment Creating customer value Innovativeness

Source: own elaboration based on the study carried out.

Compared to EiBPM, ErBPs are even more oriented at dynamic adaptation of the process flow to the turbulent economic environment, so as to enable identification of the customer needs and expectations, both externally and internally, in the shortest time possible. These processes demand different skills and tools than traditional business processes, as they often require a more open and experimental approach to problem solving. Successful exploratory business processes call for a strong focus on innovation, creativity and flexibility, alongside a willingness to take risks and learn from failures.

5.2. Managerial implications

The qualitative research carried out on the example of the organization described, which is characterized by a high (4) level of process and project maturity, yielded existence of a potential for the SSC under analysis to reach a higher (fifth) level of process and project maturity. It should be stressed that the decision to undertake activity aimed at achievement of the highest, fifth level should be preceded by analysis of the benefits for the organization and analysis of the potential in terms of the resources necessary to reach that level and the availability thereof. Based on the case studies carried out in 2021 and 2023, a set of recommendations supporting the examined SSC's achievement of the fifth level of process-project maturity was proposed.

First, the organization examined is currently employing a contextual approach to the achievement of ambidexterity in the context of a dynamic balancing of exploitative (exploitative processes and projects) and exploratory (exploratory processes and projects) activities. Alas, the study carried out in 2021 and 2023 revealed fragmentary implementation of the ambidexterity achievement strategy. In the Authors' opinion, a long-term strategy needs to be developed to outline the target state of process-project maturity, taking the implementation of ICT technologies into account, in both exploitation and exploration. It is worth emphasizing here that, in addition to the system layer, it would be worthwhile to factor in flexibilization of the organization's structure towards ambidextrous or process-project solutions.

Second, mechanisms should be put in place to enable knowledge management between exploitation and exploration, particularly between explorative processes (highly saturated with knowledge) and exploitative processes. The knowledge generated through the processes and projects implemented in the organization was found to be codified and available to the stakeholders within the organization, allowing the transfer thereof from projects to processes and vice versa.

5.3. Research limitation

As any such study, this one also is subject to limitations associated with exemplifying a process-project organization that is based on the ambidexterity concept assumptions. These limitations apply to the focus on one organization, with a clear indication that the results of research on process and project maturity indicate that most organizations in Poland are classified at relatively low levels, which has been noted in various works (Sliż, 2021). This also generates a state, in which directions for further research enabling construction of theoretical and in-depth models allowing identification of an organization's maturity, with regard to the degree of BPM, project management and ambidexterity concept implementation have been set, and attempts to identify the factors supporting and limiting this level of maturity by the degree of ICT implementation have been made.

Summing up, the study has outlined three cognitive gaps (L). L1: There are no studies illustrating the use the technologies supporting big data exploration and analysis in the exploitation and exploration layer of organizations (Cf. Dezi et al., 2018). L2: There is scarcity of academic studies focusing on the so-called explorative BPM (Cf. Kohlborn et al., 2014) in business process management.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANISATION AND MANAGEMENT SERIES NO. 177

APPLICATION OF SELF-EVALUATION MODEL IN THE QUALITY-ORIENTED PRODUCTION ORGANISATION IN A MACHINERY INDUSTRY COMPANY

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Purpose: To undertake a non-formalised assessment of a contemporary quality-oriented manufacturing organisation, which will provide a comprehensive source of information for learning and defining change; for the creation of a concept for perceiving the development of a company on the basis of a quality criterion; and will make it possible to determine its level of excellence as perceived through the prism of the completed sheets of the MSOP Model and the obtained value of the manufacturing organisation quality index.
Design/methodology/approach: The self-assessment of the organisation was carried out using the MSOP model, which is both qualitative and quantitative in character. The methodology used provides the opportunity to interpret the organisation's activities using a substantive constatation of the factors of each attribute in the MSOP model, these being, in turn: Customer orientation, Organisational improvement, Organisational strategy and culture, Production process and technology management, Intellectual capital management, Quality management, Occupational safety and environmental protection. In addition to the praxeological interpretation the MSOP model is supplemented by the weighting magnitudes of the individual factors for a proper quantitative interpretation of the quality level of the organisation.
Findings: The most important findings relate to obtaining information on the areas of organisational activity (attributes) in which self-assessment is very high and also those in which improvement measures should be taken as soon as possible.
Research limitations/implications: The example given is only the beginning of an organisation's journey towards maturity assessment and the development of a strategy for continuous self-assessment in the years to come. The cyclical nature and objectivity of the research is important.
Practical implications: the MSOP model can serve as a model for organisations that are considering the use of non-formalised self-assessment models for their own development and improvement, with a future attempt at a quality award.
Social implications: the continuous development of the organisation, its processes, and the upgrading of staff competences will enhance the quality of life of the organisation's community.
Originality/value: The publication contains the author's model for self-evaluation of production organisations, together with an example and its analysis.

Keywords: organization's maturity, improvement, self-assessment, total quality management.

Category of the paper: Research paper.

1. Introduction

Today's manufacturing organisation faces many challenges, and this is subject to many changes and transformations, on the one hand, and strives to achieve a high position in the market on the other. The transformations will influence the determination of the rules of operation, the interactions and the definition of the ways in which the company will develop. Thus, the success of the modern organisation will be determined by the assumptions of a knowledge-based economy, focused on quality, taking into account the development of intellectual capital, the culture of the organisation and environmental and social conditions.

The contemporary manufacturing enterprise is therefore multifaceted, emphasising the importance of its external and internal forms, which concern both defining expectations and determining the degree to which customer requirements are met, as well as defining an appropriate strategy integrated with the implementation of activities within the organisation, such as developing a vision and mission, describing a quality policy and establishing objectives at strategic, tactical and operational levels. An important element in such a defined action is also the appropriate distribution of competences and responsibilities in a clear organisational structure correlated with properly defined and interrelated processes operating in the organisation. Thus, when shaping a modern production organisation, it should be emphasised that the right form of managing it is one that very consciously implements tangible and intangible resources to achieve its goals, and treats it as a continuous process of decision-making and is able to make the right choice as to the style of management and ways of improving it. By viewing its activity through the prism of creating a modernist management concept, this form builds a stable image and thus creates a value-added philosophy for the organisation.

An important element of the organisation's activities is also the correct definition of its processes and the links between them (process map) and the determination of the form of the validation procedure for the systems it has in order to confirm the adequacy of meeting the requirements described by the organisation, as well as seeking ways to define its own maturity and the yardsticks for measuring it.

In the literature on the subject, E. Skrzypek points out [...] that the maturity of an organisation is a certain level of skills, as well as excellence, it is the degree to which the organisation is prepared to perform its tasks, implement its objectives. The determinants of high maturity can include effectiveness, efficiency and effectiveness [...] (Skrzypek, 2010). The effectiveness of an organisation's performance is reflected in its relationship with the environment, especially in its relationship with customers and other stakeholders, and in its position in the market, as well as in the achievement of the organisation's defined objectives. Efficiency makes it possible to assess the ability to act in the planned way and to evaluate the efficiency of the process. Thus, it becomes important to continuously review the organisation's activities in order to inform its further actions.

A survey conducted by the author of this article (Dudek-Burlikowska, 2015) indicates that many organisations have difficulty in choosing the right self-assessment model to implement. On the positive side, however, is the organisation's knowledge of self-assessment topics and methodologies. Companies are also aware of the need for self-assessment, are not afraid of it and do not consider it unnecessary work. Management largely identifies with the activities carried out and emphasises the importance of their regularity. Staff resistance is also not very visible. Unfortunately, there is a barrier related to formal competition evaluations, companies feel that the criteria indicated are not always interpreted correctly and feel inadequate in terms of proper formulation in relation to the specifics of their activities. Organisations accentuate the lack of evaluation criteria, important in their view, that reflect the individual character of the organisation in the models in operation, necessary for the organisation to carry out its self-assessment. Among these criteria, the organisations indicated aspects related to technology and production management and the importance of valuing the intellectual capital of the company. The surveyed organisations also signalled that the current solutions are not universal enough to sufficiently address all areas relevant to the needs of manufacturing organisations and at the same time involve employees at different levels in the self-evaluation procedure.

Currently, the most well-known but not always appreciated form of self-evaluation is participation in the Polish Quality Award competition, which involves the preparation of a self-evaluation report by top managers and its verification by experts during an audit. The defined areas form the basis of the assessment without the possibility of omitting any of them or replacing them with one's own. Each competition is a verification by an external auditor of the current state in the organisation with the prepared documentation, i.e. the self-assessment report, which may cause stress, tension and thus not serve to create added value for the improvement of the organisation.

Thus, the self-evaluation model should be used for internal use within the organisation and implemented at all levels of the organisation's management by involving representatives of each employee group in the evaluation. This will result in a more effective diagnosis of problems and, consequently, a wider range of concepts and ideas that can be included in defined plans to improve and enhance all the organisation's processes. Both the author's research (Dudek-Burlikowska, 2019) and the analysis of national and international literature have confirmed that there is a cognitive gap at the substantive level concerning the appropriate, non-formalised way of self-evaluation of the processes of a functioning production organisation focused on quality and improvement.

Table 1 presents the forms of self-evaluation present in the literature and also indicates the solutions proposed by the author in the area of the possibility of self-evaluation by a modern production organisation.

Table 1
A summary of the state of available assessment models in the literature and the positioning of the author's proposal

Nature of the self-assessment model organisations		Existing models		The author's proposal for manufacturing organisations
		Polish	*international*	
Formalised forms of assessment	**Reward-based models**	Polish Quality Award, Regional Quality Awards	EFQM model, E. Deming Quality Award, M. Baldrige Quality Award	
	Standards-based models	Assessment model in accordance with EN ISO 9004:2010	Assessment model according to ISO 9004:2010	
Informal forms of assessment	**Models for organisational diagnosis and improvement as added value**	Systematic assessment of the organisation R. Kolman	no	Model for the self-assessment of a quality-oriented manufacturing organisation (MSOP) with a substantive statement
	Defined maturity models	E. Fiddler	B. Crosby	
	Estimation of a production organisation through valuation	Kwalitonomic assessment of the organisation's quality levels R. Kolman		Estimation of the Production Organisation Quality Index - W_{JOP}
	Other forms of assessment development-oriented organisation	no	no	Analysis of the manufacturing organisation's self-assessment through the prism of opportunity and threat analysis of defined scenarios

Source: own elaboration.

Nowadays, the way to assess the organisation's performance should be a formula that reflects the achievement of the defined organisational objectives and provides an opportunity to assess the organisation's performance, thus indicating its level of maturity.

This level depends on the degree of sophistication in the perception of the organisation's own development by the self-assessment method used towards achieving excellence. It is justifiable, therefore, to find the right form of self-acceptance for an organisation to highlight its own value, to claim a high level of product quality, and to emphasise the functionality of processes, proper work organisation and flexibility of information flow.

In this context, the article presents a Self-Assessment of Company X of the engineering industry based on the criterion of quality using the Self-Assessment Model of the Quality-Oriented Production Organisation (MSOP). This model is a modern form of monitoring and improving the performance of manufacturing enterprises managed by managers at all organisational levels and is described in detail in publication (Dudek-Burlikowska, 2019) by the author of this article. The proposed solution has been developed to carry out an effective self-assessment of activities in organisations, to calculate an index of the quality of the

organisation, as well as to indicate and estimate the probability of possible opportunities and threats by applying scenario methods in the area of management of a manufacturing organisation. The strengths of the model are undoubtedly its adaptation to the specifics of manufacturing organisations, the flexibility of the approach according to the needs of the organisation and the possibility of preparing a diagnostic report on the basis of the assessment and planning further improvement activities.

The MSOP model, is implementable in any manufacturing sector and applicable at any organisational level. It makes it possible to assess the current state within an organisation and guide its further development in the pursuit of excellence. The formulated MSOP Model worksheet facilitates the estimation of the organisation.

2. Contemporary perceptions of a quality-oriented enterprise - theoretical aspects

2.1. Quality management in modern organizations

The origins of management theory provided the inspiration for today's perspective on managing a modern quality-oriented organisation. By showing the correlations between the currents of management and the formation of the contemporary concept of quality, it can be concluded that the dynamics of the development of management knowledge has influenced the definition of quality management (Table 2). Analysing the assumptions of the classical school of management, it is possible to see elements that relate directly to quality management, namely the shaping of ways to improve as well as the responsibility of employees, while in the behavioral approach it is essential to value the initiative of employees as well as limiting full control (Szczepańska, 2013).

In the literature, it is possible to see many connections between the subjective evolution of quality management and concepts for building organisational strategy, forms of approach to the environment, activities related to defining market aspects, as well as opportunities to view the organisation through the prism of processes. There is a cross-fertilisation of these areas for the benefit of a quality-oriented organisation.

Table 2.
Relationship of TQM to classical management theory

Developer of the theory	Theory topics	Relationship with Management by Quality
F. Taylor	Scientific management	Management by facts, TQM tools and techniques and problem solving
H. Fayol	Planning and organising	Business process management
M. Weber	Economic organisation	Leadership
A. Sloan	Decentralisation of organisations	Business process design and management.
E. Mayo	Human relations	Employee satisfaction. Creating a system of motivation
D. Mc Gregor	The human factor of the organisation	Employee involvement in management, motivation
P. Drucker	Result orientation, the role of leadership in management	Leadership goal development, process orientation
M. Balbin	Creating teams	Group dynamics, teamwork
Ch. Handy	Internal culture	Organisational values, forms of communication, work culture
H. Mintzberg	Strategic planning and management	Creating a mission vision and objectives

Source: compiled on the basis of Dudek-Burlikowska, 2015, pp. 229-236; Szczepańska, 2013.

Thus, over the years, the role of quality management has been changing from a strict supervisory function, through 100 per cent and random quality control, to quality assurance, system activities and then methodologies for incorporating more and more organisational functions into quality management, to the current comprehensive quality management (Figure 1) (Dudek-Burlikowska, 2013; 2019; Skrzypek, 2000; Tkaczyk, 2000). Today's companies are affected by the high pace of change in the market and its immediate environment. Growing competition, ever-increasing customer expectations, the required high quality of products, the achievement of optimum levels of operational efficiency, the estimation of process risks and the high potential of employees' intellectual capital are all factors that determine the nature, as well as the way in which a company operates. Top management therefore acts with the conviction that it is necessary to continuously improve the aforementioned elements.

Quality management is thus becoming an explication for organisations currently operating in a dynamically changing environment. According to K. Bielcher, an organisation operates in an environment of constant challenges and changes, resulting in the complexity of the processes and problems facing the organisation, which are growing simultaneously. According to the concept of integrated process management (K. Bielcher), an organisation is a holistic entity in which the complementation and interpenetration of organisational elements on a rational and emotional level occurs naturally. This methodology is formed on the basis of two paradigms, namely: a holistic view of the world and a reductionist view of reality (Bugdol, 2007; Szczepańska, 2013). Thus, it is oriented towards the consolidation of the organisation's forms of management and its implemented formalised and non-formalised systems, in which employees identify with the philosophy of comprehensive quality management and every activity of the organisation is considered process-wise through the prism of its continuous improvement (Dudek-Burlikowska, 2015).

Today, therefore, business management and its improvement is a continuous, long-term activity, involving all processes and involving employees at every level in the belief that the defined activity is for the good of the company (Peters, Waterman, 2011). The BQA defined that comprehensive quality management as a team-based concept of organisational management for which the integration of customer needs with the goals of the organisational unit is paramount. This approach indicates the importance of the aspects of interaction between employees at all levels of the company in every process taking place, taking into account the conscious application of available methods, quality techniques (Dudek-Burlikowska, 2019).

R. Kolman pointed out that the essence of quality management in an organisation is the employees, who create quality through their entire activity (Kolman, 2009). Thus, the shaping and application of the concept of management by quality in an organisation requires their involvement, daily breaking of the previous form of thinking, systematic improvement of the intellectual capital they possess and directing their attention to the so-called 5 K's, i.e.: customer, cost, creativity, communication and culture (Kolman, 2009; Peters, Waterman, 2011; Skrzypek, 2014).

The literature identifies a number of universal principles in the area of quality management and improvement, the implementation of which is aimed at achieving quality objectives. These include the involvement of the organisation's management in solving quality issues, the elimination of communication barriers in the organisation (improving communication both between employee and manager and between staff and consumer), the implementation of a system of training and motivating employees, the conduct of employees aimed at improving products and processes, and learning about consumer expectations by surveying customer opinions about the services provided (Deming, 1982; Dudek-Burlikowska, 2014; Oakland, 1992; Szczepańska, 2013).

In the European models, the following principles can be specified for aspects of management by quality: customer orientation, management by facts, people-oriented management, continuous improvement process. In Japanese models, on the other hand, the following rules are defined: management commitment, employee focus, customer focus, focus on facts, continuous improvement (Kaizen), universal participation, elimination of waste (Muda) (Tkaczyk, Napora-Kowalska, 2012).

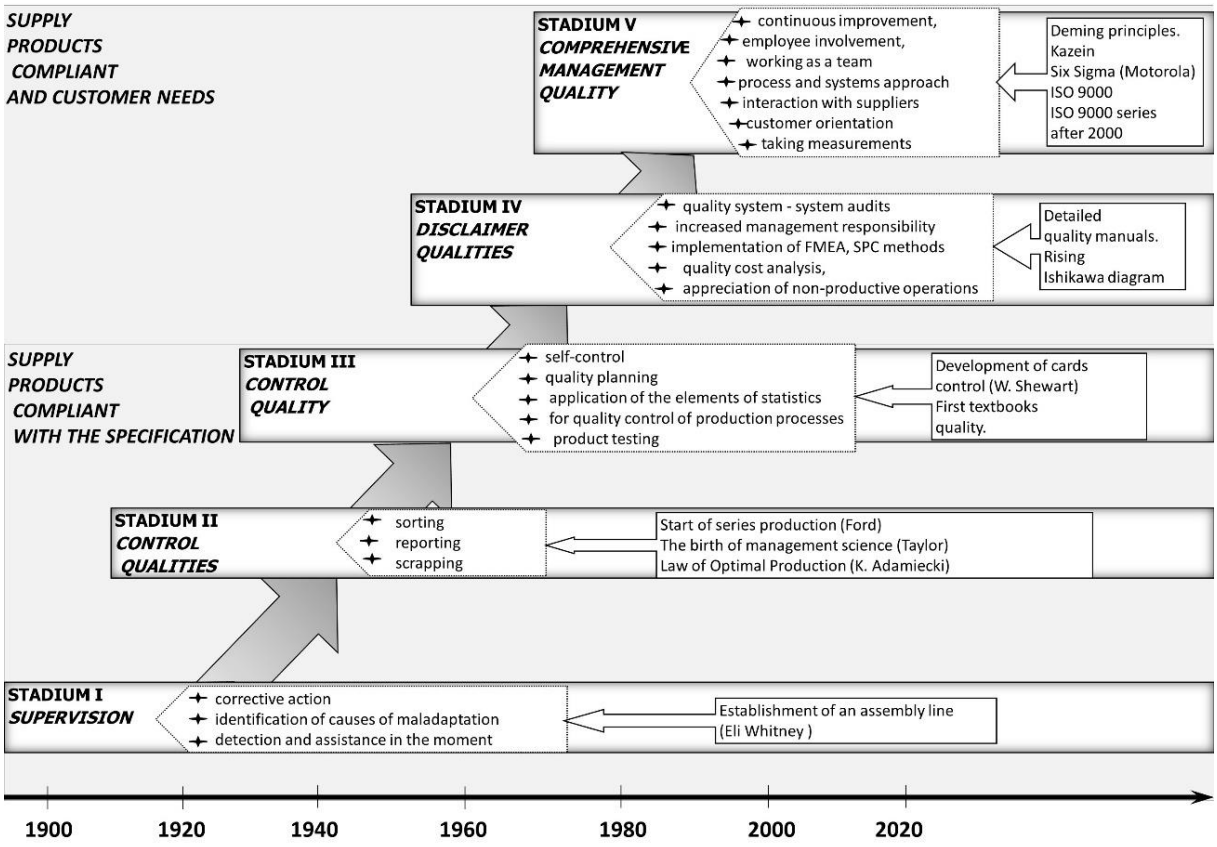


Figure 1. Evolution of the quality management approach.

Source: own elaboration.

The indicated mechanisms are nowadays determinants for many organisations in achieving quality objectives and maintaining proper relations with the environment. Therefore, in order to strengthen its position and reflect the requirements of the ISO 9000 series standards, the ISO/TC Technical Committee defined and then formalised the principles of quality management and made them available for the first time in the PN-EN ISO 9000:2001 standard. The first assumption was that these principles should be helpful to the management in improving the Quality Management System (QMS) in the organisation, in the years 2000-2014 they were treated as a tool for improving the QMS, and currently they constitute a kind of canon of activities that are the foundation of the company's functioning and development.

To sum up, it should be noted that the asset of the modern quality-oriented organisation is the implementation of modern management methods, which should cover with their activity the area of strategic management of the production organisation, and at the same time the aspects of implementation and improvement of each process. Also important is the form of verification of the activities carried out through the use of objective ways of assessing the organisation, for example, through participation in competitions for quality awards, assessment of the advancement of the adopted principles of quality management and comprehensive quality management, implementation of a non-formalised model of self-assessment of the enterprise or its own form of defined assessment (Dudek-Burlikowska, 2019).

2.2. Maturity of the organisation

Nowadays, the image of a process-managed organisation operating in accordance with the assumptions of the concept of total quality management has become the inspiration for defining the concept of organisational maturity and formulating ways of achieving it.

Looking at contemporary enterprises through the lens of the full concept of quality and the process-managed enterprise, as well as through the lens of good practice, has provided the impetus for shaping the definition of process maturity (Skrzypek, Hofman, 2010; Tkaczyk, 2010). Ph. Crosby emphasises that the maturity of an organisation is its ability to professionally implement quality management tools and techniques (Porter, Tanner,2014; Skrzypek 2004). S. Tkaczyk points to the relevance of relating the concept of organisational maturity to the implemented processes as the ability of the organisation and its processes to systematically deliver increasingly better results, on a par with the need to emphasise the organisation's social responsibility (Tkaczyk, 2010). On the other hand, P. Grajewski states: [...] *implementing the process approach means going through certain stages, which are interpreted in the literature as levels of process maturity of the organisation* [...] (Grajewski, 2007). E. Skrzypek points out that the process of achieving maturity is related to the improvement of skills and the acquisition of certain attributes and an indication of the degree of preparedness for the realisation of tasks. The maturity of an organisation is defined as a certain level of skills and excellence in the pursuit of proper execution of activities, tasks, objectives. Process maturity is the attribute that determines the probability of predictability of the consequences of restarting the process. The maturity of an organisation's processes will therefore be determined by its performance, predictability and the quality outcomes achieved and confirmed. The assessment of high process maturity will also be related to the level of efficiency, effectiveness, productivity and agility (Dudek-Burlikowska, 2019; Skrzypek, 2014; Skrzypek, Hofman, 2010).

In the literature, many authors seek answers to the question of how to properly assess the functioning and maturity of an organisation's processes. A comprehensive and insightful form of defining maturity levels is the concept of E. Skrzypek and M. Hofman, which reflects very well the perception of process management in a company and relates directly to the process approach of an organisation focused on quality and improvement (Figure 2) (Dudek-Burlikowska, 2013; Skrzypek, Hofman, 2010; Tkaczyk 2013).

In the perception of the maturity of the organisation, and thus the achievement of process maturity levels, it is correct to state by E. Skrzypek (Skrzypek, 2013) that [...] *maturity assessment creates a sphere of voluntary valuation of the state of the quality management system. The improvement of effectiveness, efficiency and maturity is part of the current of continuous system improvement by indicating the possibility of improving the existing state of organisational solutions and practices* [...]. When *companies carry out such an assessment, it is an expression of employee commitment and the search for continuous improvement*. An important aspect, therefore, is to identify where the organisation is in consciously assessing its own level of maturity.

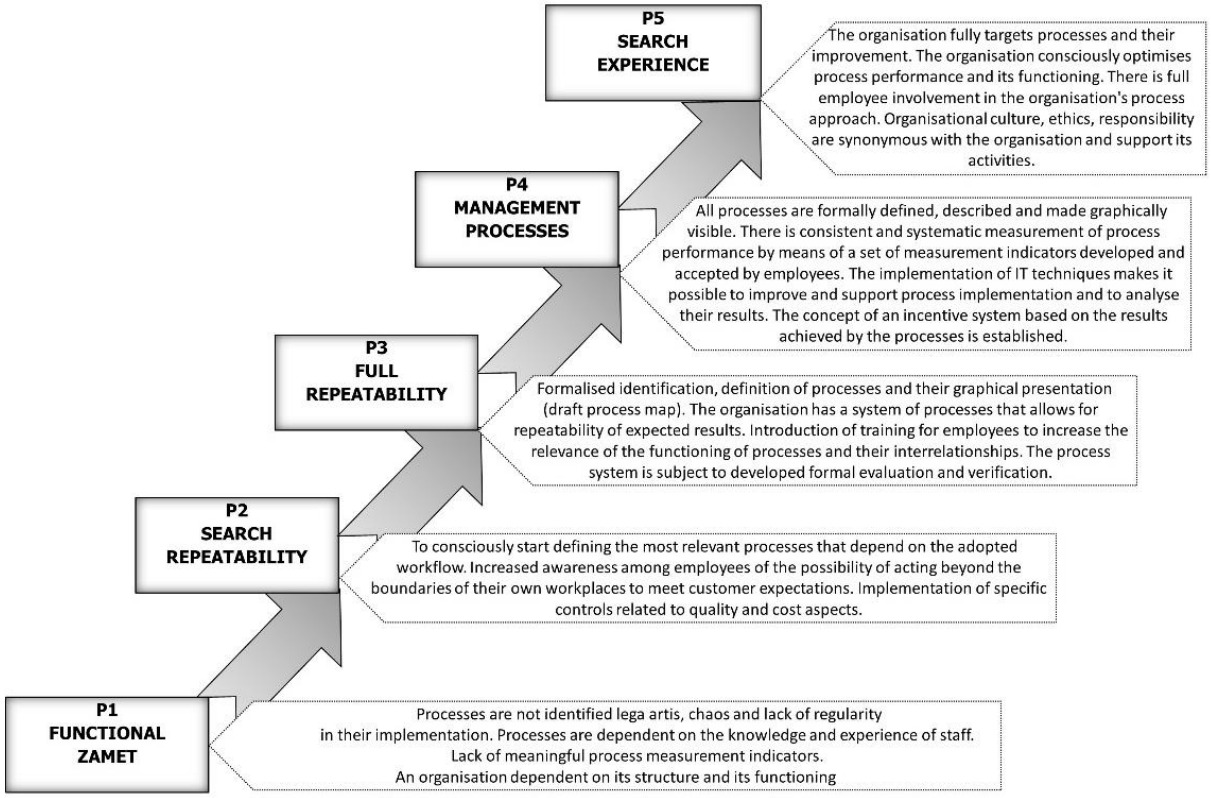


Figure 2. Levels of organisational maturity according to E. Skrzypek, M. Hofman.
Source: compiled on the basis of Skrzypek, Hofman, 2010.

It is therefore reasonable to believe that an organisation that wants to determine its level of process maturity should choose one of the process maturity models and follow it or develop its own, reflecting the nature of the organisation. In addition, it should periodically perform a self-assessment of the organisation, which will be a kind of vector to indicate the direction of its development and its maintenance.

2.3. Company self-assessment

The maturity of an organisation clearly correlates with forms of organisational self-assessment. Nowadays, any organisation implementing the concept of management by quality, and thus seeking confirmation of: the level of excellence of its products, the proper formulation of processes and ways of managing them, the assessment of its development, will carry out its own evaluation.

L.J. Porter emphasises that self-assessment is a learning and development methodology for any organisation. The right perception of excellence and management by quality is a step towards achieving the so-called 'excellence champion' (Porter, Tanner, 2014).

In the PN-EN ISO 9004:2006 standard, the definition of self-evaluation is as follows: *it is a careful evaluation carried out by the top management of an organisation, the results of which are usually opinions or judgements regarding the effectiveness and efficiency of the organisation and the maturity of the quality management system* (PN-EN ISO 9004:2010).

Self-evaluation is therefore a comprehensive, systematic and regular review of an organisation's activities and results in correlation with the chosen business excellence model. This form of activity is the most powerful methodology available for both education and development for the modern organisation. Self-assessment is not only a means of measuring continuous improvement, but also a tool that is an ideal opportunity to integrate business or increase internal organisational excellence across all processes (Dudek-Burlikowska, 2019; PN-EN ISO 9004:2010). A development- and quality-oriented enterprise is aware of the need to improve all its activities and to involve all its employees, and the confirmation of the rightness of such a chosen activity is precisely the conscious submission to self-evaluation.

Companies deciding to undertake self-evaluation are also guided by the need to identify and use indicators to help assess the degree to which defined objectives are being met. The choice of methodology for self-assessment is therefore also one that is consistent with its chosen purpose (Dudek-Burlikowska, 2019; Tkaczyk, 2013).

An organisation focused on success is constantly increasing the number of initiatives in which it participates. These may include business excellence - benchmarking, Six Sigma, Strategic Scorecard (BSC). It is important to emphasise that these initiatives do not negate each other, but are in fact complementary to each other and should be seen as complementary activities within a planned strategy to achieve organisational excellence. Faced with choosing a ready-made model for assessing organisational excellence or developing their own, managers at every level should be aware of the need to define self-assessment functions and principles. Table 3 presents examples of the types of self-assessment principles and functions with their characteristics.

Table 3.
Principles and functions of self-assessment

PRINCIPLES OF SELF-ASSESSMENT (Z)	***Name***		***Characteristics***	***Correlation with self-assessment functions***	***(F)***
	1.	Purposefulness	Self-evaluation is an intentional activity, linked to the achievement of organisational goals		*1*
	2.	Complexity	Self-assessment covers all processes and attributes of the organisation		*2*
	3.	Usability	The results of the self-assessment are a tool for improvement		*3*
	4.	Continuity	The results of the self-assessment are informative by making many comparisons in the future		*4*
	5.	Methodology	The self-assessment is carried out in accordance with the procedure developed		*5*
	6.	Professionalism	The self-assessment is carried out by persons with the appropriate knowledge, skills as well as experience		*6*
	7.	Formalisation	Self-evaluation is defined and described in the organisation's internal documentation and the results are properly documented and stored		*6*

Cont. table 3.

SELF-ASSESSMENT FUNCTIONS (F)		*Name*	*Characteristics*	*Correlation with self-assessment functions*	*(Z)*
	1.	Management	Implementation of self-evaluation results in quality system management decisions		*1*
	2.	Information	Providing information to management		*2*
	3.	Motivational	Self-assessment results are a motivating factor for managers of all levels and all employees to improve their work		*3*
	4.	Corrective	Defining irregularities in the QMS and its functioning		*4*
	5.	Stabilising	Continuous delivery of activities that meet the requirements and expectations of the organisation		*5*
	6.	Development	Formulation of future tasks aimed at improving the QMS		*6/7*

Source: own elaboration.

Self-evaluation processes should involve the collection of data and information about the organisation doing the self-evaluation, and it should be subjected to a real assessment of all its activities. Figure 3 presents a generalised flowchart for the organisation's self-evaluation process. This self-evaluation must be based primarily on team action. This is because no single person working in an organisation has such in-depth knowledge in all areas of the chosen excellence model as to make an independent, reliable, assessment. Objectivity is the most important aspect of selecting members of the evaluation team.

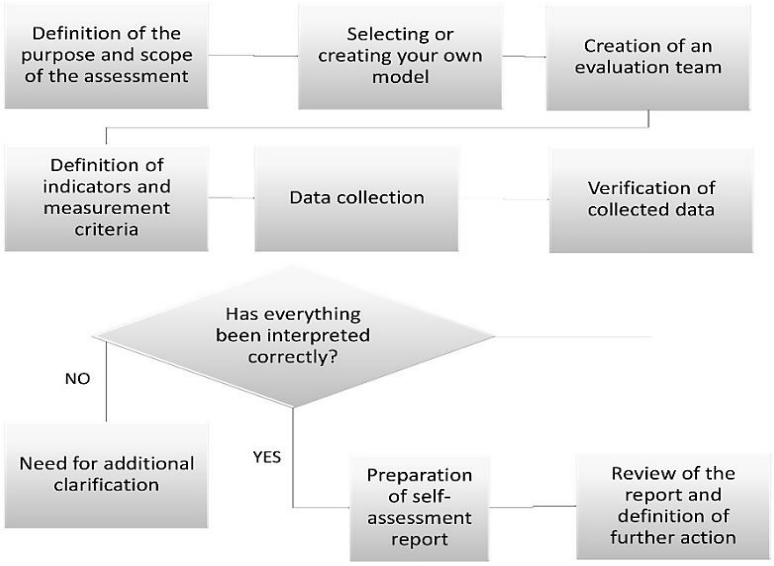


Figure 3. The process of conducting a self-assessment.

Source: own elaboration.

People's perceptions of excellence can be interpreted differently by each evaluator, and a team-based activity makes the whole self-assessment process robust and balanced, while at the same time being different from employees' personal views and experiences (Deming, 1992; Dudek-Burlikowska, 2019; Skrzypek 2000; Tkaczyk, 2010).

In summary, it can be stated that the awareness of the development of the organisation and its continuous improvement for the achievement of the set goals, the fulfilment of the mission and vision, the realisation of the defined strategy and the proper functioning of the processes leads managers to seek the right model for the self-assessment of the organisation, i.e. a model of excellence.

3. The Self-Assessment Model for a Quality-Oriented Production Organisation with usage MSOP Model

3.1. Description of the MSOP model – theoretical aspects

Every modern production organisation should realise the importance of implementing the principles and form of carrying out self-evaluation according to a defined and established scheme. The response to the needs of the organisation is to develop an MSOP model and then a sheet of this model to serve as an estimation tool for the manufacturing organisation. The developed model contains 7 groups of attributes with evaluation criteria, and so sequentially:

- **Attribute A: Customer orientation -** proper definition and interpretation of customer requirements, optimum product price, complaint handling time, customer satisfaction survey, on-time delivery, flexibility of information flow between organisation and customer, formal aspect of dealing with customer property - procedure.
- **Attribute B: Organisational improvement -** compliance of processes with the organisation's objectives**,** innovation**,** assessment of the impact of external and internal factors on the organisation's operating strategy, revision of strategy, monitoring of the organisation's processes, involvement of management and employees in the implementation of improvement programmes, self-assessment of the organisation, training of employees at all levels.
- **Attribute C: Organisational strategy and culture -** monitoring the environment, organisational stability, strategy-process relationship, mission and vision versus organisational values, ethical agenda of the organisation, social responsibility, empathy among employees.
- **Attribute D: Production process and technology management -** production resources**,** process and product design**,** technology attractiveness**, production** process control**,** information systems in production, logistics processes, Product compliance.
- **Attribute E: Intellectual capital management -** strategy - HR methodology relationship**,** employee competences, interpersonal relationships, employee self-evaluation, employee evaluation system, employee development path, motivation system.
- **Attribute F Quality Management:** Identification of inputs and outputs**,** process relationship quality strategy**,** audits**,** PDCA methodology**,** accessibility to documentation, information flow**,** system overview, quality methods and tools in processes.

- **Attribute G: Occupational safety and environmental protection -** internal and external communication in the area of OSH and environmental protection, ergonomics of workstations, occupational risk analysis, adherence to principles and guidelines related to safety in processes**,** 5s methodology**,** waste minimisation**,** monitoring of noise, vibration and pollution levels.

Each attribute has seven factors defined on the basis of the Attribute/Factor Validity Grading Methodology. The weight magnitudes of the factors were defined on the basis of conclusions obtained by applying the multi-criteria decision-making method - AHP (Dudek-Burlikowska, 2019). The analysis and calculations made it possible to develop a universal sheet of the MSOP model (Table 4), which is a utilitarian tool for carrying out estimation in manufacturing organisations. The manager evaluation mechanism takes into account the author's formulated nine-point factor evaluation scale. The obtained numerical values of the factor ranks contributed to the formulation of the formula of the Production Organisation Quality Index WJOP based on the developed MSOP model. The assumption is that this index provides an opportunity to assess a quality-oriented production organisation, and its correct interpretation contributes to the knowledge of defining the degree of commitment to the improvement of all the organisation's processes and the forms of their management.

Table 4.
MSOP Model Sheet

Evaluator position - level (tick as appropriate) ***operational tactical strategic***		**Data oceny:..... nr sheet: .....**	
Attributes and factors	**WEIGHT**	**Evaluation of the manager***	**Result of the assessment**
Attribute A		S_{Ai}	$O_{Ai} = W_{A1} * S_{Ai}$
A 1: Proper definition and interpretation of customer requirements	$W_{A1} = 0.31$		
A2: Optimum product price	$W_{A2} = 0.05$		
A3: Complaint processing time	$W_{A3} = 0.09$		
A4: Customer satisfaction survey	$W_{A4} = 0.19$		
A5: Timeliness of deliveries	$W_{A5} = 0.13$		
A6: Flexibility of information flow on organisation-client interface	$W_{A6} = 0.15$		
A7: Formal aspect of proceedings with customer property - procedure	$W_{A7} = 0.08$		
Attribute value A $W_a = \Sigma\, O_{A1} \ldots O_{Ai}$			
Attribute B		S_{Bi}	$O_{Bi} = W_{Bi} * S_{Bi}$
B1: Compatibility of processes with assumptions organisations	$W_{B1} = 0.35$		
B2: Innovation	$W_{B2} = 0.04$		
B3: Assessing the impact of factors external and internal on the organisation's operating strategy, reviewing strategy	$W_{B3} = 0.12$		
B4: Monitoring of organisational processes	$W_{B4} = 0.2$		
B5: Management commitment and staff in the implementation of improvement programmes	$W_{B5} = 0.12$		
B6: Organisational self-evaluation	$W_{B6} = 0.15$		
B7: Staff training for all levels	$W_{B7} = 0.08$		
Value of attribute B $W_b = \Sigma\, O_{B1} \ldots O_{Bi}$			

Cont. table 4.

Attribute C		S_{Ci}	$O_{Ci} = W_{Ci} * S_{Ci}$
C1: Monitoring the environment	$W_{C1} = 0.26$		
C2: Stability of the organisation	$W_{C2} = 0.24$		
C3: Strategy-process relationship	$W_{C3} = 0.1$		
C4: Mission and vision versus organisational values	$W_{C4} = 0.14$		
C5: The organisation's ethics programme	$W_{C5} = 0.07$		
C6: Social responsibility	$W_{C6} = 0.08$		
C7: Empathy among employees	$W_{C7} = 0.09$		
Attribute value C $W_c = \Sigma\, O_{C1} \ldots O_{Ci}$			
Attribute D		S_{Di}	$O_{Di} = W_{Di} * S_{Di}$
D1: Production resources	$W_{D1} = 0.18$		
D2: Process and product design	$W_{D2} = 0.23$		
D3: Attractiveness of the technology	$W_{D3} = 0.05$		
D4: Process control	$W_{D4} = 0.27$		
D5: Information systems in production	$W_{D5} = 0.05$		
D6: Logistics processes	$W_{D6} = 0.02$		
D7: Compliance of products with requirements	$W_{D7} = 0.2$		
Value of attribute D $W_d = \Sigma\, O_{D1} \ldots O_{Di}$			
Attribute E		S_{Ei}	$O_{Ei} = W_{Ei} * S_{Ei}$
E1: Relationship Strategy - HR Methodology	$W_{E1} = 0.2$		
E2: Staff competence	$W_{E2} = 0.4$		
E3: Human relations	$W_{E3} = 0.04$		
E4: Employee self-assessment	$W_{E4} = 0.08$		
E5: Staff appraisal system	$W_{E5} = 0.1$		
E6: Staff development path	$W_{E6} = 0.05$		
E7: Motivation system	$W_{E7} = 0.13$		
Value of attribute E $W_e = \Sigma\, O_{E1} \ldots O_{Ei}$			
Attribute F		S_{Fi}	$O_{Fi} = W_{Fi} * S_{Fi}$
F1: Identification of input data and output	$W_{F1} = 0.2$		
F2: Process relationship - quality strategy	$W_{F2} = 0.1$		
F3: Audits	$W_{F3} = 0.12$		
F4: PDCA methodology	$W_{F4} = 0.12$		
F5: Accessibility to QMS documentation, flow of information	$W_{F5} = 0.04$		
F6: System overview	$W_{F6} = 0.18$		
F7: Quality methods and tools in processes	$W_{F7} = 0.26$		
Attribute value F $W_f = \Sigma\, O_{F1} \ldots O_{Fi}$			
Attribute G		S_{Gi}	$O_{Gi} = W_{Gi} * S_{Gi}$
G1: Internal communication and external in the field of health and safety and environmental protection	$W_{G1} = 0.25$		
G2: Ergonomics of workstations	$W_{G2} = 0.14$		
G3: Occupational risk analysis	$W_{G3} = 0.14$		
G4: Compliance with rules and guidelines related to safety in processes	$W_{G4} = 0.05$		
G5: 5S methodology	$W_{G5} = 0.19$		
G6: Minimising waste	$W_{G6} = 0.1$		
G7: Monitoring of noise, vibration levels and pollutants	$W_{G7} = 0.13$		
Value attribute G $W_g = \Sigma\, O_{G1} \ldots O_{Gi}$			
VALUE OF ORGANISATIONAL ASSESSMENT	$S_{MSOP} - \Sigma\, (W_A \ldots W_G)$		

Source: own elaboration based on Dudek-Burlikowska, 2019.

The manager's assessment is based on a formulated nine-point rating scale. The least favourable rating is 1 point means unacceptable condition, 2 points is critical condition, 3 points is acceptable condition, 4 points is average condition, 5 means satisfactory condition, 6 is good (favourable) condition, 7 points is very good condition, 8 is outstanding condition and 9 points means excellent condition.

The opportunity to self-evaluate a contemporary quality-oriented manufacturing organisation according to the MSOP model is a chance to define the degree of commitment to improving all the organisation's processes and forms of management.

At the same time, the formula of the Quality Index of the Production Organisation W_{JOP} based on the developed MSOP model was defined. Integrating the developed evaluation sheet and the defined evaluation scale, the following version of the formula (1) was proposed.

$$\boldsymbol{W_{JOP}} = \sum_{i=A}^{n=G} \frac{W_i}{49} \quad (1)$$

where:

W_{JOP} - MSOP organisation quality index,

In_i - sum of scores for each attribute I = (A...G):

$W_A = \Sigma\ (O_{A1} \ldots O\ )_{A7}$ $W_B = \Sigma\ (O_{B1} \ldots O\ )_{B7}$ $W_C = \Sigma\ (O_{C1} \ldots O\ )_{C7}$

$W_D = \Sigma\ (O_{D1} \ldots O\ )_{D7}$ $W_E = \Sigma\ (O_{E1} \ldots O\ )_{E7}$ $W_F = \Sigma\ (O_{F1} \ldots O\ )_{F7}$

$W_G - \Sigma\ (O_{G1} \ldots O\ )_{G7}$

O_{ij} - the rating of a given attribute as the product of the weight of the factor and the assigned score according to the rating scale.

The maximum possible value to be obtained is 0.45[1] , hence the importance of formulating an interpretation scale for assessing the quality of the organisation (Table 5).

Table 5

Interpretive scale for assessing organisational quality

100-90%	89-70%	69-55%	54-40%	39-20%	19%<
0,45-0,40	0,39-0,33	0,32-0,25	0,24-0,18	0,17-0,1	0,09<
EXCELLENT	**VERY GOOD**	**GOOD**	**AVERAGE**	**SMALL**	**VERY WRONG**

Source: own elaboration.

In summary, conducting an Organisation Self-Assessment using the MSOP Model boils down to the following steps:

1. Establishing an organisational Self-Assessment team.
2. Defining the roles in the team.
3. Conducting training on the use of the MSOP Model and the interpretation of the different attributes as instructed: "Substantive statement of the factors of each attribute in the MSOP model for a manufacturing organisation".

[1] 0.45 is the maximum size possible, assuming that the organisation rates its activity as excellent in all factors for each attribute of the MSOP model.

4. Develop a schedule for conducting the annual assessment.
5. Determining the method of collection of MSOP sheets.
6. Calculation of the organisation quality index WJOP.
7. Analysis of the results - defining the improvement actions and added value of the self-assessment, and if possible formulating good practices.
8. Presentation of results among managers and employees.

3.2. Application of the MSOP model in a machinery company – experimental part

The application of the MSOP model is presented on the basis of research results obtained in one of the companies of the engineering industry. The selected company is a medium-sized organisation, operating on the Polish and foreign markets, cooperating mainly with the automotive industry. The surveyed organisation, in order to meet market trends, implemented and certified an Integrated Management System (IMS) in 2008: Quality Management System, Environmental Management System and Occupational Health and Safety Management System. The objectives behind the IMS are to improve production quality, continuously reduce the harmful impact on the environment, achieve the highest possible level of work safety, improve employee-organisation relations, improve information flow, and be open to new standards and forms of process improvement. The organisation in question has so far not participated in quality competitions, nor has it undergone any comprehensive evaluation of its processes. It explained its approach by its aversion to formal quality competitions and lack of access to methodologies worthy of attention in this area. However, with a view to developing the organisation by improving the quality of the processes carried out, and thus the quality of the products offered, the need to carry out a voluntary self-analysis of activity estimation in accordance with the proposed MSOP was identified. In order to obtain a complete picture of the organisation's quality assessment, it was decided to carry out a utilitarian study using the model with the help of organisational representatives selected for this purpose. Individuals at different managerial levels were asked to complete a self-assessment sheet, including: the organisation's director (I), production director (II), sales and marketing director (III), integrated management system representative (IV), QMS coordinator (V), QMS coordinator (I), and QMS coordinator (II). QMS (V), health and safety coordinator (VI), environmental coordinator (VII), selected internal auditor (VIII), production master (IX), HR director (X), sales specialist (XI), purchasing specialist (XII), maintenance coordinator (XIII). The final value of the quality of the organisation will be the average score of the individual managers of the production organisation. Individuals using the scale completed a scoring, and then the importance values for each factor and the values for each attribute were calculated according to the MSOP model sheet developed. The next step was to add up the individual assessment values for each employee and accordingly calculate the W_{JOP} index for each selected employee's individual assessment of the production organisation. Table 5 shows the evaluation values of the organisation made by the employees, while Figure 4 shows the calculated quality indicators of

the production organisation W_{JOP} obtained by each evaluator. Averaging the obtained values of the index W_{JOP}, it was calculated that the quality index of the analysed production organisation is 0.285. Comparing the obtained value with the adopted scale of interpretation of the assessment, it was found that the quality of the organisation is at a good level.

Table 5.
Obtained evaluation of MSOP factors in a manufacturing organisation according to the function of the selected employee (results of research)

Lp.	Selected employee function	The value of organisational assessment (MSOP)
I	Director of the organisation	15,65
II	Production Director	16,05
III	Sales and marketing director	16,35
IV	Plenipotentiary for the Integrated Quality, Environmental and Health & Safety Management System	15,95
V	QMS Coordinator	14,3
VI	Health and Safety Coordinator	13,95
VII	Environmental coordinator	14,3
VIII	Internal auditor (selected)	15,55
IX	Production Master	14,5
X	HR Director	14,9
XI	Sales specialist	14,95
XII	Purchasing specialist	14,55
XIII	Maintenance coordinator	14,55

Source: own elaboration.

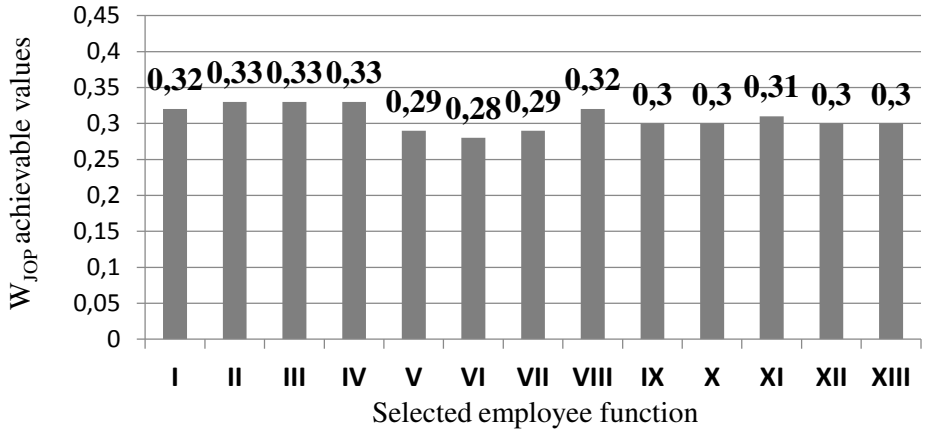
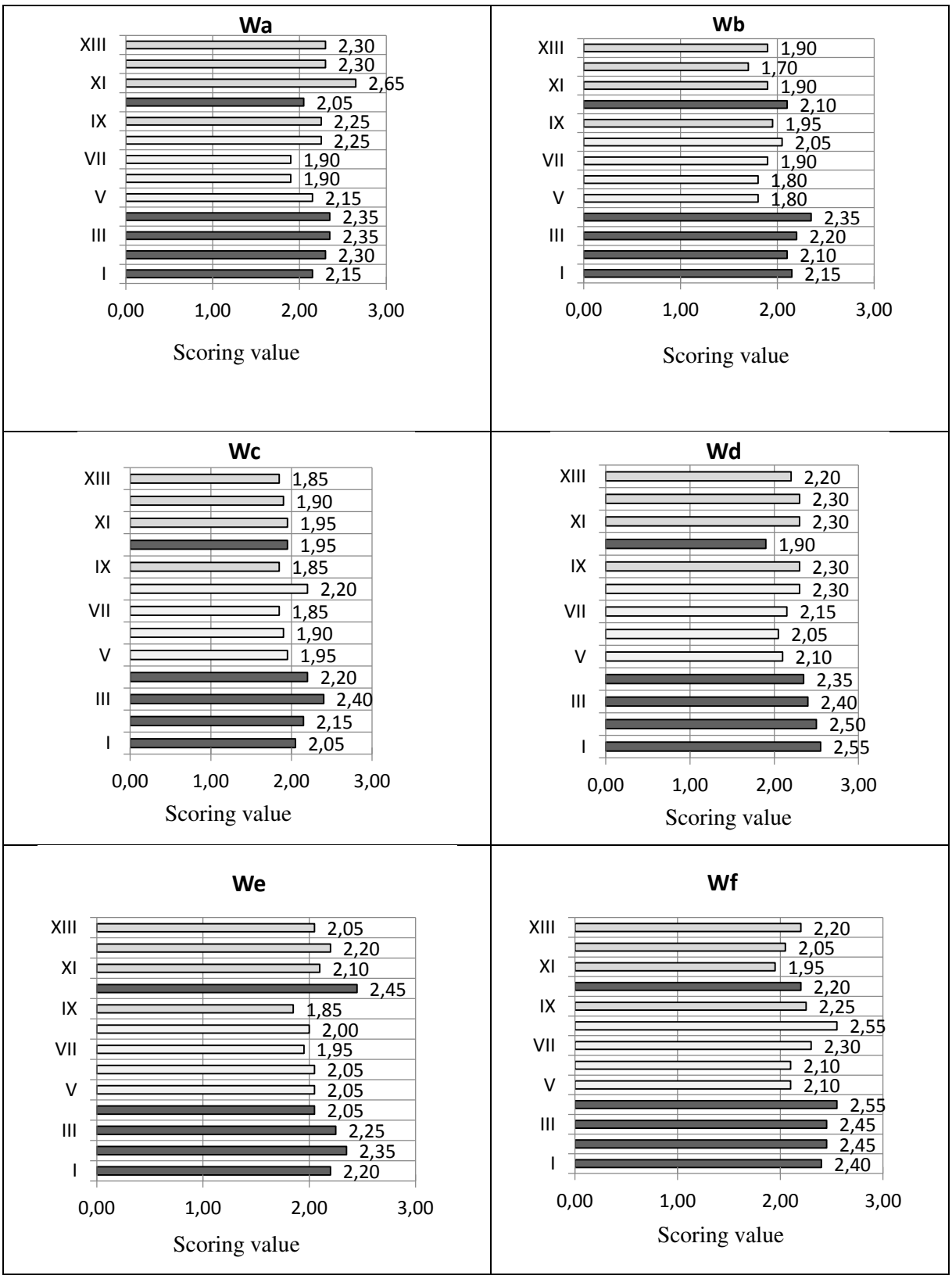


Figure 4. W-index values: W_{JOP} for employees participating in the survey (results of research).
Source: own elaboration.

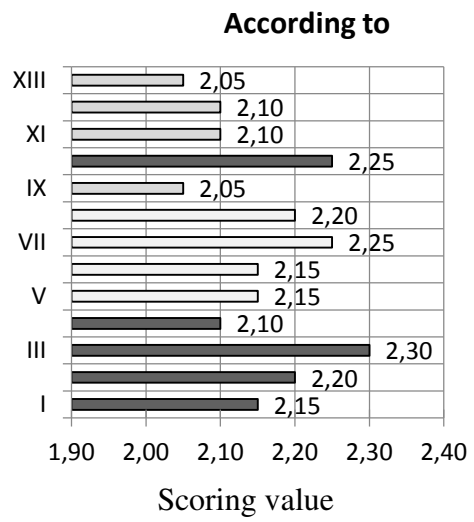
In line with a continuous improvement approach identical to the MSOP, it was assumed that the conclusions obtained from the organisation's self-evaluation would be used to define improvement actions for functioning processes integrated with the organisation's goals and its vision and mission. These will add value to the development of the organisation under consideration. A detailed analysis of each attribute of the MSOP was carried out to identify activities in need of improvement. Table 6 provides a summary of the scores obtained and the importance of the factor for each attribute.

Table 6.

Scoring values with factor importance of individual MSOP attributes in the analysed manufacturing organisation (results of research)



Cont. table 6.



Legend:

I, II, III, IV, X - management representatives - strategic level

V, VI, VII, VIII - management representatives - tactical level

IX, XI, XII, XIII - management representatives - operational level

Source: own elaboration.

3.3. Discussion of research results

Attribute A (W_A) - customer orientation. In conducting the assessment, it was indicated that the overall customer-oriented activities in the organisation are rated best by the sales specialist and the sales and marketing director; the organisation's director, the production director and the representative of the integrated quality, environment and health and safety management system also rated this aspect at a similar level. This is confirmed by the fact that the processes related to the activities of the indicated employees are very well interpreted by them and translated into the realised partial objectives and activities, the customer and its requirements are properly defined, and contact with the customer takes place on an ongoing basis. The constant number of customers and the increasing number of requests for quotations confirm that the price of the product is adequate to the sales level and customer expectations. Complaints and the time taken to deal with them are handled according to an established procedure familiar to employees and customers. Elements in need of improvement are aspects related to internal operations (procedure) regarding customer ownership and improving the flow of information between the organisation and the customer, as well as the timeliness of deliveries, which are currently rated at an average level.

Attribute B (W_B) - organisational improvement. This attribute provides information on the correct perception of the production organisation's objectives in this area. Employees at the strategic and tactical level confirm that the implemented process improvement elements are properly planned and implemented, and that information coming from the environment is taken into account on an ongoing basis by the organisation's management. They point out, however, the inadequate form of perception of changes in the environment in terms of broadly understood innovation. The lack of a rapid response reduces their own attractiveness on the market. Older machinery and thus less modern technology can be a potential obstacle to conquering

new markets and, in time, meeting the needs of regular customers. Employees at all levels point to the need to refine procedures for cyclical, objective self-assessment of processes at all workstations by each employee. It is also important to improve the training system in place in the selected organisation. Improving the aspects indicated will positively influence employees' identification with the organisation's improvement goals and raise their awareness of the validity of the activities carried out in this area.

Attribute C (W_C) - the organisation's strategy and culture. This area is best rated by representatives of the organisation's top management - managers at the tactical and operational level oscillate in the approximate rating. The organisation's environment is monitored correctly, but it would be worthwhile to increase the dynamics of the response to change. The stability of the organisation, its credibility and the proper implementation of its goals are emphasised. Employees identify with the organisation's vision and mission and emphasise the strong positive relationship existing between the strategy and the defined processes. Interaction among employees, as well as with customers and stakeholders, is positive. On the other hand, it is worth considering refining the organisation's social responsibility activities, taking into account environmental aspects and actions for the benefit of the community both within the organisation (working environment) and the external environment. The code of ethical conduct also needs to be improved, including provisions emphasising the importance of involving representatives of all employee groups in the modernisation of the organisation.

Attribute D (W_D) - management of production processes and technology. This is an attribute rated very well by all representatives in virtually every factor analysed. Improvement actions are worth taking towards increasing the attractiveness of technology. Thus, the earlier assessment regarding a better perception of innovation and an increased dynamic response to changes in the environment is confirmed. In order to improve the functioning of the organisation's processes, activities related to the implementation of IT solutions in the area of production and auxiliary process management should also be expanded.

Attribute E (W_E) - intellectual capital management. This attribute is rated very good (top management) and good (operational level managers) by selected employees. Middle managers return attention to the need to refine the form of self-evaluation of activities in their positions by all employees, as well as changes in existing procedures for the evaluation of employees by management, linked to a proper motivation system and, consequently, to better formulated employee development paths. The implementation of improvement actions in the area indicated will add value in the identification of employees with the organisation.

Attribute F (W_F) - Quality Management. As the organisation has had a QMSm implemented and certified for more than 10 years, and has been implementing the importance of the TQM philosophy in its processes and indicating in its strategic objectives for several years, it is not surprising that this particular attribute scored highly. According to managers, the PDCA methodology in all activities of each process needs to be refined, as well as the procedure for assessing possible risks in each of the organisation's functioning processes. Operational

managers also point to the need to increase the number of quality methods and tools used in the processes, which will improve their operations and positively influence the quality level of the final product, as well as meeting the increasing demands of customers.

Attribute G (W_G) - occupational safety and environmental protection. This attribute was rated at a good level. Managers associated with the processes in the area indicated emphasise the need to pay more attention to minimising waste and reducing noise and vibration at workplaces, while top management advocates the inclusion of more positions in the 5S methodology, which they believe will improve work safety, reduce production costs, and encourage employees to properly perceive the importance of health, safety and ergonomics in the workplace.

This analysis confirms the validity of the organisation's approach to its development by improving the quality of its processes and products in order to achieve a high position in the market and increase its attractiveness in relation to the competition. The internal confirmation of the achievement of the set objectives will be the demonstration of added value in the evaluation and verification of activities in the area of MSOP attribute factors in the context of quality and improvement, thus achieving an increasingly higher level of maturity for the organisation.

4. Conclusions

The self-evaluation presented has made it possible to conclude that employees at the strategic level evaluate the organisation's activities, and thus the processes in place, best. Middle managers, on the other hand, perceive the greatest risks and are the most stringent in their assessment, with a percentage score of approx. 60%; in their view, many of the company's activities require continuous improvement and even the implementation of corrective measures in some cases.

The self-assessment carried out in the engineering company represents the beginning of the analysed organisation's journey towards achieving the highest level of maturity and excellence by continuously building quality awareness among managers at every level and employees. The identification of individual areas (attributes) and their detailed analysis will provide the evidence base for the formulation of further objectives and strategies for the organisation. At the same time, it should be borne in mind that there is a risk of a lack of objectivity in the assessment, both in over-assessment and over-assertion in the assessment.

Therefore, it is very important to select the team for the self-assessment and to conduct team training for a proper understanding of the MSOP Model worksheet and how to interpret the factors. The formulation of a timetable for the annual evaluation will add value to the reliability of the self-assessment and the detailed analysis of the results.

In this way, after the annual cycle is completed, it will be possible, for example, to develop radar charts and correlate them with the company's goals set and achieved, which will allow constructive conclusions to be drawn and realistic improvement actions to be planned.

Additionally, for utilitarian purposes, the author plans to develop a computer application of the MSOP worksheet to facilitate the self-assessment of the organisation by a self-defined group of employees. In order to illustrate and interpret the results in detail, the application will potentially be extended to include the use of quality statistical tools and correlated with selected quality methods.

Thanks to the developed tool, it will be possible to verify the self-assessment carried out, keep it cyclical and thus make comparisons and interpret them in order to take appropriate improvement measures in the future.

The periodic calculation of the quality index of the production organisation WJOP will make it possible to monitor the self-evaluation of the organisation both in its entirety - based on the evaluation of all MSOP self-evaluation sheets - and in its partial aspect, with a breakdown into groups of employees taking part in the self-evaluation. Carrying out further exemplifications of the model will aim to define the maturity levels of contemporary manufacturing organisations. These levels should reflect the organisation's self-assessment and its ability to identify with the definition of a self-learning organisation.

Complementing the measures indicated will be an analysis of the risks present in the organisation's processes. With the assumption that risk causes deviation from expectations - positive or negative - an important aspect will potentially be the development of risk measurement procedures based on the MSOP model.

Using the defined attributes and factors, it will thus be possible to demonstrate the correlation between the estimated risks and the opportunities and threats of the manufacturing organisation.

Confirmation of the right way to think about quality in an organisation is to implement organisational self-assessment mechanisms, to achieve a high level of quality maturity, and to win a regional, national or European quality award. In other words, a manufacturing enterprise in the modern world is aware that the integration of management in all aspects is embedded in quality management and the improvement of each process.

Consequently, an important strength of the organisation is its ability to create knowledge, the involvement of employees at all levels in day-to-day activities in order to achieve defined goals, as well as its expansiveness in the search for ways to improve. By developing a process- and employee-oriented improvement methodology in the organisation, and this the indicated Self-Assessment Model for a Quality-Oriented Production Organisation, it is possible to transform the organisation's weaknesses into strengths and thus reduce threats and increase opportunities in a dynamic environment.

The contemporary form of creating a manufacturing organisation is actually a number of defined assumptions and performed activities, which interact and influence each other, so that changes in one area have repercussions in other aspects of its functioning and improvement. Thus, the pursuit of excellence is the conscious management of an organisation, characterized by: continuous activity, the right relationship between the organisation and the customer, the importance of valuing the creative thinking of employees, the implementation of the organisation's strategy, the recognition of corporate social responsibility.

In conclusion, it is worth quoting E. Skrzypek and S. Tkaczyk who believe that looking at quality in an organisation today as the most important management mechanism leads to a modern form of industrialisation. What follows is the creation of a culture and philosophy of management by quality, and this is evidence of the organisation following the ever-changing needs of customers and the consistent thinking of all employees as regards improving all activity and all processes in the organisation.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

KNOWLEDGE REPRESENTATION OF MANAGERIAL COMPETENCES IN VIRTUAL TEAMS AIMED AT ARTIFICIAL MANAGEMENT

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Purpose: The aim of this paper is to show an innovative approach to managerial competences measurement which can be used in team management automation. This aim will be achieved by solving the research problem in the field of artificial intelligence implementation to team management.
Design/methodology/approach: There are answers to two research questions: how to represent the knowledge of what a human manager does and how to record the knowledge of what a human manager does. The answer was formulated on foundation of the original concept of methodology in management reality and research on human managers' behavior using online management tools as research tools (TransistorsHead.com).
Findings: There are two types of findings. Firstly, an original methodology of team management research – the system of organizational terms, developed and tested in the last years. This is also an answer to the first research question. Secondly, the only way is to record what a manager does directly recording his managerial actions which mean managerial competences able to implement in an artificial manager.
Research limitations/implications: To implement an artificial manager at least three conditions should be met: a mutual basis for communication for an artificial manager and team members (shared concepts and their meanings), prediction methods of human behavior in teamwork, a possibility of a real influence of an artificial manager on team members.
Practical implications: The last 20 years there has been a rapid development of information technology, robotics and replacing people's work with machines or algorithms. Therefore, the area of team management automation and its consequences seem to be dominant area of research in the nearest future as well as practical implementation of this research.
Social implications: In the literature and in the public domain an important discussion has started how artificial intelligence will change our social life. The same implications consider the artificial management.
Originality/value: The system of organizational terms used to represent managerial competences as managerial actions.

Keywords: artificial management, managerial competences, knowledge representation.

Category of the paper: Research paper.

1. Introduction

The last 20 years there has been a rapid development of information technology, robotics and replacing people's work with machines or algorithms. Managers commonly work with electronic tools that facilitate their work registering their work (Ewenstein, Hancock, Komm, 2016), e.g., in organization processes (Dash, McMurtrey, Rebman, 2019), IT sector services (Keller, 2017) as well as team management (Davenport, Kirby, 2015).

From the business perspective organizations must respond more effectively to the dynamic and complex environments today. Therefore, team management have become more and more relevant in the past decades, and they are seen as a key fac-tor in increasing organizational effectiveness (Mathieu et al., 2008). This has enabled modern organizations to look for the advantages of integrating all related activities by the means of teamwork and artificial management (Webber et al., 2019). However, team management processes can lead to the consequences which a human manager as well as team members are not able to foresee (Franken, Wattenberg, 2019).

Therefore, in this perspective the research problem in the field of artificial intelligence implementation to team management can be described as a simple question: how to know the activity of a human manager to replace him with an artificial manager? This research problem implicates two main research question:

1. How to represent the knowledge of what a human manager does?
2. How to record the knowledge of what a human manager does?

Importance of the research problem comes from the fact that effective teamwork becomes a crucial problem in organizations. Its internal elements – a team manager and team members – are the warp and woof of the dynamic fabric of companies. They cannot exist without each other activated by managers to use a constellation of specific objectives, resources, and processes (Sohmen, 2013).

The aim of this paper is to show an innovative approach to managerial competences measurement which can be used in team management automation. This aim will be achieved by answering two mentioned research questions on foundation of research on human managers' behavior using online management tools as research tools (TransistorsHead.com).

As a main term which allowed us to understand what a human manager really competence does was defined as an acquired personal skill demonstrated as one's ability to provide a consistently adequate or important level of performance in a specific job function (Numminen et al., 2020). Therefore, competences of human managers were examined in a few research projects of the authors and the are promising theoretical construct to represent knowledge of what a human manager does as well as quite easy to record by online management tools.

In Section 2 there is a description of fundamental issues of (1) artificial management as a new approach to team management, (2) managerial competences as a theoretical construct used in AI implementation, and (3) virtual teams as an environment of an artificial manager activity. In Section 3 there are (1) theoretical foundations of knowledge representation by the system of organizational terms (an original research methodology created by Olaf Flak) and (2) examples of knowledge acquisition by the online management tools in the platform of TransistorsHead.com. Section 4 contains conclusions and future perspective of team management automation research.

2. Theoretical background

2.1. Artificial management

The first vision of artificial management was spoken in words that in the future "computers" will not only make decisions, but they will do much more (Drucker, 1967). Looking for an answer if it is possible to replace human team managers with robots, terms "artificial management" and "artificial manager" were created (Geisler, 1986). The concept of artificial management and its operational consequence in person of in artificial manager was seen as a dehumanizing attempt to eliminate participation of human managers in the processes of the organization. Therefore, most of researchers considered artificial management applications only in organizational decision systems or routine operational processes which were well structured (Huber, 1990; Mitroff, Linstone, 1993; Pomerol, 1997; Courtney, 2001; Gigerenzer, Gaissmaier, 2011). Eventually, it led to a strong need of establishing some patterns of team managerial work (Halliday, Stacey, 2009) or it is focused on automated decision making (Zimmermanna et al., 2019).

However, nowadays AI overwhelms more areas of managerial actions. Artificial intelligence is emerging as a potential growth area for facilitating the improvement and development of teams in the workplace. AI, as used in the team context, is currently underdeveloped and limited, thus reducing the wide-scale adoption and implementation of Al to improve team effectiveness (Webber et al., 2019). New applications such as robotics, automation or intelligent assistance are becoming drivers of a wide-ranging change process in companies which requires reorganisation of team management, particularly in virtual teams (Franken, Wattenberg, 2019).

However, in the literature there are approach to artificial management which representations are an artificial leader or an artificial manager. On the one hand, there is a vision of an artificial leader as an intelligent system which has new dimensions of human-computer interactions based on natural communication patterns and consideration of human individual differences.

It is said that in the future information systems will involve both the automated delivery of human-like communication and the interpretation human verbal and non-verbal messages (Derrick, Jenkins, Nunamaker, 2011). The ability for a computer system to have a knowledge base on which to draw to deliver appropriate messages to a human user is an ambitious undertaking and is a novel conceptualization for information systems. The prospective benefits of AI to the decision-making process before arguing that they can be practicably implemented in a social setting, e.g., if a human leader can veto any decision taken by an AI-based system (Parry, Cohen, Bhattacharya, 2016). There are also philosophical dilemmas about ethical aspects of artificial leadership (Lawless, 2021). Such focus may utilize top-down and bottom-up ethical issues, with decreased focus on getting machine followers to feel part of a virtual team (Smith, Green, 2018).

On the other hand, automation of the role of managers can be seen as a gradual replacement of human managers only by algorithms in some areas of team management and such a system would be called an artificial manager. As a result of this approach nowadays in many organizations some processes are completely managed by AI technologies (Petrin, 2019). Managerial activities have been taken over by machines such as describing tasks, evaluating team members performance, and matching employees in work teams (Jarrahi et al., 2019). It is even said that these technologies can cover the entire spectrum of manage-rial actions of highly qualified managers (Susskind, Susskind, 2015). Overall, this new AI approach presents both opportunities and challenges within workplace management. For example, in the literature there are many challenges in cooperation of artificial managers (AI management) and human team workers (Peifer, Jeske, Hille, 2022).

2.2. Managerial competences

There are many definitions for the competences, but authors agree that a competence is defined as a learned ability to adequately perform a task, duty or role (Bartram, Roe, 2005). The competences integrate knowledge, skills, personal values, and attitudes, and they build on knowledge and skills and are acquired through work experience and learning by doing. It means that competences rest on the pillars of knowledge, skills, and attitudes and that the whole structure is built upon the individual person's dispositions, i.e., abilities, personality traits, interests, values, etc. They define capabilities to learn the necessary knowledge and skills, the appropriate attitudes and to conduct psychological services for clients to meet the standard expected by their profession.

The descriptions and definitions of competences have been increasingly present in the area of Human Resource Management and replaced the concept of qualifications (Cook, Wildschut, Sande, 2017). In the literature The term "competence" refers to the general competence, the quality of an individual or a set of skills that allows one to perform in certain situations (Anzengruber et al., 2017). Competences refer to a set of traits that influence one on certain

actions, and a specific skill set of activities that one can use to measure and demonstrate the universal competence.

Competences have attracted a lot of research; however, competencies usually have been focused on individual or organizational ability to express effective job performance in the context of expected real job proficiency (Cook, Wildschut, Sande, 2017). Competences are defined as the ability to do the work which means that individuals have the knowledge, skills and values required in jobs of today and tomorrow (Phuc, Matsuura, 2016). In such context competences are defined as acquired personal skills demonstrated as one's ability to provide a consistently adequate, important level of performance in a specific job function (Numminen et al., 2020)

The competencies have unique characteristics or qualities, and they are difficult to copy (Hensel et al., 2010). Additionally, individual competencies contain explicit knowledge, personal skills and experiences with individuals' results and judgement of organizational values which are obtained in their social context (Ubeda, Santos, 2007).

However, significant differences were observed in the effectiveness of managers using task, relations, and changing capabilities. Competencies depend on the organizational context and may be different at various levels of management. For example, at top management level there is a need for more strategic competencies, i.e., change-oriented, which become two to three times more important than at the lowest level. Task-oriented capabilities become significantly less important at the top level and more important at a lower level of management, whilst relations-oriented capabilities are important at all levels (Anzengruber et al., 2017). It is said that the competencies are also shaped by the context of work, work environment, and the employee's personality and motivation (Forsten-Astikainen, Heilmann, 2018).

Competency analysis is an alternative to traditional job analysis and is a method focused on the individuality of the employee. It can be used for selection, training, development, and evaluation. The purpose of competency analysis is to create a profile of an ideal employee or a competency template consisting of a set of characteristics. Such a profile shows what competencies an employee should have to perform his or her duties effectively (Rożnowski, 2020). A competency model is the result of such a job analysis and contains a description of all competencies considered by the company to be necessary for success in its business. They consist of a list of competencies and a detailed description of each of them. In the context of job analysis, competencies are understood as compositions of qualities and states of an employee that lead to optimal performance of tasks on a given job and thus are a set of knowledge, attitudes and personality traits possessed by an employee (Sew, Yahya, Tan, 2019).

As the management activity and its representation aimed at artificial management is concerned, it is necessary to describe teamwork competency. It can be diagnosed by observing the following behaviors: (a) interacting with co-workers, (b) being active in achieving goals, (c) stimulating the motivation of others in the team, (d) communicating information important to the quality of cooperation, (e) dealing with demanding situations (Wood, Payne, 2006).

These five groups of competences we could represent and record by the online management tools implemented in the research platform called TransistorsHead.com, described in Section 3.1.).

2.3. Virtual teams

A team is defined as a bounded and stable set of individuals as a group of people who are interdependent for a common purpose or who work interdependently to-wards shared goals (Edmondson, Reynolds, 2016). Thus, teams have two required elements: firstly, membership and, secondly, collaborative tasks.

Firstly, team memberships in the past were often mutually exclusive, with members working on only one team at a time. Traditional teams are co-located and have easy access to both face-to-face and electronic communication. These teams have been formally studied for more than half a century, resulting a huge body of literature (Mathieu et al., 2008).

Contemporary the term membership tends to overlap because members working simultaneously on more than one team. Additionally, today teams are becoming more virtual organized (Salas, Tannenbaum, Kozlowski et al., 2015) than face-to-face due to inter-organizational alliances, globalization, outsourcing and alternative work arrangements (Kozlowski, 2015). These teams are most often constructed because organizations require skills, local knowledge, experience, resources, and expertise from employees who are geographically- distributed.

Secondly, collaborative tasks in teams implies that team members interact and share resources to complete their duties, which means that they are interdependent regarding task accomplishment. Through the years, an increasing number of frameworks have been proposed to provide a classification of teamwork actions such as communication, coordination, and cooperation (Kozlowski, Bell, 2003; Frick et al., 2017). The integrated model of hierarchical conceptual structure of teamwork activities has been presented in which two set of teamwork actions are proposed: focused on regulation team performance (preparation of work accomplishment, task-related collaboration, team adjustment and work assessment) and focused on management team maintenance (psychological support and conflict management).

Virtual teams in organizations appeared in the last decade of the 20th century and they are associated with accelerating business activities and increasing innovations (Fuller, Hardin, Davison, 2006). A virtual team as a group of people who do not stay geographically, organizationally, or temporally in the same place, but co-operate with each other through the use of ICT for one or more organizational tasks (Kożusznik, Pollak, Chrupała-Pniak, 2020). The degree of use of innovative technologies then becomes an indicator of the level of virtuality of such a team (from semi-virtual to pure virtual) (Lonnblad, Vartiainen, 2012).

The virtual team is also described by the category of temporality when short, un-defined time of the team's activity is conditioned by the needs of the organization and individual motivations of its members (Gassmann, Von Zedtwitz, 2003). Virtu-al teams are also found in

organizations which bring together specialists who design and conduct research or collect data (Engerer, 2019). During the COVID-19 pandemic virtual teams appeared in organizations as a necessity to meet the challenges of isolating employees and virtual teams became a hallmark of the pandemic. A few last years have boosted the implementation of virtual teamwork, with many employees working at homes using virtual tools to collaborate with their teammates (Feitosa, Salas, 2020). Therefore, a virtual team we assume as a natural environment of artificial management implementation and in such virtual teams we conducted re-search, as it was described in Section 3.2.

3. Research methodology

The first research question, mentioned in Introduction, concerning knowledge representation of managerial competences, will be answered by presenting a new research methodology based on the original system of organizational terms.

In the management science literature, one can find a full range of publications on knowledge management in organizations. This process is understood as the management of the processes of creating, distributing, and practicing knowledge to increase the efficiency of the organization, especially in the operational dimension. Two types of knowledge can then be distinguished: tacit (Chalmeta, Grangel, 2008) and explicit (Matos et al., 2010).

There is a way of creating tacit knowledge as a result of teamwork but based on the intellectual capital of each of its members and the recipients of activities in the organization. Explicit knowledge is created based on the intellectual capital of the team as a whole and the processes that take place in the organization. Both types of knowledge "span" the human capital and social capital of the organization (Matos et al., 2010).

In the context of knowledge representation of what a manager does, the model of the formation of tacit and explicit knowledge in an organization seems much better (El-Sayed, 2003). It shows four stages of changing tacit knowledge into explicit knowledge and vice versa. The model captures both types of knowledge in a dynamic way. Tacit knowledge, through the process of socialization and because of an individual's choices, transforms into explicit knowledge, resulting in its conceptualization. Then, through the process of combination and exchange, overt, systematized knowledge of reality is created. It transforms again through the individual's learning process, which results in the operationalization of knowledge in the individual. Such knowledge is again tacit knowledge. This is where the cycle begins again (El-Sayed, 2003).

On this foundation and based on the previous research we formulated the answer to the first research question, how to represent the knowledge of what a human manager does. The answer is an original methodology of team management research – the system of organizational terms, developed and tested in the last years (Yang, Flak, Grzegorzek, 2018; Flak, 2019; 2020; 2021). This methodology allows us to record managerial actions one by one and it is possible to answer what a team manager and his team members really do (Sinar, Paese, 2016). Managerial actions are the real and active representatives of managerial competences, according to the definition presented in Introduction. It is worth reminding, that competence is acquired personal skills demonstrated as one's ability to provide a consistently adequate or high level of performance in a specific job function (Numminen et al., 2020).

The philosophical foundation of the system of organizational terms is based on Wittgenstein's philosophy: his theory of facts (the only beings in the world) and "states of facts" (Brink, Rewitzky, 2002). According to this approach team management can be organised by events (derivative organizational terms) and things (primary organizational terms). Specifically, as shown in Figure 1, each event and thing have the label n.m, in which n and m represent a number and a version of a thing, respectively. Event 1.1 causes thing 1.1, which in turn releases event 2.1 that creates thing 2.1. Thing 1.1 simultaneously starts event 3.1 which creates thing 3.1. Then, thing 3.1 generates the latest version of the first event, i.e., event 1.2. In such a way, the latest version of the first thing is created, which is called thing 1.2. So, the managerial action structure consists of, e.g., event 1.1 and thing 1.1. As it was shown in Figure 2, differences between features of goal 1.2 and goal 1.1. let us do reasoning on the team management process (Flak, 2018).

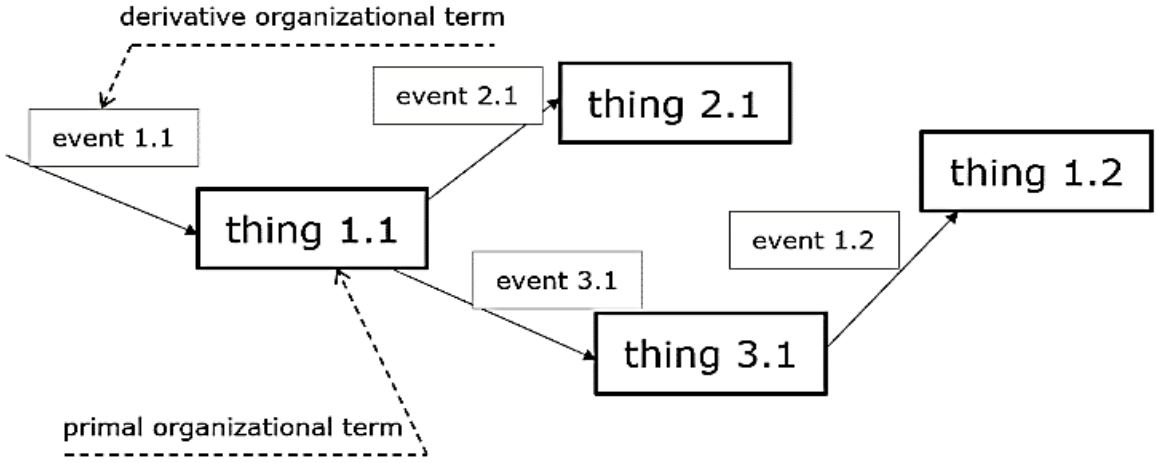

Figure 1. Theoretical pattern of events and things.
Source: Flak, 2022, pp. 153-166.

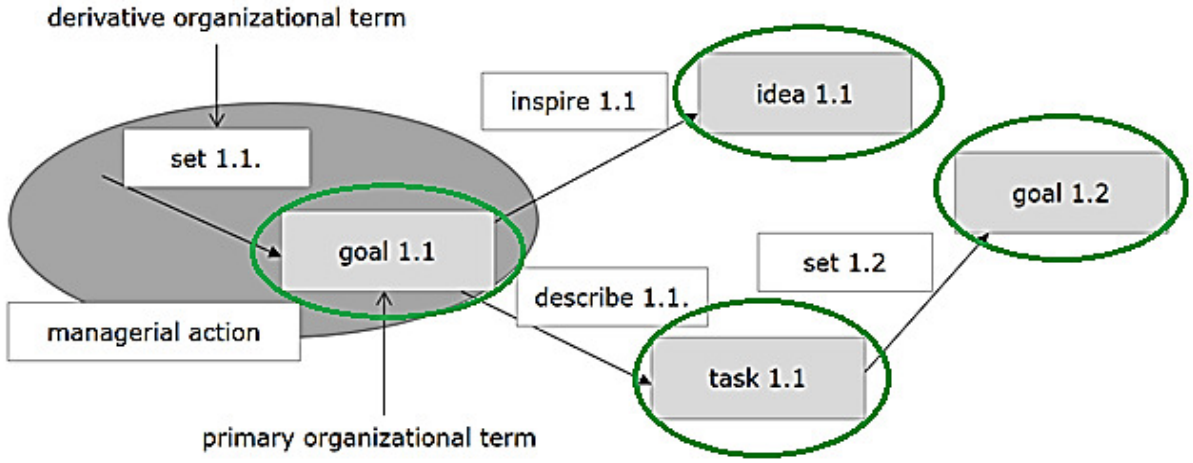

Figure 2. Managerial action's structure.

Source: Flak, 2022, pp. 153-166.

In the research we recognized 10 managerial actions which represented 10 managerial competences in 5 groups which were described in Section 2.2. Table 1 presents managerial competences which build knowledge of what a human manager does. This is the answer to the first research question, how to represent the knowledge of what a human manager does. We can do it by managerial competences, which theoretical construct consists of primary and derivative organizational terms formed in managerial actions.

Table 1.
10 managerial actions representing 10 managerial competences

Item	Combination of managerial competences in groups of behaviours	
	group of behaviours (Wood & Payne, 2006)	**managerial competences (represented by managerial actions taken by managers)**
1	interacting with co-workers	generate ideas (3), specify ideas (4)
2	being active in achieving goals	set goals (1), describe tasks (2)
3	stimulating the motivation of others in the team	check motivation (7), solve conflicts (8)
4	communicating information important to the quality of cooperation	prepare meetings (9), choose options (6)
5	dealing with demanding situations	define problems (10), create options (5)

Source: Own elaboration.

4. Research results

The second research question which was how to record the knowledge of what a human manager does concerned knowledge acquisition of managerial competences. However, it is not easy to record behaviors which could mean managerial competences able to implement in an artificial manager. The only way is to record what a manager does directly recording his managerial actions.

So that the research platform TransistorsHead.com was created with 10 online managerial tools being in the same time research tools. This set of online management tools record parameters of the managerial actions (effects marked with a round, e.g., a goal 1.1 because of set 1.1). It reminds making a movie of teamwork with frames of features team management processes. The results of using this approach to track managers' behaviour by managerial competences, checked in empirical research, was described in many previous publications (Flak, 2018; 2019; 2020; 2021; Yang, Flak, Grzegorzek, 2018).

As an example of the acquisition of knowledge on what a human manager does managerial competences, we present the results of the research obtained during a 36-hour non-participant observation on June 29-30, 2021. The group of observation participants consisted of 6 2nd degree students at the University of Silesia in Katowice, working in 2 equal virtual teams. Each team had a designated team manager role. The students had basic competencies in managerial techniques, acquired during courses in the study program. Both groups were given the same task, which was to design an entertainment program in Talent Show format on a YT channel. Participants could work at any time between 9 a.m. on the first day and 9 p.m. on the second day of observation. During the assignment, students used 10 online managerial tools on the TransistorsHead platform and the MS Teams as a communication tool.

In Figure 3 and Figure 4 there are histories of managerial competences used by participants in certain moments of research time by manager 1 and manager 2, respectively. We can see how much they differed from each other when they were managing teams, both focused on designing an entertainment program in Talent Show format on a YT channel. The numbers of types of managerial competences mean the managerial competences indicated in Table 1. As it can be seen, managers used different managerial competences in different time periods and sequences. They had their own managing style consisted of managerial competences which could be repeated by artificial managers. Such research confirmed that the way of recording the knowledge of what a human manager does when used online management tools is efficient and let us build knowledge ready to use for artificial management.

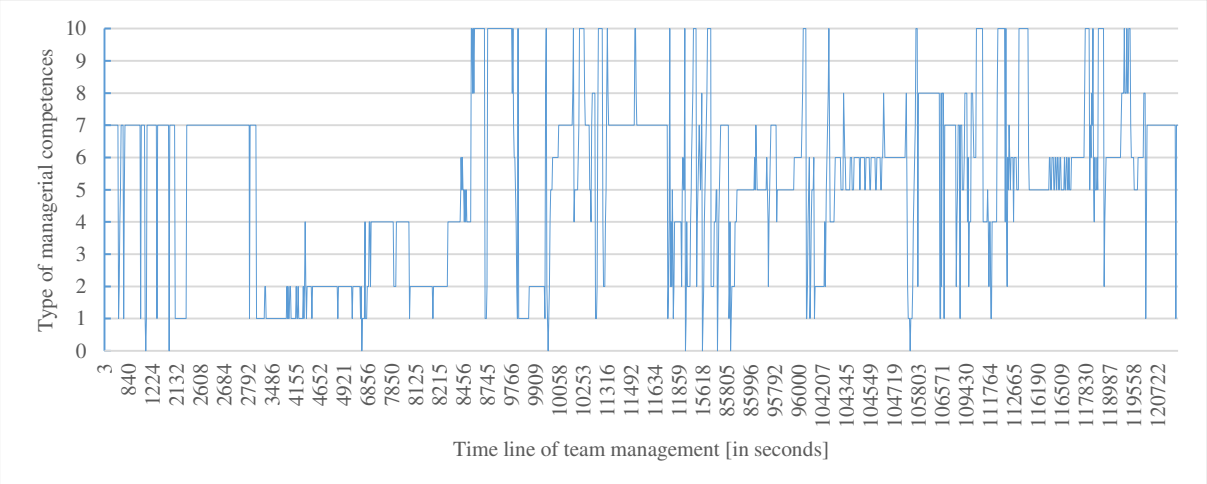

Figure 3. History of managerial competences used by manager 1.

Source: Own elaboration.

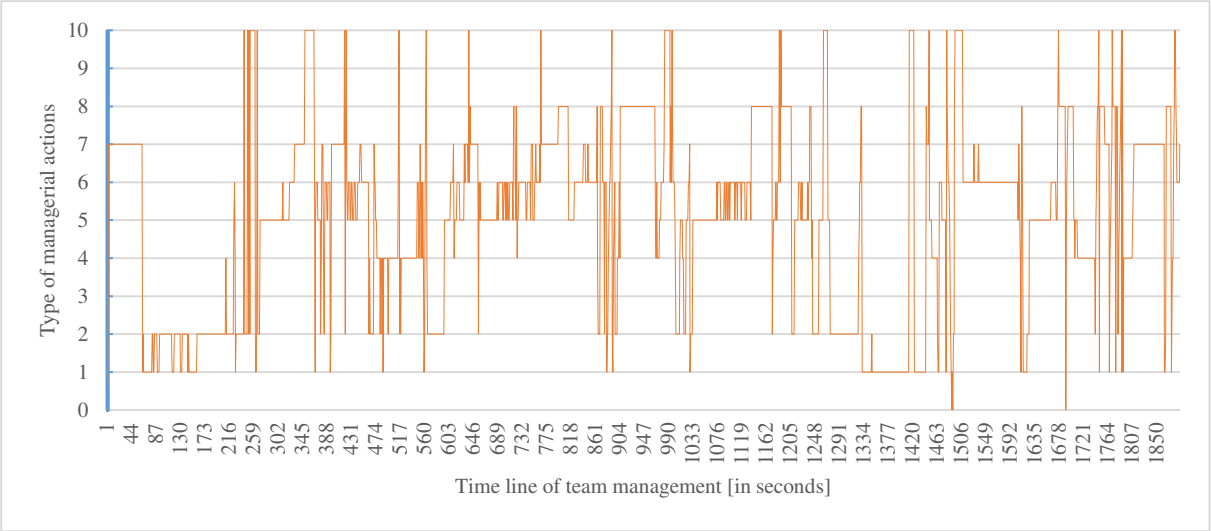

Figure 4. History of managerial competences used by manager 2.

Source: Own elaboration.

As it was shown in Figure 3 and Figure 4, using the system of organizational terms and the representing managerial competences as managerial action, we can answer the second research question, how to record the knowledge of what a human manager does. We can record managerial actions using managerial tools, such as in TransistorsHead.com or many others, to distinguish separate managerial actions to know which competences are necessary in artificial management.

5. Conclusions

This rapid development of computer science gives opportunities to replace managers of teams with robots. The area of team management automation and its consequences are dominant area of research in the nearest future (Peifer, Jeske, Hille, 2022). We can find research on influence of AI management on such aspects of team management as planning (Liu et al., 2020), creativity (Parry, Cohen, Bhattacharya, 2016) or decision making (Smith, Green, 2018). However, it still not possible to employ a robot on a managerial position. Why?

In the paper we present answers to two main research questions when we think of implementing artificial management. Firstly, how to represent the knowledge of what a human manager does. Secondly, how to record the knowledge of what a human manager does. The answer to the first question is the system of organizational terms as the research methodology of managerial competences, represented by managerial actions. The answer to the second question is the set of managerial tools implemented in the TransistorsHead.com platform, which can record managerial actions to know which managerial competences are necessary in artificial management.

This approach is more efficient than the traditional approach to competences and their measurement presented in the Theoretical background. It is more fruitful because we can achieve clear histograms of managerial competences sequences used in a certain situation which a manager must solve during projects.

Therefore, in this perspective the research problem in the field of artificial intelligence implementation to team management can be solved by knowledge of human managers' activities which should be replaced with an artificial managers' activities. However, to implement artificial management at least three conditions should be met: (1) a mutual basis for communication for an artificial manager and team members (shared concepts and their meanings), (2) prediction methods of human behavior in teamwork, (3) a possibility of a real influence of an artificial manager on team members.

Taking into consideration these conditions the next research problem to be solved in the future concerns patterns of team management processes in a virtual team. This main research problem can be split to 3 groups of specific research domains: (1) content domain (what are the features of managerial actions), (2) a time domain (when do they happen) and (3) a psychological domain (what are the interactions of managers and team members). Answering to these research questions will be a task for the future research on implementing artificial management in virtual teams.

Acknowledgements

This paper was undertaken as part of the internal research project of the Interdisciplinary Centre for Staff Development of the University of Silesia in Katowice.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

CORPORATE SOCIAL RESPONSIBILITY IN THE CONTEXT OF DEMOGRAPHIC CRISIS. CHOSEN RESULTS OF THE EMPIRICAL STUDY ON THE SME'S

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Purpose: The main aim is to present the results of research taken in small and medium-sized enterprises from Poznań poviat in the area of social responsibility.
Design/methodology/approach: The study was conducted by using both CATI and PAPI methods. The research sample consisted of fifty SMEs from the Poznań poviat. The respondents were asked to answer 24 questions.
Findings: In the analyzed companies one can notice very small manager's engagement in the sphere of older workers and very low care about the future of companies in the context of demographic crisis. Respondents suggested lack of respect of their value system and that the value conflict is the second biggest barrier in the cooperation of young and old generation in companies. What is more, one can observe the existence of age discrimination. Only four entities implemented so far the corporate social responsibility system.
Research limitations/implications: There is a need to conduct study on bigger research sample and extended it by younger respondents. Due to that a comparison between two generations will be possible to make.
Practical implications: Companies should focus on the values professed by all workers and try to create the strategy of existence based on common accepted values by both – young and old generation.
Social implications: All mentioned in the article recommendations may positively affect the labor market and lead to higher welfare of seniors.
Originality/value: The originality of the paper is the attempt to examine whether SMEs consider needs of older employees, especially in the social-psychologic sphere. Nowadays due to negative trends on the labor market managers should focus their attention on the system of values, creation the written books of values, implement the management strategy based on common values. Also there is a need to educate all the workers how to combine economic decisions with ethics.

Keywords: age, demographic crisis, age management, social corporate responsibility.

1. Introduction

The last phase in human life, i.e. old age, has been in the center of interest of representatives of various scientific disciplines in recent years. Sociologists, psychologists, demographers and economists are increasingly carrying out their research by choosing representatives of the 50+ population as a research sample of their studies. Such a situation is undoubtedly related to progressing - not only in highly developed countries - unfavorable demographic trends. For several decades, the global process of population ageing has been visible. According to World Bank data, in 1960 the share of people 65+ in the total world population was at the level of 5%, in 2020 it has already reached the level of 10%, and according to the forecast in 2050 - it will increase to the level of 16.5%. At the same time, the share of people aged 0-14 in the population is systematically decreasing. In 1960 it accounted for 37%, in 2020 this group already represented 25% of the population, and according to estimates, its share in 2050 will decrease to 20.7% (UK, 2023). It is worth adding that this situation is caused i.a. by the improvement of the calorific value of the diet and hygienic conditions, progress in medicine (i.a. resulting both in a decrease in infant mortality and in the number of fatal diseases), a lowering fertility rate (as a result of women entering the labor market, resignation from the traditional family model, as well as the currently observed so-called conscious childlessness). As a result, the population structure has now taken on a regressive character and the traditional population pyramid has been reversed.

The ageing of the population also affects Poland. According to World Bank estimates, in Poland the share of people 65+ in 2020 was at the level of 19%, and in 2050 it will increase to 30.01%. In turn, the share of people aged 0-14 in the entire population in 2020 was at the level of 15% and will decrease by about 3 pp. by 2050 (UK, 2023). It is not surprising therefore that the projected demographic dependency ratio for Poland the ratio of people 65+ to people 15-64 years old) will be at the level of 52.9%, which means that there will be two people in productive age for one non-working senior (EU, 2023). Moreover, the average Polish citizen is now 42 years old, which means that Pole is two years younger than the average European. However, according to the forecast for 2050, the median age in Poland will be at the level of 50.9 years, and for the EU27 - 48.2 years. At the same time, this indicator will be higher for only three countries i.e., Portugal (median at 51.2 years), Lithuania (51.5) and Italy (51.6) (EU, 2022).

The demographic trends mentioned here have consequences not only in the sphere of public finances (longer period of pension's payment or an increase in spending money on health care), but also on the labor market. This is due to the fact that the ratio of economically active to inactive people changes very quickly in favor of the second group. Therefore, the shortage of labor noticeable over time forces both systemic changes undertaken at the central level (e.g. through the statutory extension of the retirement age) and changes that must take place in

the enterprises. They should not only concern such issues like: ergonomics of workplaces and their adaptation to physical conditions, the introduction of flexible forms of work. Nowadays they should present holistic approach to sociological and psychological aspects determining the well-being of seniors in the workplace (e.g. through the fight against ageism). Therefore, a specific challenge should be taken by managers to include these aspects in the strategic management of enterprises, and taking into account the issues of old age and ageing in the philosophy of corporate social responsibility. Therefore, companies should emphasize ethical aspects, including - in particular - interest in such matters as: norms and values, respect between manager – employee and employee – employee, trust, fight against stereotypes and a culture of diversity and inclusion, as well as age discrimination. There is a belief that the demographic crisis is becoming a kind of the opportunity to take a broader look at the philosophy of corporate social responsibility and to include the issue of old age in it. This proposal is treated as making both economics and management more ethical (Barcik, 2009).

The above findings became one of the prerequisites for conducting a quantitative survey among SMEs from the Poznań poviat. Through its implementation, answers were sought i.a. to the following research problems, which took the form of the following questions: 1) are the values professed by people 50+ respected by other employees? 2) do the analyzed companies have an implemented corporate social responsibility strategy? and 3) do employees experienceage discrimination? In the phase of preparation of empirical research, three research hypotheses were adopted. In order to verify them, the CATI and PAPI methods were used.

The article consists of three main parts, in addition to the introduction and ending. In the first theoretical one, the concept of corporate social responsibility is characterized more broadly and age management is indicated as a practical exemplification of this concept. The second part presents the research criteria of the project implemented in 2022-2023. The results and discussion are presented in the last part of the article.

2. Corporate social responsibility in the time of demographic crisis

Let us note at the beginning that corporate social responsibility (CSR) is a management strategy according to which enterprises voluntarily take into account social interests, environmental aspects or relations with various stakeholders, in particular with employees (EC, 2001). Jan Klimek states that "due to the disclosure of adverse defects of the "invisible hand" of the market – causing several adverse effects, conflicts and threats – there was a need to notice a number of other aspects of business activity. In this case, however, the phenomenon of the market is not only a source of order, but also of injustice, unacceptable threats, inequalities and social unrest. Therefore, the ethics of social responsibility fulfills a corrective function" (Klimek, 2013, p. 206).

Corporate social responsibility is a young field only at the formal level. Although the definition of CSR appeared in the twentieth century, its sources should be sought in distant epochs. The origins of corporate social responsibility can be found in the thought of ancient thinkers and in biblical texts. According to K. Majchrzak, "such issues as: morality, responsibility or honesty are the values that underlie the rules that build social responsibility and, above all, set the directions of proper conduct in business. Business ethics, which is an expression of the freedom of enterprises, according to the rule that "authentic freedom is aware of its limits" gave rise to later corporate social responsibility" (Majchrzak, 2019, p. 40).

One can briefly distinguish several stages of the development of thought and the application of ethics in business. The turn of the nineteenth and twentieth centuries was the time of the creation of the first philosophical, theological and economic works, which considered issues of both ethics and morality. The 60s of the twentieth century, in turn, were characterized by an emphasis on legal aspects. In the following decade, ethics was given the status of a research discipline. In turn, the first half of the 80s was a period of dissemination of business ethics in enterprises. It is also a period of formation of managerial ethics. The following years, in turn, were characterized by the creation of both methodological foundations of business ethics in the sphere of science, as well as the development of company codes of ethics (Majchrzak, 2019).

In the literature on economics or management, as well as in many reports and statistical studies, one can find numerous attempts to define the term corporate social responsibility. An example set of definitions is presented in the table below.

Tabele 1.
Summary of exemplary definitions of the CSR concept

an internal organizational policy or a corporate ethic strategy	(Dann, 2009)
a form of business self-regulation	(Sheehy, 2015)
a set of commitments to organize and strengthen the society in which it operates	(Griffin, 2002)
a strategic initiative that contributes to a brand's reputation	(Johnson, Mao, Lefebvre, Ganesh, 2019)
a moral responsibility and obligation to account to the law and society for their activities, in particular to owners, employees, shareholders, customers, creditors, banks, environmental movements, suppliers, cooperators, state administration	(Zbiegień-Maciąg, 1997)
a voluntary action consisting in balancing three dimensions: economic, social and environmental by taking ethical actions addressed to a wide group of stakeholders	(Mazur-Wierzbicka, 2012)
a philosophy of doing business, including building long-lasting, transparent relationships with all interested parties	(Wołowiec, 2009)
a commitment to ethical behavior and to contribute to differentiated economic development by working with employees and their families, the local community and society to improve their quality of life	(Nelson, Grayson, 2013)
a company's responsibility for it impact on society; a business management style that integrates social, environmental, ethical and human rights issues into business operations and strategies in collaboration with stakeholders	(UE, 2011)
a responsibility of an organization for the impacts of its activities on society and environment, through transparent and ethical behavior that contributes to sustainable development	(ISO, 2010)
a company's responsibility in three areas: producing goods and providing services that are functional and safe for every consumer; concern for the environment and the depletion of natural resources; the quality of the enterprise as a moral community	(Pratley, 1998)

Source: own elaboration based on literature.

It is worth emphasizing here that the content of individual definitions confirms a wide range of activities of enterprises included under the term CSR. Undoubtedly, the common issues that are visible in most definitions include moral principles that companies should follow when implementing business strategies and responsibility for their actions in many spheres of enterprise operation (employment, production, logistics or the environment) (Kwarcińska, 2015).

The CSR philosophy can be implemented by small, medium and large enterprises, as well as non-governmental organizations. "Taking action as part of the concept is not treated as additional costs, but as an investment that is to result, among others, in an increase in the competitiveness of the individual" (Wieteska-Rosiak, 2012, p. 333). The dissemination of this idea helps the company's management to understand that modern enterprises are expected to be sensitive to the needs of stakeholders, an ethical way of making profits, as well as care for a positive image that may determine the competitive position of the company (MG, 2011).

It is worth adding here that the activities undertaken by the organization as part of the CSR concept can be divided into two groups. The first represents a number of activities that concern its interior, and therefore directly concern primarily employees. The second group, in turn, of an external nature, considers all activities undertaken mainly in relation to other entities. A list of the most frequently mentioned issues in the literature, around which the concept discussed in the article is focused, is presented below.

Tabele 2.
Dimensions of activities in the CSR concept

Internal dimension	External dimension
human resources management	local communities
ethical programs for employees	business partners, suppliers and customers
health and safety at work	human rights
ability to adapt to changes	principles of corporate governance
environmental management	
principles of corporate governance	

Source: (Kwarcińska, 2015) after (Rok, 2004).

Based on the table above, it can be indicated that selected elements of the internal and external dimension also perfectly fit into the elementary assumptions of the concept of age diversity management (also known as age management), which is treated as a specific response to contemporary unfavorable demographic trends. The real threat of destabilization of labor markets, and thus the functioning of the social security system, or exclusion of seniors from both professional, social or public life, through acts of age discrimination, forces a comprehensive approach to the issue of population ageing and taking it into account also in the management of modern enterprises. This approach is expressed by conducting "activities within the organization tailored to the preferences, needs and capabilities of employees of different ages, which will allow rational and effective use of the potential of the organization's human resources" (Liwiński, Sztanderska, 2013, p. 6). This definition, although it emphasizes

that the concentration of attention should be spread over the entire period of employment, i.e. on employees of all ages, due to progressive demographic problems, it emphasizes people 50+. However, this state should not have a social pejorative perception. Therefore, it should be treated not as a form of discrimination against younger people, but as a kind of remedy for the current problems of the labor market. As J. Osiecka-Chojnacka rightly states, "age management results from the fact that the functioning of ageing people on the labor market and their longest activity depends on the extent to which their professional potential is used and whether they receive support in matters in which they need help or training" (Osiecka-Chojnacka, 2012, p. 199). Age management can therefore be treated as a manifestation of voluntary consideration by business owners of the interests and needs of employees, so a significant part of the society (Gajowiak, 2015).

3. Research criteria

In the period of time 2022-2023 the project titled "Age diversity management. Intellectual capital of employees 50+" was conducted on a sample of 50 small and medium-sized companies located in the Poznań poviat.

The basic research problem was to identify the extent to which these entities take into account the phenomenon of aging employees in the management sphere. The author of the project is interested especially in such issues as: norms and values, equality and age discrimination. The selection of enterprises constituting the research population was deliberate, and the criteria for this selection were:

1) location (Poznań poviat characterized by the largest number of people in non-mobile age (45-59/64), i.e. 86,268 people, the largest number of unemployed aged 55-59 (12.7%) and aged 60+ (8.2%), as well as one of the highest demographic old age rates in the voivodship (GUS, 2020; USwP, 2020; PUP, 2019);
2) total number of employees (small and medium-sized entities, which are the largest group of enterprises in the Poznań poviat (just after the city of Poznań) (SWW, 2020);
3) section C according to PKD 2007 (it is one of the key industries of Wielkopolska and develops the most in the Poznań poviat) (Dąbrowska et al., 2019);
4) employment of a minimum of 4 people under 50 years of age and a minimum of 4 people over 50 years of age.

On the basis of the analysis of data from the database purchased from the Statistical Office in Poznań and their correction by research assumptions, a group of 362 entities was distinguished. Fifty enterprises, including 32 small and 18 medium-sized, agreed to participate in the survey. Two basic techniques (CATI and PAPI) were used. The main tool of the study was an interview questionnaire, which consisted of 24 questions. The implementation of

appropriate research required terminological determinations i.a. in a set of the following concepts: norms and values, elderly person, diversity, age diversity management, stereotype, ageism.

4. Selected research results

The basic premise of the study is the statement that crises are an inseparable element of the modern world, including the demographic crisis observed for several decades (Gajowiak, 2022). This is evidenced by the statistics quoted above. As A. Kwarcińska notes, "crisis situations, leading to specific significant turns, decisions and often making difficult decisions, affect various spheres of life of individuals, societies, as well as the economy and enterprises functioning in it. [...] Therefore, all that remains is to make people aware of the uniqueness of crisis events and the need to build a comprehensively understood resistance to them. The search for solutions hardened to crises is not easy and often requires difficult, unpopular decisions, also concerning the sphere of ethical values. [...] Conscious actions within the concept of corporate social responsibility, constituting a set of voluntary and strategic solutions, probably strengthen the mutual business relations of enterprises and organizations, as well as their stakeholders" (Kwarcińska, 2018, p. 114). They can also contribute to improving the psychological well-being of people 50+. A friendly atmosphere at work that supports employees' self-esteem, mutual responsibility and respect for diversity can have a positive impact on extending the professional activity of seniors.

For this reason, it becomes important to recognize whether SMEs from the Poznań district take into account the basic assumptions of the CSR philosophy in their activities, which - as indicated in the previous paragraph - also include the basic guidelines for age diversity management. Therefore, the study sought to verify the following research hypotheses:

H1) The values of workers aged 50+ are respected in the companies.

H2) The analyzed enterprises have implemented a system of corporate social responsibility.

H3) Employees do not experience age discrimination.

In order to verify the first research hypothesis, the interview questionnaire included a question about respecting the values represented by people aged 50+. The importance of this question stems from the fact that values are a unique set of beliefs and ideas that influence the attitudes and behaviors of employees. Unfortunately, in the analyzed companies, 64% of respondents indicated the lack of respect. The first hypothesis must therefore be rejected. Such a situation worries, as the lack of acceptance of professed values may lead to a narrowing of trust and a decrease in credibility. At the same time, such a state may affect the adoption of an attitude of passivity and - instead of creative actions - appears an element of adjustment. There is no question that "values create a friendly environment for work and the whole business,

because respect for each person in the team is of great importance for the flow of energy and motivation. Shaping the best environment means creating a space of kindness, triggering ideas, satisfaction of all team members, but also the effectiveness of processes. In such an ethical space, based on the principles of human dignity, solidarity, cooperation, justice and subsidiarity as well as the common good, the idea of one's own development and concern for the economy of business is triggered" (Barcik, 2009, p. 32). Lack of understanding of the essence of values threatens the existence of the company, as it may lead to earlier professional deactivation of employed seniors. Just at the moment, only 56% of respondents are willing to come to work. This is particularly dangerous in the context of the demographic crisis described above.

What's more, the urgency of business owners to take care of the aspect of respecting values is evidenced by further data obtained from the survey questionnaire. It turns out that the conflict of values is considered by the respondents of the survey as the second most important barrier to cooperation between the younger and older generation. The answers are summarized below.

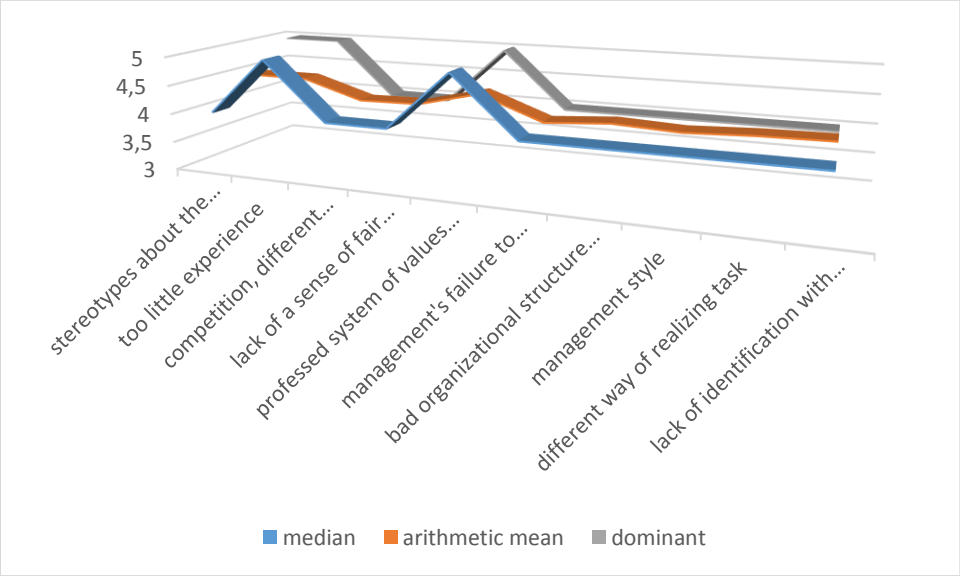

Figure 1. Barriers to cooperation between the younger and older generations.

Source: own elaboration based on research results.

Based on the collected information, three dominant obstacles can be identified here: 1) too little experience ($m_e = 5$, $d = 5$, $\bar{x} = 4.47$), 2) professed system of values (the so-called conflict of values) ($m_e = 5$, $d = 5$, $\bar{x} = 4.43$) and 3) stereotypes about the older generation ($m_e = 4$, $d = 5$, $\bar{x} = 4.47$). It is worth adding here after Alicja Smolbik-Jęczmień that people born in the years 1945-1995 differ in their experience resulting from the various economic, political and social situation in which they found themselves over the years. Therefore, it strictly determines their system of values, attitudes and behavior both in life and in the work environment (Smolibk-Jęczmień, 2019). For this reason, generational affiliation should be particularly considered in human resources management processes. Therefore, it is necessary for company managers to recognize the reasons for not respecting the values of employees 50+ through i.a. implementation of individual consultations with employees. It is also necessary

to consider the creation of a code of values common to employees and the company as a whole or - more broadly - a code of ethics. Such a collection would then constitute a unique and material proof that business owners recognize the importance of norms and values for the functioning of employees nowadays. Importantly, according to research, only seven companies have such a book and in four of them it is implemented as part of the implemented corporate social responsibility system. Therefore, this state does not allow to accept the hypothesis number two. Moreover, it is not optimistic, that only three respondents indicated the presence of an age management system in their company.

What is important, the obtained data also allow to additionally indicate two important issues in the area of CSR philosophy. Respondents were asked about the reasons for implementing or potentially implementing the system (multiple choice option). Thus, these answers express the subjective perception of the company and its owners. Aggregated answers divided into companies that already have the system in place and those that are not yet at this stage are provided below.

Table 3.
Reasons for implementing or potential implementation of CSR

Reasons		Number of responses
YES	image improvement	3
	willingness to prolong professional activity	0
	willingness to respect human rights	2
	fighting with stereotypes	0
	creation of social capital	0
	injunction from the headquarters	1
	sponsorship and charity activities	3
	rational and efficient use of available resources	1
NO	image improvement	22
	willingness to prolong professional activity	2
	willingness to respect human rights	11
	fighting with stereotypes	8
	creation of social capital	5
	injunction from the headquarters	6
	sponsorship and charity activities	19
	rational and efficient use of available resources	10

Source: own elaboration based on research results.

The above data allow us to draw some interesting conclusions. Among the answers given by employees of companies, in which the CSR system was implemented, it can be pointed out that the main goal was to improve the company's image and to carry out sponsorship and charity activities. The dominant number of such indications is also noticeable among companies that have not yet implemented this system. It should be added here that understanding the CSR philosophy only in terms of sponsorship activities is a significant barrier to the development of this concept, as it leads to its distortion (Gajowiak, 2015). What's more, based on the results, it is difficult to clearly indicate one reason for the unfavorable perception of the company by their employees. There are few indications that would confirm concern for the issues of ageing of employees, or care for the social capital of employees. Rather, respondents even point to the

instrumental treatment of employees and the lack of consistency of ethics with the company's activities. Among the potential ones, one can probably distinguish the above-described lack of respect for values, as well as - as confirmed by the study - the dissemination of stereotypes about old age and the elderly in companies, which consequently lead to acts of age discrimination. A lack of reaction or delayed reaction made by the management to such behavior may also have a big impact on such a way of not well perception. The most frequently forms of discrimination mentioned by respondents were: disregard (19 indications), ridiculing (16), negligence and paternalism (14 indications each). The lack of an anti-discrimination policy may raise concerns about mutual relations between working generations. The flow of knowledge, skills and experience may be hindered. It should be added here that the phenomenon of discrimination against employees should give rise to particular concern on the part of the managers of the enterprises concerned, since it reflects the existence of negative social capital. This can adversely affect the social potential of seniors and intensify their passivism, caution, distance and even alienation. In addition, lower subjective potential has a negative impact on the ability to act creatively and self-improve (Matysiak, 2006). This may result in a state when seniors will begin to be characterized by passivity and dependence on the environment. As M. Straś-Romanowska notes, older people show "low, compared to young people, motivation of achievements and low self-confidence, while increased need for peace and security, as well as a high level of fear of loneliness" (Straś-Romanowska, 2007, p. 28). Hypothesis number three must therefore be rejected.

It is worth adding here that the answers of respondents presented below do not present that managers care for taking into account the aspects of population ageing in the functioning of enterprises is at a high level.

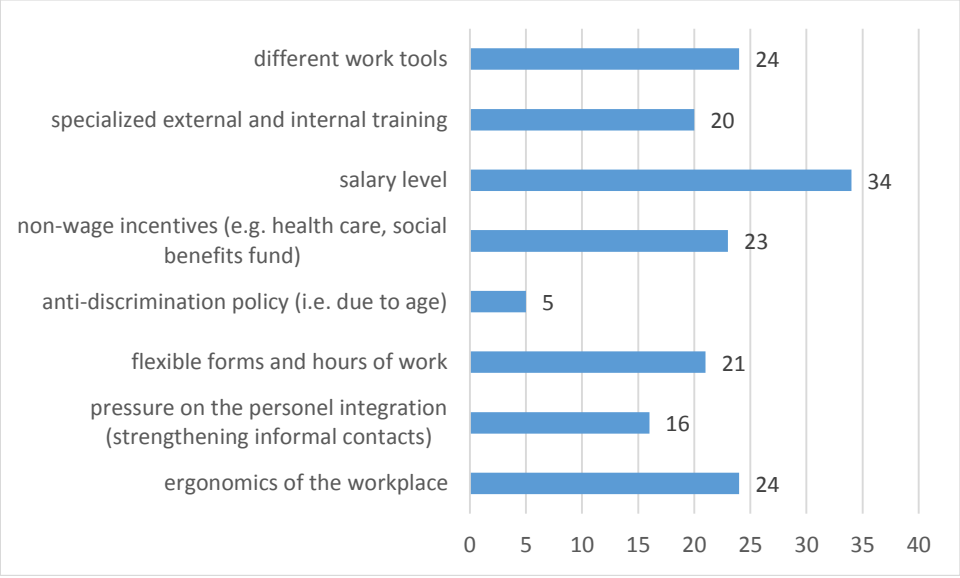

Figure 3. Actions of companies in the face of the demographic crisis.

Source: own elaboration based on research results.

Based on the collected data, it can be pointed out that companies currently focus their concern for the future existence in the context of the progressing demographic crisis primarily on financial aspects (salary level), technical (ergonomics of the workplace, various work tools) and organizational ones (flexible forms and working time, non-wage benefits). However, it is not optimistic that business owners do not see anti-discrimination policy as an opportunity to stop the decline in labor supply on the market. Then such activities could contribute to a positive perception of the company in the eyes of employees and potential employees hired in the future. Therefore, they could also lead to an increase in the level of trust. As I. Grzanka states, "people-oriented strategy creates an atmosphere of harmony within the company and serves to use the richness and originality of employees' personality traits, fulfilling a broader social and cultural role. This makes people and the relations arising between them the greatest good of the company" (Grzanka, 2009, p. 10).

5. Conclusion

The demographic changes taking place, which are also nowadays called the "generational tsunami", force all economies and - in a micro scale - individual enterprises to revise the basic assumptions of doing business. The mutual coexistence and effective cooperation of the younger and older generation requires managers of modern enterprises to take care especially for the system of values. It is due to the fact that values determine the way of behaving, mutual respect, social capital, fight against stereotypes and acts of age discrimination. These issues perfectly fit into the philosophy of corporate social responsibility, and thus into the concept of age management, which can be treated as a specific part of this philosophy.

The research conducted on a group of fifty small and medium-sized enterprises from the Poznań poviat unfortunately confirms the low involvement of managers in issues related to employees 50+, as well as low concern for the future of business entities in the context of the begative demographic trends. Most respondents (64%) admitted that other people employed in companies did not respect their value system. The lack of such acceptance does not inspire optimism, because it may weaken the motivation to work. There may also be problems with the transfer of knowledge and experience, which - due to age - younger people do not have. What's more, the conflict of values is, in the opinion of respondents, the second most important barrier to cooperation between the younger and older generation. The vast majority of surveyed companies do not have a written code of common, acceptable values, age management system or CSR strategy. In addition, employees indicated that they experience acts of age discrimination, most often in the form of disregard, ridiculing, neglect or paternalism. Therefore, the lack of an implemented anti-discrimination policy raises concerns about mutual relations between employees.

The analysis of the research results entitles to indicate several recommendations. First, surveyed companies should implement management system based on precious values. In this approach, values become the basis of organizational culture. As I. Świątek-Barylska notes, "the issue of values, which for years was considered by managers as "too soft" to be included in any serious approach to management, has now become a central part in discussions about organizational strategy and changes" (Świątek-Barylska, 2010, p. 571). What's more, if values turn out to be well understandanded by all employees, it will be possible to achieve mutual benefits both by employees and the entire company. In the analyzed enterprises, there are opportunities to eliminate - mentioned in the article – cooperation's barriers. This is crucial in the context of progressing unfavorable demographic trends.

Second, this strategy should be based on a written code of values or an ethical code. Unfortunately, such books are not present in the analyzed enterprises. In today's turbulent environment, it becomes necessary to make business ethics the highest standard of the organization. In turn, "the conviction about the necessity of economic autonomy has led businesspeople to ethical abuses in social and cultural life, to violation of the dignity of workers, to the elimination of the principle of justice and social love, to exploitation and harm to the world of work, to the breakdown of proper relations between employer and employees through the violation of human rights" (Barcik, 2009, p. 25). It is recommended that the owners of the organization should identify the most precoius values based on consultations with employees at all levels of the organizational structure, develop a set of norms and values in the form of the above-mentioned written code.

Thirdly, it is also worth considering the implementation of moral education, through which employees will be prepared for economic activity based on the principles of ethics, as well as taking responsibility for their harmful actions. In addition, managers themselves should be even more involved in creating and caring for moral order in the company and promoting ethical principles. Therefore, they should take into account in management strategy not only financial or organizational aspects but - in the context of the ageing of societies - also sociological, psychological and moral issues. Such actions may become crucial in reducing for example ageism. It is also worth considering periodic monitoring of compliance with codes of ethics and create a special team for equal and fair treatment of employees. Such actions seem to be necessary in the situation of demographic crisis and mainly the pejorative perception of old age and aging currently in Poland. What's more, they can be a contribution to the implementation of age diversity management, and consequently to the implementation of system of corporate social responsibility.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

SENSITIVITY TO THE NEEDS OF THE SENIORS AND THE DIGITALIZATION OF MUNICIPALITIES

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Purpose: The research aims to identify a relationship between the digitalization of municipalities and their sensitivity to the needs of seniors.
Design/methodology/approach: The objective of the paper has been achieved by employing a set of questions to detect seniors' needs and the level of municipalities' digitalization. The analysis was conducted using a classification tree based on the CHAID (Chi-square Automatic Interaction Detection) technique. The proposed approach allows us to identify significant digital predictors that impact the improvement of sensitivity to the needs of seniors.
Findings: Three significant factors of municipalities' digitalization in affecting sensitivity to the needs of seniors have been identified: municipalities' transparency and accountability growth through digitalization, reduction of social exclusion through digitalization, and municipal office support for digitalization.
Research limitations/implications: The main limitation of the study is a possible inconclusive understanding of digital tools and their role in dealing with seniors' problems. In future research, further development of a precise level of analyzed tools is proposed as well as additional development of the decision trees division algorithms.
Practical implications: The research highlights that municipalities' transparency and accountability growth through digitalization, reduction of social exclusion through digitalization, and municipal office support for digitalization positively affect municipalities' sensitivity to the needs of seniors.
Social implications: Growing sensitivity to the needs of seniors is a primary concern in rapidly aging societies. Research results reveal that this concern can be addressed through the digitalization of municipalities and the adoption of digital tools to reduce social exclusion. In the long term, these digital tools should enhance the quality of life for seniors.
Originality/value: The novelty of the paper lies in the establishment of a fast and significant factors detection method by employing the CHAID algorithm. Another novelty is the identification of transparency improvement of municipalities as a significant predictor in addressing the needs of seniors, observed in three out of four models. This finding is particularly relevant for municipal managers who are tasked with addressing issues related to an aging society and seniors' concerns.

Keywords: public management, municipalities, sensitivity to the needs of seniors, digitalization, CHAID algorithm.

Category of the paper: research paper.

1. Introduction

Developments in information and communication technology (ICT) have moved many forms of social life into digital space. This means that ways of solving existing social problems can be looked at from a different perspective.

One of the growing social issues – the mitigation of which is seen in the use of ICT – is the rapid growth of the 60+ means senior population in Europe. The needs of seniors in today's world are often related to health ailments (Rostgaard, 2012), but cannot be seen solely from a medical perspective. Seniors can participate in urban and rural life more than ever before thanks to digital tools and services offered by digitalization. However, this fact poses a challenge to the management of municipalities, which generates a new type of clients who, without these tools, would not be able to meet their needs in person. Thus, it establishes a link between municipalities' digitalization and the detection of the needs of seniors, which can be met with appropriate digitalization applications.

Access to the Internet and the ability to use the opportunities it offers is now no longer just a convenience in citizens' daily lives, but a prerequisite for their full participation in social, professional, and cultural life. Lack of Internet access and the ability to use it leads to digital exclusion (e-exclusion), defined in European Union documents as exclusion from functioning in the information society. This type of social exclusion and the associated information exclusion are predictors of lower quality of life and lower subjective psychological well-being. The European Commission publishes annually the results of the Digital Economy and Society Index (DESI), which tracks the progress made in EU Member States on digital competitiveness in the areas of human capital, broadband connectivity, digital integration by businesses, and digital tools in the delivery of public services (EC, 2022). Although the COVID-19 pandemic significantly accelerated the digitalization process and raised the average value of the index for Member States, the value for Poland fell slightly between 2021 and 2022 (down from 41 to 40.5pct).

According to a survey by the Central Statistical Office conducted in 2019, 54.4 percent of people aged 65-74 had never used a computer, while only 37.0 percent of people in this age group used the internet, and although there was a decrease in the percentage of older people not using the internet during the COVID-19 pandemic, it is still high in Poland. According to CSO data published in 2021, this was close to 48% of people in the 65-74 age group and around 25% of those aged 55-64. Moreover, a significant proportion of older users with access to the

Internet used the Internet only to a limited extent, not coping with many new functionalities (Frączkiewicz-Wronka et al., 2023).

In the context of demographic changes taking place in Poland, characterized above all by the dynamic process of aging of the population, the problem of digital exclusion of senior citizens acquires particular importance and poses a particular challenge both for public authorities and for citizens themselves. Specific organizational, financial, and educational measures to prevent cyber-exclusion of the elderly should be taken both by central authorities and local self-government units.

Our research focuses on the role of municipalities' sensitivity to the needs of seniors. It aims at identifying the relationship between the digitalization of municipalities and their sensitivity to the needs of seniors.

The rest of the paper is structured as follows. The next section reports hypotheses developed based on the literature. Then, the methodology followed in this work is presented. In the latter two sections, the research results are reported with their discussion. The last section concludes our work.

2. Literature review

Digital technologies, especially information and communication technologies (ICTs) such as computers, smartphones, and tablets, permeate all aspects of our lives (Castells, 2010). ICT can provide significant benefits to older people and is becoming increasingly important for accessing services (for example, digital health), circulating information and building and maintaining social relationships (Tomczyk et al., 2023; Tomczyk et al., 2022). Although access to the Internet through these devices has become widespread research results show significant differences in use between age groups (Schulz et al., 2015) and some studies confirmed that older people are particularly at risk of digital exclusion (Seifert, Rössel, 2019). As numerous research findings indicate, the low use of ICT by older people is due to, among other things, the following barriers: (a) psychological because older people show higher levels of computer anxiety (Silver, 2015), frustration with user interfaces (Hussain et al., 2017), negative attitudes towards technology (Kamin, et al., 2017), concerns about online security issues, mainly with personal data (Hussain et al., 2017); (b) health-related, e.g. poor eyesight, cognitive impairment (Hussain et al., 2017); (c) socio-economic, mainly educational level and low income (Neves, Amaro, 2012); (d) resulting from insufficient interventions by public actors supporting the digital inclusion of older people (Černá, Svobodová, 2018).

The analysis and synthesis of the barriers affecting the level of digital exclusion of older people formed the basis for the formulation of a new approach identifying the barriers to digital exclusion and the role of the institutional setting in counteracting it (Rohner et al., 2020). The referenced researchers found that the use or non-use of ICT in later life is – in essence – not the result of a conscious decision or an individual learning process. It is a consequence of the activity of various agents, i.e. organizations/institutions operating within the social field in which the older person lives and of the relationship between citizens and agents/entities. From this perspective, not using the Internet in later life is not an individual process, but "co-constituted in a social field composed of actors, discourses and power relations" (Wanka, Gallistl, 2018).

The latter statement implies that how an older person uses ICT is not only the result of their individual activity or the support provided by relatives, friends, and other supportive people. Above all, it is the result of the influence of agents/entities/institutions, especially public ones involved in activities that shape the skills and opportunities to use or not use ICT in later life (Gallistl, Nimrod, 2019; Neven, Peine, 2017). Therefore, to develop a full understanding of the determinants of digital use and non-use in later life, it is necessary to consider not only the older person but also to ask what public management practices shape their attitudes towards ICT use and how these relate to daily lives of older people in the community. This means seeking answers to questions about the preparedness of municipal offices to deliver public services to citizens using the instruments of digitalization and digitization to do so and, as a consequence of this process, laying the foundations for a dialogue between citizens and public authority.

Some studies confirmed that the digitalization of municipalities is positively associated with the level of e-participation (Ziemba, Grabara, 2023; Stratu-Strelet et al., 2021). Therefore, it can be assumed that the digitalization of municipalities can also affect municipalities' sensitivity to the needs of seniors. E-participation pertains to the utilization of ICT to engage citizens, also seniors in public policy and decision-making processes, as well as designing and delivering e-government services in a manner that is participatory, inclusive, and deliberative (UN, 2018). It comprises a wide range of components including e-information, e-consultation, e-decision-making, e-petition, e-referendum, e-lobbying, e-voting, as well as e-design and e-creation (Roztocki et al., 2022; UN, 2018). Furthermore, e-participation is driven by ICT adoption in municipalities (Ziemba, Grabara, 2023) and is shaped by various technological, economic, cultural, and management factors (Ziemba, 2021). These factors influence the digitalization strategy of municipalities, which, among others, includes electronic government development, improving the quality of ICT infrastructure, enhancing transparency and accountability through ICT, optimizing the efficiency and effectiveness of municipalities' processes and communication through ICT, reducing social and cultural exclusion through ICT, and promoting democratic public decision-making through ICT.

At the same time, it should be emphasized that equally important, if not more so, for the successful adoption of ICT in municipalities and the digital inclusion of older people, are the conditions highlighted by the Venkatesh team in their research (Venkatesh et al., 2003) in formulating the so-called Unified Theory of Acceptance and Use of Technology (UTAUT). The original and extended UTAUT models have been used to examine technology acceptance in various sectors, including e-government (Gupta et al., 2008; Chan et al., 2010) and healthcare (Chang et al., 2007), which is particularly important for the municipality's sensitivity to the needs of seniors. Four factors play a key role in this theory, directly influencing the intention to use and, consequently, behavior. These factors are performance expectancy, effort expectancy, social influence, and facilitating conditions.

3. Research questions and hypotheses

3.1. Research questions development

Based on the literature the following survey questions were indicated:

- four questions detecting municipalities' sensitivity to the needs of seniors (Table 1); and
- 13 questions detecting the digitalization of municipalities divided into two groups: digitalization strategy and the usage of digital tools in municipality offices (Table 2).

Table 1.
Questions aimed at detecting municipalities' sensitivity to the needs of seniors

Question number	Question	Literature source
109	Your municipality office has prepared and conducted special training on the use of digital tools for seniors	Wanka, Gallistl (2018) Gallistl, Nimrod (2019; Neven, Peine (2017)
110	In your municipality office, there is an employee/department responsible for collecting information from various public entities about the issues faced by seniors in using electronically provided services	
111	Other public or social organizations in your municipality have raised funds to purchase and donate notebooks and/or computers to seniors	
112	Other public or social organizations in your municipality have raised funds for training in strengthening digital skills among seniors	

Source: own work.

Table 2.
Questions aimed at detecting the digitization of municipalities' digitalization

Question type	Question number	Question	Literature source
Digitalization strategy	V97	There is an information strategy in your municipality embracing the adoption of digital tools for building and improving electronic government	Ziemba (2021)
	V99	No technological barriers are limiting the use of digital tools in your municipality office	
	V102	The transparency and accountability of your municipality office have increased through digitalization	
	V103	Processes and procedures as well as communication, cooperation, and networking within your municipality office and with other offices have been automated and improved through digitalization	
	V105	Social exclusion of residents based on age, education, place of residence, or disability, the causes of which lay in limited and impeded participation/participation in social or collective life and limited or impeded access to public services and social institutions, have reduced through digitalization	
	v106	The participation of residents in public consultations and democratic public decision-making has increased, as well as cooperation, communication, partnerships, and networks with residents have developed	
Digital tools usage	V65	You perform your municipality tasks faster by using digital tools	Venkatesh et al. (2003)
	V66	The use of digital tools is necessary for the effective resolution of residents' issues	
	V67	The use of digital tools increases residents' satisfaction with your services	
	V70	A large number of employees in your municipality office use digital tools in their daily work	
	V73	Using digital tools is easy and hassle-free for you	
	V76	You have been provided with the resources necessary to use digital tools (software and hardware)	
	V78	Your municipality office supports (e.g., through training) the use of digital tools by employees in their interactions with residents	

Source: own work

3.2. Research hypotheses development

Based on the developed survey questions, the following hypotheses have been formulated and categorized into partial hypotheses:

H1: Digitalization strategy and the usage of digital tools in the municipality affect the digital training of the seniors.

H1.1: Digitalization strategy in the municipality affects the digital training of the seniors.

H1.2: The usage of digital tools in the municipality affects the digital training of the seniors.

H2: Digitalization strategy and the usage of digital tools in the municipality affect access to information about seniors' problems in using the municipality services provided electronically.

H2.1: Digitalization strategy in the municipality affects access to information about seniors' problems in using the municipality services provided electronically.

H2.2: The usage of digital tools in the municipality affects access to information about seniors' problems in using the municipality services provided electronically.

H3: Digitalization strategy and the usage of digital tools in the municipality affect acquiring funds to purchase and donate notebooks and/or computers to seniors.

H3.1: Digitalization strategy in the municipality affects acquiring funds to purchase and donate notebooks and/or computers to seniors.

H3.2: The usage of digital tools in the municipality affects acquiring funds to purchase and donate notebooks and/or computers to seniors.

H4: Digitalization strategy and the usage of digital tools in the municipality affect acquiring funds for training in strengthening digital skills among seniors.

H4.1: Digitalization strategy in the municipality affects acquiring funds for training in strengthening digital skills among seniors.

H4.2: The usage of digital tools in the municipality affects acquiring funds for training in strengthening digital skills among seniors.

All the explanations' predictors were assumed to be included in a set of explanations factors per each question detecting the sensitivity of the needs of seniors. If at least one predictor has been found significant the specific hypothesis was confirmed. However, if no partial hypothesis of the main hypothesis (H1, H2, H3, or H4) was found significant then the main hypothesis was also found insignificant. Lastly, if only one of the specific hypotheses of the main hypothesis was found significant then the main hypothesis was found only partially confirmed.

4. Material and methods

4.1. Research instrument and data collection

This study is a part of od study on 'The digital economy' - a model approach to supporting the inclusion of cyber-excluded older people in the use of social services provided in a post-pandemic world by public management entities using ICT (2022_2023). Research has been conducted in the form of a questionnaire. The Likert-scale instrument – a survey questionnaire – was employed in this study. The scale's assessment was: 5 – strongly agree, 4 – rather agree, 3 – neither agree nor disagree, 2 – rather disagree, and 1 – strongly disagree. The task of respondents was to answer the question listed in Tables 1 and 2.

LimeSurvey software was used to implement the survey questionnaire. The sample was created based on data obtained from the Public Information Bulletin, which included a list of all local government entities in Poland. To ensure that the sample was representative and that all types of entities were represented, stratified random sampling was used. The differentiating feature of local government units was their membership in a NUTS macro-region. Individual strata had an even allocation to ensure that macro-regions could be compared with each other. Each stratum had a structure corresponding to the differentiation of institutions in terms of their type (urban municipality office, urban-rural municipality office, rural municipality office. As of 1 January 2023, the administrative division of Poland comprised – 2 477 local government units on the gminas level, including 302 municipal, 677 rural-municipal, and 1498 rural). To draw the units for the survey, an algorithm drawing numbers without repetition created in an Excel spreadsheet was used. The operator of the local government units was submitted to the CATI studio and totaled 1,500 records. The data were collected between December 6, 2022, and December 21, 2022. A response ratio of approximately 25% was achieved, meaning that approximately one in four or one in five questionnaire interviews was successful. In the end, 357 local government units were surveyed. The average time taken to complete one questionnaire interview was 57 minutes,

4.2. Data analysis

To assess the importance of the factors affecting the sensitivity to the needs of seniors, the classification tree (also named decision tree) model Chi-square Automatic Interaction Detection (CHAID) was chosen. CHAID is widely used in surveys about cities and sustainability (Ferreira et al., 2022), enterprises leadership studies (Milanović and Stamenković, 2016) or marketing research (McCarty, Hastak, 2007), and thus it is useful for analyzing categorical variables and identifying underlying relationships. CHAID is an extension of the chi-square test of independence for AID (Automatic Interaction Detection) and can handle both categorical and continuous target variables. One of the key advantages of CHAID is that it is capable of splitting the set of observations using the most significant predictor. The method is partitioning the data into subsets that best describe the dependent variable. Subsets are mutually exclusive and exhaustive (Kass, 1980). The procedure is based on the method of recursive partitioning. The process of partitioning is shown on the tree, which is in the basic graph with the tree structure (Walesiak, Gatnar, 2009).

Analysis was provided using MS Excel 2021 (Microsoft) software for data gathering and statistical computation was carried out using SPSS v.28 (IBM, Predictive Solutions).

5. Results

5.1. Respondents profile

A total of 357 respondents completed the questionnaire. Basic descriptions of the analyzed municipality offices are provided in Table 3.

Table 3.
Description of the surveyed municipal offices

Element		Frequency	Percentage	Cumulative percentage
Municipality office type	Rural	177	49.6%	49.6%
	Rural-municipal	104	29.1%	78.7%
	Municipal	76	21.3%	100.0%
	Total	357	100.0%	
Turnout in recent local elections by respondent	Low	136	38.1%	38.1%
	High	221	61.9%	100.0%
	Total	357	100.0%	

Source: own work.

5.2. Models summary

The results of the summary models are presented in Table 4, whereas the classification trees are provided in Figures 1 – 4. The procedure provided four classification trees. For models with variables V109, V110, and V112 there was only one significant predictor found per each model, i.e., V102, V105, and V102 respectively. Only in model V111 there were two significant predictors, i.e., V102 and V78.

Overall, the percentage of correctly predicted observations was found to be more than 40% for each model with a maximum of 48.7% for model V111, and a minimum of 41.2% for the least correctly predicted model V109.

Table 4.
Classification models summary

Element description	Model results			
Dependent Variable	V109	V110	V111	V112
Independent Variables Included in the Model	**V102**	**V105**	**V102, V78**	**V102**
Number of Nodes	3	3	5	3
Number of Terminal Nodes	2	2	3	2
Depth	1	1	2	1
Overall Percent Correctly Predicted Observations	41.20%	46.80%	44.30%	48.70%

Source: own work.

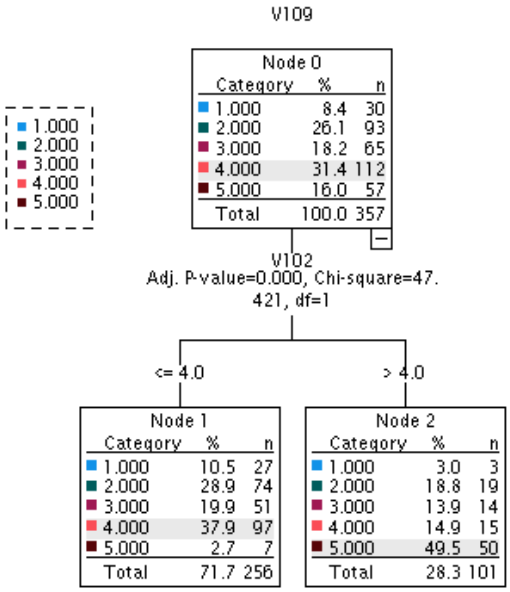

Figure 1. Model V109 classification tree.

Source: own work.

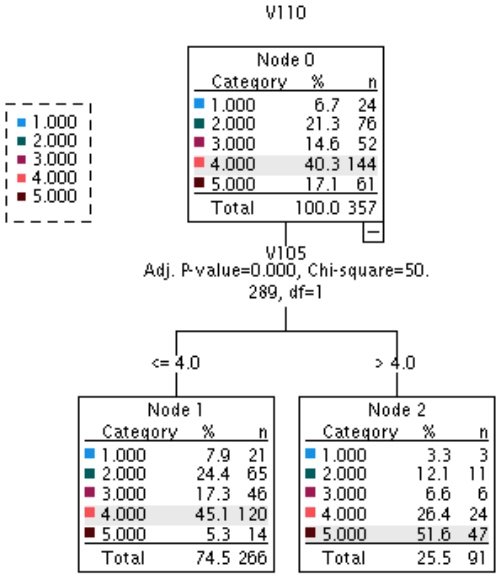

Figure 2. Model V110 classification tree.

Source: own work.

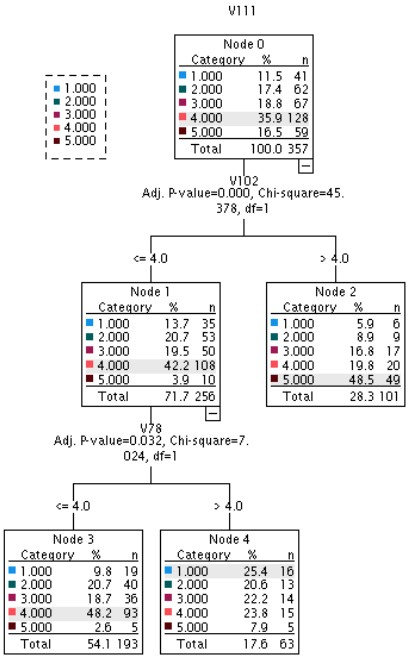

Figure 3. Model V111 classification tree.

Source: own work.

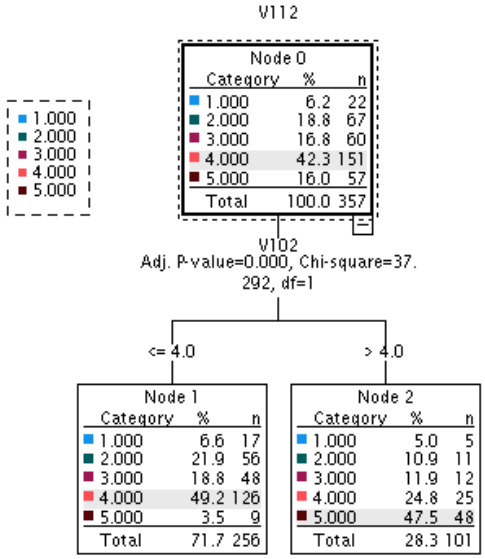

Figure 4. Model V112 classification tree.

Source: own work.

6. Discussion

The discussion was carried out for each model and the similarities and differences between the models.

6.1. Model V109

Hypothesis H1 was related to the preparation and conduction of training by municipal offices on the usage of digital tools for seniors. In the procedure, only predictor V102 was found significant in providing classification. Predictor V102 is related to the improvement of transparency and accountability of municipality offices through digitalization. Thus, could be concluded that H1 is only supported partially and only the digitalization strategy in municipality offices affects the sensitivity to the needs of the seniors (H1.1), whereas the usage of digital tools in municipality offices does not affect such sensitivity (H1.2). Thus, H1 is only partially supported by hypothesis H1.1.

It is observable that accountable organizations in the seniors' healthcare sector provide teaming strategies in all care settings (Gorbenko et al., 2016). Kane and Cutler (2015) argued that greater consumer transparency fueled the progress of attending to seniors' needs. **In the study, progress is represented by digitalization and thus, also could lead to the conclusion that the better transparency level and more accountability are provided through digitalization usage, the more training capability of the office is aimed at seniors' needs.**

6.2. Model V110

Hypothesis H2 was associated with municipal employees' access to information about seniors' problems in using the municipality services provided electronically. In the procedure, predictor V105 was found significant in providing classification. The model results exhibit the same behavior as model V109, with only one significant predictor. Thus, could be concluded that H1 is only partially supported and states that digitalization strategy in municipality offices affects the sensitivity to the needs of seniors (H2.1), while the usage of digital tools in municipality offices does not affect such sensitivity (H2.2). However, in model V110, the most important is a reduction of social exclusion (V105).

The findings are in line with other studies. Johnson et al. (2018) reported that sociodemographic factors have no impact on complex care for older adults, however, they admitted that they cannot see the whole perspective. In the light of other studies like Schwitter et al. (2012), social exclusion, however, is significant. This conclusion is also true for the digital exclusion of seniors as shown by Ciesielska et al. (2022). Those findings are also corroborated by the presented study. **The model not only confirms the common sense notion of providing special care by employees for marginalized seniors but also emphasizes that this is the sole and most crucial aspect of delivering digitalization services to seniors**.

6.3. Model V111

Hypothesis H3 was related to acquiring funds from public or social organizations to purchase and donate notebooks and/or computers to seniors. In the procedure, predictors V102 and V78 were found significant. While V102 is related to the transparency and accountability of municipality offices, predictor V78 is associated with the support of municipality offices (e.g., through training) for employees to use digital tools in their interactions with residents. Thus, it can be concluded that H3.1 and H3.2 are supported, and finally H3 is also supported.

The findings are in line with other studies. Rostgaard (2012) argued that the complexity inherent in providing home help for seniors necessitates political and administrative transparency in allocating funds for healthcare. **Even if in the presented study the most important is to get proper notebooks and/or computers by the seniors it is a help for seniors. However, it also generates the need for transparency. It is in line with the idea of using different available funding methods by seniors. To get funds, the training of the employees (and in a more particular sense training personnel in helping seniors to get the funds) is especially important.**

6.4. Model V112

Hypothesis H4 was related to acquiring funds for training in strengthening digital skills among seniors. In the procedure, only predictor V102 was found significant. This is the same predictor as in model V109. Once again, the improvement of transparency and accountability of municipality offices through digitalization is the most important factor for attending to seniors' needs. Thus, H4 is only partially supported by hypothesis H4.1

The findings are in line with other studies. Arroyo-Menéndez et al. (Arroyo-Menéndez et al., 2022) argued that digital skills stay in relationship with the income of the seniors, and thus in the presented study, the connection is also found. **However, fund spending on the skills rising should be provided transparently. It could be also perceived in the context that the more transparent spending, the more organizations join digital skills improvement programs for seniors.**

6.5. Model summary

A summary of hypotheses verification is presented in Table 5.

Table 5.
Summary of hypotheses verification

Hypothesis	Supported?	Partial hypothesis	Supported?
H1	Partially	H1.1	Yes
		H1.2	No
H2	Partially	H1.1	Yes
		H1.2	No
H3	Yes	H1.1	Yes
		H1.2	Yes
H4	Partially	H1.1	Yes
		H1.2	No

Source: own work.

While only one hypothesis (H3) was found to be fully supported, no hypothesis was not backed at all by the results. From this perspective, it may be concluded that digitalization affects all kinds of seniors and municipality office interactions. Thus, through digitalization, the overall quality of life of the seniors may be increased and municipality offices are much more sensitive to the needs of seniors.

7. Conclusions

Digitalization is affecting every aspect of people's life. However, it is little known how digital technology affects the intersection of the municipality offices and life of the seniors who happen to be simultaneously the most resistant to technology group of society in general. Existing models pointing to computer anxiety as preventing further its acceptance and digital exclusion such as those developed by Phang et al. (2006) confirm it. The presented study contributes to the development of theory by introducing models of decision trees to find significant factors related to the digitalization of municipalities that affect municipality sensitivity to the needs of seniors.

From a practical point of view, the research directs practitioners responsible for carrying the needs of seniors to particular solutions. In the context of predictor V78 managers or employees responsible for digitalization should take special care in providing enough support for digitalization introduction when dealing with seniors, while legal and social welfare departments should concentrate on digital tools related to transparency and accountability of the municipality offices (predictor V102), and social exclusion (predictor V105).

Although the study has been provided on a wider sample of offices, there are some limitations. The first limitation is the understanding of the role of digital tools and situations by the respondents. The interdisciplinary character of research includes knowledge from the digitalization field and familiarity with the needs of seniors, which can be difficult in achieving. The problem is shown in not as high efficiency of prediction of decision trees. However, the weaker performance pertains only to negative answers. Thus, in future research,

it is proposed to pay special attention to further help available for respondents who have no experience in one of the fields. The second concern is a further expansion for the usage of the decision trees to consider additional algorithms of dataset division.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

ISOMORPHIC MECHANISMS OF PROJECTIFICATION IN THE POLISH PUBLIC SECTOR

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Purpose: The purpose of this article is to discuss isomorphic mechanisms which accompany the process of projectification in the Polish public sector.
Design/methodology/approach: Research material used to develop this text was gathered during a comprehensive research project conducted between 2017 and 2020. The project utilized the instrumental case study method, focusing on the phenomenon of projectification within the Polish public sector. It employed a combination of quantitative and qualitative research techniques, such as document analysis, quantitative data analysis, and in-depth interviews.
Findings: The study revealed that isomorphic mechanisms (coercive, mimetic, and normative), which lead to the projectification of the Polish public sector, appear at the macro level (sector), meso level (public organizations), and micro level (public sector employees) of the projectification research. Depending on the level of analysis of the phenomenon of projectification, different forms of isomorphic mechanisms dominate. At the macro level, which covers the entire sector and its public policies, coercive mechanisms played a central role. At the meso level, within organizations, both mimetic and coercive mechanisms proved crucial. Normative mechanisms, in turn, held prominence at the micro level, that is, among public sector employees. It is important to note that these mechanisms often intertwined and overlapped with each other. The article describes numerous examples of specific isomorphic mechanisms that manifest themselves in the studied organizational field.
Research limitations/implications: The study examined a limited sample of public projects carried out in Poland and several public organizations. In the future, it would be worthwhile to consider a broader context, taking into consideration business and non-governmental organizations as well. This would facilitate a deeper reflection on those isomorphic mechanisms which support the projectification process within a broader scope.
Practical implications: In practical terms, this study makes it possible to comprehend the mechanisms that drive the transfer of project knowledge and bring about organizational and structural transformations within the public sector. These mechanisms can aid practitioners in terms of deepening their reflection on seemingly unnoticed yet significant changes which take place in project-based organizations.
Originality/value: The article presents a fresh perspective on the understanding of projectification processes based on isomorphic mechanisms.

Keywords: projectification, public sector, institutional isomorphism.

Category of the paper: Research paper.

1. Introduction

Projectification is a phenomenon which consists in the institutionalization of project-based practices at various levels of social life (Jacobsson, Jałocha, 2021). It involves not only an increase in the number of projects but also a change in their role in organizational management and entire sectors of the economy. According to Voros Fregolente et al. (2022), projectification relies on the use of project management tools, both in work and in daily life tasks. Initially, the discussed phenomenon was observed at the level of individual organizations. For instance, Christophe Midler (1995) describes the transition of Renault from a functional organization to a project-based organization. However, it is more difficult to discern the changes that projectification induces in a broader context, such as economic sectors, regions, countries, or multinational organizations. To understand the broader context of this phenomenon, it is essential to consider the mechanisms that contribute to the spread of projectification across various industries and sectors, also on a global scale. Initial attempts are being made to understand these processes, focusing on national economies (Ingason, Fridgeirsson, Jonasson, 2019; Schoper, Wald, Ingason, Fridgeirsson, 2018; Wald, Spanuth, Schneider, Schoper, 2015), sectors (Jałocha, 2019), and multinational organizations (Büttner, 2019; Godenhjelm, Lundin, Sjöblom, 2015; Jałocha, Góral, Bogacz-Wojtanowska, 2019). Still, these observations often focus on the effects of projectification processes, the transformations that occur under their influence, and attempts to measure this phenomenon.

This article attempts to present particular isomorphic mechanisms that influence the development of projectification. This will be illustrated through the example of the Polish public sector, which in the past two decades has undergone significant changes brought, among others, by projects, especially those co-financed by the European Union. Importantly, the public sector has a profound impact on the business and non-governmental sectors. This implies that projectification mechanisms observed within public organizations have implications for other sectors: for instance, in terms of shaping public policies and compelling organizations that do not belong to the public sector to undertake specific actions. To sum up, the identification of projectification mechanisms within the public sector provides insights into processes which occur outside of this sector, but which develop under the influence of public regulations and organizations.

The theoretical backdrop for the flowing discussion and presented model is the concept of institutional isomorphism (DiMaggio, Powell, 1983). The research study that served as the basis for the presented conclusions was conducted between 2019 and 2021. The article begins by introducing the concept of projectification and the levels at which it can be studied. Subsequently, the concept of institutional isomorphism is discussed. The next section describes the methodological assumptions and results of the conducted research. The article concludes with a summary of the discussed issues.

2. Projectification

Research on the concept of projectification originated in the 1990s with Christophe Midler's longitudinal study conducted at Renault. Midler observed that the growing number of projects had a significant impact on both the organizational structure and culture of the company. It is now recognized that projectification extends beyond organizational boundaries and can be observed at various societal levels. The scope of projectification encompasses not only formalized organizations but also states and sectors. As Jensen et al. (2016) write, we are currently witnessing a pervasive phenomenon known as "the projectification of everything", whereby projects have permeated business, public and non-governmental sectors, and even our personal lives. Indeed, as research on projectification progresses, it reveals the increasing complexity of this phenomenon. Voros Fregolente et al. (2022), in their analysis, identified as many as 55 distinct definitions of projectification, reflecting its diverse manifestations across different organizational contexts and individuals' private life.

We can distinguish several levels where projectification is observed and can be subjected to scientific analysis. The typology of projectification levels includes the meta, mega, macro, meso, and micro levels (cf. Table 1).

Table 1.
Typology of projectification research levels

Projectification research level	Research area
Meta	Relations and trends transforming global social structures
Mega	Societies, countries, supranational organizations
Macro	Industries, sectors
Meso	Organizations
Micro	Individuals

Source: Jałocha (2018), Jacobsson, Jałocha (2018); Jałocha (2021).

At the meta level, we can observe relations and trends that transform global social structures. The phenomenon of projectification poses challenges when studied at the meta level since changes brought by projectification on a global scale may occur gradually and thus become observable only in a long-term perspective (Jałocha, 2019). At the mega level, we observe the projectification of entire societies (Jensen et al., 2016; Lundin et al., 2015), countries and regions (Fred, 2018), and supranational organizations (Büttner and Leopold, 2016; Godenhjelm et al., 2015; Jałocha et al., 2019; Wagner, Huemann, Radujković, 2022). The projectification of sectors and industries is examined at the macro level. In this case, research often concerns the public sector (Hodgson, Fred, Bailey, Hall, 2019; Jałocha, 2021) or highly projectified industries such as the automotive sector (Midler, 2018). The meso level represents the level of organizational projectification, which has been the most extensively studied so far (Maylor, Turkulainen, 2019). It involves increasing the role of projects within organizations through various means, including implementing changes in organizational

structures and ways of executing tasks (Bergman et al., 2013; Fred, Hall, 2017; Wenell et al., 2017). Finally, there is the micro level where research is focused primarily on the consequences of projectification for individuals, such as changes in how people work, the precarization of work, and disruptions to work-life balance (Jałocha, 2021).

Research conducted across all five levels presented in the typology confirms that projectification has largely exceeded its original, organizational understanding and acquired a wider social dimension. In the present article, projectification will be examined at the macro level, specifically within the public sector, as well as at the meso level (organizations) and micro level (employees). This selection is justified by the presence of isomorphic mechanisms at all three levels of analysis.

3. Institutional isomorphism

Isomorphism refers to the similarity of processes and structures between two organizations, resulting from emulation or independent development under similar constraints. DiMaggio and Powell (1983) were among the first to explore the scientific inquiry into why many organizations resemble each other. They expanded on the research conducted by Meyer and Rowan (1977). The latter discussed specific processes that generate rationalized myths of organizational structure, leading to isomorphism: relational networks, legal mandates, and leadership in organizations (Ramanath, 2009). Building on Meyer and Rowan's assumption that organizations are structured by phenomena in their environment, that they become isomorphic to their environment, DiMaggio and Powell searched for sources of organizational similarities not only in the need to increase operational efficiency or existing inter-organizational competition. In their groundbreaking work, they presented the conceptualization of three types of isomorphism. In general, isomorphism is expected to take place in an organizational field defined as "a system of organizations operating in the same realm as defined both by relational linkages and by shared cultural rules and meaning systems" (Ramanath, 2009; quoted in: Scott, 1998, p. 129). The organizational field also encompasses the area of relationships, interdependencies, cooperation, and conflicts, which are governed by certain institutional rules. Within this area, there operate forces that foster similarities between organizations and, over time, may limit their willingness to embrace change (Marczewska, 2016, p. 190).

Di Maggio and Powell identified: (1) coercive isomorphism (2) mimetic isomorphism, and (3) normative isomorphism. The first that stems from political influence and the need for legitimacy, the second results from responses to uncertainty, while the third is associated with professionalization (Frumkin, Galaskiewicz, 2004).

It often happens that these three mechanisms occur simultaneously (to a greater or lesser extent). At the same time, as Frumkin and Galaskiewicz write, "only coercive isomorphism is linked to the environment surrounding the organizational field. Mimetic and normative processes are internal to the field and help explain the spread of roles and structures" (Frumkin, Galaskiewicz, 2004, p. 285). The three isomorphic processes distinguished by DiMaggio and Powell exhibit distinct characteristics (DiMaggio, Powell, 1983; Jałocha, 2021; Marczewska, 2016; Slack, Hinings, 1994; Wróbel, 2011). Coercive isomorphism occurs when an organization is under formal or informal pressure from other organizations on which it depends, compelling it to adopt patterns of action expected by powerful entities within the organizational field. Mimetic isomorphism leads to organizational changes resulting from the emulation of structures and practices of other organizations, particularly those perceived as successful. This type of isomorphism is especially observed when individuals and organizations face uncertainty and seek solutions that would help them deal with such situations. In turn, normative isomorphism pertains to professionalization processes and the definition of work methods and conditions, to legitimize professional autonomy within specific professions. Normative isomorphism is fostered, among others, by similar educational processes and reinforced through interactions within industry networks (e.g., international project management networks).

4. Methodology

The research material used to develop this text was collected as part of a larger research project conducted between 2017 and 2020. The study had a broad scope and focused on the projectification processes within the Polish public sector[1]. The research method employed in the project was instrumental case study, and the analyzed case was the phenomenon of projectification in the Polish public sector under the influence of the EU. The study utilized both quantitative and qualitative research techniques, including document analysis, quantitative data analysis, and in-depth interviews.

The research was characterized by a multi-stage and multi-method approach. It consisted of the following elements: document analysis, quantitative data analysis, and qualitative research. Prior to the actual data collection, an in-depth literature review was conducted concerning projectification processes within the public sector.

[1] The study was carried out as part of the research project no. 2016/23/D/HS4/01810 funded by the National Science Centre. The comprehensive research findings are available in Jałocha, 2021.

The following data sources were utilized:

- Data on projects from the SIMIK database for the years 2007-2013.
- Expert interviews.
- In-depth interviews with the management staff in twelve public organizations.
- In-depth interviews with project managers and team members in twelve organizations.
- Documents such as statutes, organizational charts, documents concerning public policies and implementation of EU programs.

The research was conducted with careful attention to research rigor and ethical aspects. All interviews were carried out anonymously, recorded, and later transcribed. Statistical data regarding public projects were obtained from a publicly accessible database (i.e., SIMIK).

This paper provides a partial representation of the obtained findings, specifically focusing on the isomorphic processes identified during the research. It serves as an extension of the thread extracted during the inferential process conducted within the aforementioned project, with the purpose of answering the following research question:

What isomorphic mechanisms influence the projectification of the public sector in Poland?

The next section of this article presents the research results which pertain to this question.

5. Isomorphic processes of the projectification of the Polish public sector – research results

The research has shown that coercive, mimetic, and normative pressures influencing the changes toward projectification in the Polish public sector have multiple sources. The influence of the EU stands out, as it conditioned the allocation of aid funds on the adoption of a project-based approach, leading to the widespread projectification of the Polish public sector. However, the EU was not the sole actor in the organizational field to cause significant sector transformations. The sources of observed isomorphic pressures can also be found in the influence of the business sector, consultants, macroeconomic changes, globalization, the implementation of New Public Management principles, or the development of modern technologies facilitating project work in virtual and distributed teams (cf. Figure 1).

Figure 1. Selected sources of isomorphic pressures which drive the development of the projectification of the Polish public sector.

Source: own research.

Depending on the level of analysis of the phenomenon of projectification, different forms of isomorphic mechanisms prevailed (Jałocha, 2021, p. 215). At the macro level, which covers the entire sector and its public policies, coercive mechanisms played a central role. At the meso level, within organizations, both mimetic and coercive mechanisms proved crucial. Normative mechanisms, in turn, held prominence at the micro level, that is, among public sector employees. At the same time, it is important to highlight that these mechanisms often intertwined and overlapped with each other, which confirms the observation (Mizruchi, Fein, 1999) that isomorphic mechanisms are not always empirically distinguishable. They can occur simultaneously, and their effects can stack on each other, making it challenging to unequivocally attribute a specific effect to a particular isomorphic mechanism.

Coercive mechanisms

The emergence of coercive pressures in the organizational field at the level of the entire public sector was driven by the mismatch between the project-based approaches of the EU (implementing public policies based on programs and projects) and the limited level of projectification in the Polish public sector. This discrepancy created a misfit that encouraged the member state to increase its alignment (goodness of fit) with the EU-established principles (Börzel, 2003). Consequently, the Polish public sector adapted and transformed its public policies management toward a model based on programs and projects (Jałocha, 2021). Given the strong need for external funding and the EU playing a pivotal role in providing resources in

the organizational field, the public sector had to conform to the imposed form of resource allocation and implementation – through projects. Coercive pressures were also evident in the ways organizations interacted with each other and reported on the progress of their projects: detailed guidelines concerning reporting procedures, tools, including IT systems, were determined based on the EU's expectations. Coercion is also manifested in the adjustment of programs and policies to the timing of EU programming periods. The internal public policies of the country are programmed and coordinated with successive programming periods of the EU.

Mimetic mechanisms

The lack of experience in project-based implementation of tasks prompted Polish public organizations to emulate those institutions that had such experience. This is largely justified by the easiness and intensity of the projectification process under the influence of the EU. Project-based working methods were not questioned, and organizations began to emulate those who "did it well." In other words, project tools that proved successful in other member states were copied. Over time, as Polish public organizations acquired competencies, mimetic processes also took place locally. Soon, organizations that excelled in project management emerged in Poland and came to be regarded as role models, serving as a recognized source of good practices.

At the organizational level, mimetic processes manifested themselves, among others, in the creation of organizational structures. Various types of public organizations established very similar units with similar tasks and goals. These units aimed to enhance the effectiveness of project implementation or project management. Regardless of the institution type, whether it was a hospital, university, or city office, similar organizational units were formed with the primary task of securing funds for projects and subsequently supporting their efficient management.

Normative mechanisms

Normative isomorphism occurs when employees in organizations adopt the dominant behaviors of their professional communities, collectively defining appropriate ways of conduct for their professional groups (Jałocha, 2021). This process involves professional socialization, which entails embracing rules and attitudes characteristic of a particular professional group. Isomorphic patterns of action are often communicated to professional groups through organizations in which they are active, such as universities, training and certification institutions, workshops, and industry-specific media.

The research has shown that the source of normative isomorphism in the projectification process of the Polish public sector can be identified as early as the initial stages of socio-political transformations at the turn of the twentieth and the twenty-first centuries. Public organizations that started operating in a completely new political and organizational

system lacked project management competencies. As a result, external organizations and specialists were often hired to train sector employees. This knowledge transfer process created a new group of professionals – project workers. A particular intensification of knowledge transfer occurred with the emergence of EU pre-accession programs and other programs supported, among others, by the United States. Under the influence of the EU, a group of professionals specializing in projects, including EU projects, emerged in the analyzed organizational field. "Project agents" and the "project class" (Fred, 2018; Kovách, Kučerová, 2006) proliferated intensively in the organizational field where public organizations operate. In the Polish public sector, these groups appeared largely because of an extremely intense training process. The mass implementation of projects was preceded by such training delivered by various types of organizations – EU institutions, businesses, training companies, universities. Project change agents transferred new knowledge to the organizational level, which influenced the standardization of project management methods in public organizations, the establishment of project units in organizational structures, and the very language used in organizations. The research also reveals the influence of international project management associations through certification programs for the sector's employees and the pressure to use selected professional project management tools, such as Prince2. Professional project associations in Poland also play an important role in shaping normative pressures, as was also observed in research on project management professionalization in Germany (Wagner, Huemann, Radujković, 2022).

6. Summary

Isomorphic mechanisms leading to the projectification of the Polish public sector were observed at the macro, meso, and micro levels of research. They appeared in the transformations occurring in public policies and task implementation methods at the sector level, but also in the change of organizational practices, structures, and the way sector employees work. Projectification is not limited merely to the fact that organizations start creating projects. Indeed, far-reaching transformations are observed, such as changes in national legislation or methods of implementing and formulating public policies.

Isomorphic processes were also evident in the language used in formal communication within organizations and among their employees. This language is reflected in organizational documents and in everyday communication practices of the staff. In the case of the studied sector, the language of projectification appeared on multiple levels: in the formulation of public policies, the content of organizational documents, elements of visual identity appearing on buildings, names of organizational units, and positions and ways of expression of sector employees (Jałocha, 2021). From small municipal offices to large public universities, hospitals,

and ministries, project-based practices are transferred through coercive, mimetic, and normative mechanisms.

Despite the research focus on the projectification of the public sector, primarily influenced by EU projects, it is important to emphasize that these processes do not occur in isolation. In fact, various institutions representing all three sectors operate within the organizational field of the public sector. Building on the research of Frumkin and Galaskiewicz (2004), the actions undertaken by the public sector have been conceived as playing a central role in initiating the structural transformation of other organizations. Finally, regulations created by the public sector, including, for instance, principles concerning the distribution of public funds in the form of projects, also have an impact on other sectors.

Comprehending the isomorphic mechanisms accompanying the projectification of the public sector in Poland provides us with opportunities to explore new research fields concerning interactions between organizations undergoing the projectification process, not only within the public sector but also within the non-governmental and business sectors.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

SHAPING ORGANIZATIONAL IDENTITY IN THE LIGHT OF LEGITIMACY CHALLENGES – CONCEPTUAL FRAMEWORK

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Purpose: The paper aims at building the analytical framework which is to enable researchers to combine the notions stemming from both the stream of the literature focused on organizational identity and the stream of the literature focused on legitimacy management when considering the phenomenon of deinstitutionalization. The context proposed for the analysis is the declining industrial sector in case of which chances of organizations operating in this sector for the maintenance of legitimacy and the continuation of their operations are analyzed in the light of different concepts of organizational boundaries with special attention paid to organizational identity and its postulated elasticity.
Design/methodology/approach: Theoretical analysis is conducted in order to build the framework and propose some possible avenues for future research. The papers selected for the analysis are related to three main fields of research, these are organizational identity, legitimacy, and organizational boundaries.
Findings: Three cases are finally discussed when taking into account the time dimension as well. It appears reasonable to argue that in order to understand tensions that are generated when pressures from external evaluators meet with how people working for organizations attempt to maintain the legitimacy of their organizations, the original concept of organizational identity based on features of centrality, endurance, and distinctiveness can be revised. This would enable researchers to stay focused on these processes that cause managers to reshape the identities of their organizations.
Research limitations/implications: Limitations of this paper are related to the range of assumptions that are adopted in order to conduct the analysis. Implications are mainly related to that by showing some details of complex relationships between two main constructs discussed (these are organizational identity and legitimacy) the paper may lead to the increase in stakeholders' awareness as to what are the sources of problems and the paths to overcome them when facing the threat of losing legitimacy in the declining industrial sector.
Originality/value: The main contribution to the debate on how organizations can maintain their legitimacy lies in the fact that the construct of organizational identity elasticity is applied and its importance from the point of view of enriching the discussion on changes in organizational boundaries is proved.

Keywords: identity. organizational boundaries, legitimacy management, deinstitutionalization.

Category of the paper: conceptual.

Introduction

When considering specific organizational outcomes to be achieved by managers, Foster et al. (2017) recognize that organizational identity and legitimacy can be viewed as to be quite different outcomes. This is because for managers to build identity they need to "highlight the uniqueness of the organization for internal audiences" (Foster et al., 2017, p. 1184). At the same time, it is conceptualized that for managers to promote legitimacy, they should "emphasize the similarity of the organization to a given set of standards and expectations of audiences external to the boundaries of the firm" (Foster et al., 2017, p. 1184). It can be noticed that following this conceptualization whereas efforts put into building identity are both aimed at internal audiences and focused on, generally speaking, "uniqueness", efforts put into promoting legitimacy are both aimed at external audiences and focused on "similarity". Among issues on which institutional theory is focused, there are those related to the processes of institutionalization in organizational environments that make organizations want to remain fit to social meanings distributed outside organizational boundaries. This is important for the organization to the extent that when being willing to achieve it, the organization can decide on the implementation of one of the possible strategic responses (Oliver, 1991). From this point of view, it can be assumed that external pressures related to social judgments being formed by the external audience (Bitektine, 2011), with whom the organization needs to negotiate how to be "sufficiently" similar to other accepted organizations, impact how organizations are to think about their uniqueness and the assessment of organizational boundaries more general (Santos, Eisenhardt, 2005).

The question that can be analyzed may relate to what the relations are among, on the one hand, tensions between uniqueness and similarity, and, on the other hand, decisions on the criteria according to which boundaries are shaped. In the case of organizational identity, to build distinctiveness in the eyes of employees, managers can e.g. neutralize effects related to contradictory situations in the company's past or omit some events from the past. In the case of legitimacy, organizations may describe their practices and effects when referring to worldwide standards in a way that the external audience can match those solutions (which otherwise could be questionable) to some pre-existing solutions by perceiving a similarity between them (Foster et al., 2017). Possibly, it may be assumed that the fact that organizations still can meet external standards that are appreciated worldwide may help managers to shape the identity of their organizations, since, for instance, the level to which a given organization meets this standard is exceptionally high. Nevertheless, the situations may appear to be different when there is greater ambiguity related to which standard should be the most appropriate (because over the longer period throughout which the sector operates many standards or, more generally, prescriptions could emerge, or, even worse, due to extremely strong pressure it may be hard to find the appropriate standard by reference to which organizations may attempt to legitimate their

activities). As the taken-for-granted legitimacy of main actors in the industrial sector becomes questionable, those who both form an influential social judgment and are in opposition to how the organization operates may be putting more and more effort into the assessment of the organization (and causing the bases for the legitimacy judgments formation to be changed which is discussed later). When a threat to the continuation of organizational functioning is to arise, the expected outcome may relate to a strategic decision like a takeover or some kind of diversification. The antecedents and consequences of these phenomena can be analyzed theoretically from the point of view of organizational boundaries literature. The above-mentioned issues are assumed to be especially possible to be found in the realm of the declining industrial sector, which is why this kind of context is primarily discussed. By paying attention to declining industrial sectors it is possible to emphasize how those externally located requirements may impact the task of identity building and what conditions should be met if the organization wants to maintain its operations in this kind of environment.

Actually, as the concept of organizational identity is regarded as the important one from the point of view of considerations on specific conditions for the formation of social value judgments resulting in difficulties with the maintenance of legitimacy in declining industrial sectors, in this paper the issue is analyzed from the broader perspective, that is the concept of organizational boundaries (Santos, Eisenhardt, 2005) which refers not only to the issues of organizational identity (e.g. Albert, Whetten, 1985) but also allows for the discussion of the concepts of managerial cognition and cognitive frames (e.g. Prahalad, Bettis, 1986) in a more detailed way. By referring to the recently introduced concept of the elasticity of organizational identity (Kreiner et al., 2015) some additional considerations on individual-level attributes of managers and important insights from social psychology for legitimacy and identity studies are made. What is also important, referring to the concept of organizational boundaries lets introduce some further considerations on relations between legitimacy and power. It is possible especially when postulated special features of the declining industrial sector like the issue of deinstitutionalization and the presence of competing institutional logics (these terms are explained in detail in the next sections) are to be taken into account. When those two concepts – these are identity boundary and power boundary - are combined, it is becoming more evident why the new conceptualizations of legitimacy or identity as processes in addition to those treating them as things are valuable. Those perspectives when combined should make it possible to find the answer to the research question included in this paper, *what makes companies operating in declining industrial sectors not lose their legitimacy even if the industrial sector appears not to be legitimated any longer*? The paper aims at finding the main possible relations among key concepts, which next could be used to build a conceptual framework and to outline the direction in which research propositions can be built. The paper is structured as follows. The next section refers to the conception of organizational boundary focusing mainly on identity boundary which makes it possible to explain why issues related to managerial cognition and organizational identity can be important from the point of view of the discussion on

attempts to maintain the operations of the organization when its industrial sector is to decline. Next, the characteristics of the assumed generic declining industrial sector are developed and it is explained in which way the specific conditions for social (legitimacy) judgment formation may be present. Finally, the framework is developed which shows conditions and requirements under which organizations may have their operations maintained even if the industrial sector declines.

In order to outline the perspective from which aspects will be discussed in the analysis to follow, it appears to be useful to emphasize a few points. It may be assumed that institutions are understood as "historical accretions of past practices and understandings that set conditions on action through how they acquire the status of taken-for-granted facts which, in turn, shape future interactions and negotiations" (Barley, Tolbert, 1997 as cited in Maguire, Hardy, 2009, p. 149). These institutions are believed to govern behavior as three "pillars" - regulative, normative, and cognitive - are to hold in place institutionalized practices (Scott, 2001 as cited in Maguire, Hardy, 2009, p. 149). The above-mentioned pillars are ones through which legitimacy should be established and conformity secured (Maguire, Hardy, 2009). Among the reasons which may be behind the abandonment of existing practices, one should primarily pay attention to the loss of their "original meaning" (Maguire, Hardy, 2008, p. 150). As a consequence, deviations, in general, from institutionalized practices are said to be "costly" (Jepperson, 1991 as cited in Maguire, Hardy, 2009, p. 149). However, they can occur. As it will be analyzed in a more detailed way next, "the process whereby previously institutionalized practices are abandoned" (e.g. Davis, Diekmann, Tinsley, 1994 as cited in Maguire, Hardy 2008, p. 150) is defined as deinstitutionalization. One could ask the question about the mechanisms that cause that despite the decline of the industrial sector the company can operate effectively through a considerable amount of time. The question becomes especially intriguing when taking into account that from the point of view of the approach adopted in this paper, both the identity concept and legitimacy concept can be analyzed as characteristics (attributes) or processes. In the case of the identity concept, the issue is that instead of using characteristic-like language to refer to organizational identity (e.g. like in the statement "we are the most competitive organization") the approach more focused on "becoming" than being (Schultz et al., 2012 as cited in Kreiner et al., 2015, p. 983) should be adopted. Here, members of the organization are said to experience identity "by negotiating a set of processual tensions" (Kreiner et al., 2015, p. 981). This approach is said to provide "a full motion picture" (Gioia, Pavardhan, 2012 as cited in Kreiner et al., 2015, p. 983) and its importance appears to grow due to the complexity of the environment and the radicality of changes that can be observed (Kreiner et al., 2015). In essence, in the case of the legitimacy concept, the approach focused on attributes relates to the understanding of the concept as a commodity (so it can be possessed or exchanged between organizations, and it is possible to express it in some measurable quantity). On the contrary, a process view is focused on communication thanks to which legitimacy can be constructed when meanings are negotiated (Suddaby, Bitektine, Haack, 2017). What is also

important is that the fact of the importance of the process approach being emphasized does not mean that previously important or even seminal approaches should be abandoned. As in the case of legitimacy studies the view of legitimacy prepared by Suchman is still widely recognized, similarly in the case of identity studies approach presented by Albert and Whetten (1985) who by emphasizing how centrality, endurance, and distinctiveness are to be important for identity created the tripartite definition of organizational identity remains valid[1]. Nevertheless, "a new scrutiny and more comprehensive analysis of each of the components of identity" is encouraged (Kreiner et al., 2015, p. 984). Especially, having conducted a deep analysis regarding how original ideas presented by Albert and Whetten were next applied in different fields of research, Knorr and Hein-Pensel (2022) emphasized the importance of conducting future research on the evolution of organizational identity depending on life-cycle of organizations. It should involve consideration of how organizational identity can evolve when the pace of growth in profit or other resources changes. Although this paper focuses mainly on the last stage of the industrial life cycle, the analysis included here is believed to allow for showing the evolving character of organizational identity with comparison to changes in "identity sustaining elements" (Knorr, Hein-Pensel, 2022, p. 22) of cognitive and relational character.

1. Theoretical background

1.1. The issue of organizational identity as a part of the organizational boundary problem. Sectoral context

Some features like a relatively stable industry structure or rather low technological uncertainty[2] (related to "the possibility of technological obsolescence" – Balakrishnan, Wernerfelt, 1986, p. 348) that may often be related to the declining industrial sector are to be in favor of mechanisms used to shape legal boundary of the company which is one related to the concept of the boundary of efficiency – Santos, Eisenhardt, 2005. Nevertheless, there are still other premises that may cause managers to change their way of thinking about the boundaries of their organization, these are e.g. the arguments provided by the concept of boundaries of identity. Here the task for organization members is to find the answer to the question of who we are as an organization. Coherence should be achieved between the identity of the organization and its activities. It appears to be difficult especially when the awareness among managers is present that the activities which the company has performed for many years are losing their legitimacy (generally acceptance). The perspective of a significant organizational change may emerge (e.g. lw.com.pl). Just here the term cognitive frame is to be important (as well as emphasized "emotional attachment" to these frames – Santos, Eisenhardt, 2005, p. 501). These frames are often said to make ambiguity reduced which is why the process

of decision-making may be facilitated. However, when being unsuited with regard to how challenges are solved by the organization as a whole in the environment, these frames may result in decisions far from being optimal (Hahn et al., 2014, see also Janiszewski, 2021).

Both unconscious character and deep emotional component are features of identity boundaries that cause them to be resistant to change, which is why alternatives considered when deciding on boundaries of the organization are expected to be coherent with organizational identity (Santos, Eisenhardt, 2005, p. 502). It is also possible to say that what constitutes the "buildings blocks" for the organization's identity is cognitive frames (Santos, Eisenhardt, 2005, p. 500). Santos & Eisenhardt (2005) see cognitive frames as the result of the crystallization of sensemaking under the conditions of bounded rationality and environmental complexity. The "collective sensemaking" allows for building shared interpretations of past actions and changes and as a result of this courses of new actions can be established (Weick, 1995 as cited in Santos, Eisenhardt, 2005, p. 500). Also, organizational identity may be argued to reflect CEO's experience and CEO' perception of the reality in the industry (Santos, Eisenhardt, 2005).

Nevertheless, in the end, the organization (being forced by the perspective of losing all hitherto created legitimacy and presumably not being able to renegotiate this loss) may decide on organizational change that means quite a radical departure from its hitherto activities (https://www.miningweekly.com/). However, the issue is about the extent to which what managers say about changes necessary in strategies and business models that allow the organization to gain access to new resources is absorbed by the employees and external evaluators. This also depends on what are the sectoral characteristics described below.

When presenting the concept of a five-stage model for the industry life cycle that includes stages like pioneering development, rapid accelerating growth, mature growth, stabilization, and market maturity as well as deceleration of growth and decline, Reilly & Brown emphasize the usefulness of the concept for predictions of industry sales and trends in profitability (Reilly, Brown, 2009, pp. 415-416). From the point of view of considerations presented in this paper attention is primarily to be paid to the last stage of the industry life cycle which is the deceleration of growth and decline. The analysis focused on sales and profitability shows that during the decline stage demand is lowering, or more and more substitutes appear. What is more, it can be noticed that since the stage of mature growth, the profit margins begin to decrease to normal levels since competitors were attracted to the previously quickly growing industry. In general, those who are still investing in the industry during this last stage may gain only low rates of return on capital (Reilly, Brown, 2009, pp. 415-416). The issue is that before the capital tied in the industry of this kind will be withdrawn by investors due to financial reasons it may be expected that there is a huge pressure directed at the industry and companies operating within it (e.g. https://www.miningweekly.com).

The above-mentioned pressure may be said to consist of different social judgments formulated by the external audience. This may be related to all the previously discussed "pillars" that support institutions depending on how much effort the decision-maker is to put

into the assessment to attempt to undermine one or more of those pillars (Bitektine, 2011; Scott, 1995). Nevertheless, companies may still have their operations accepted by the environment throughout some significant period depending on how they react to the situation. There are many potential reasons why these companies are struggling to maintain their operations in the declining industrial sector (e.g. feeling of responsibility for local communities or the whole region where the company is operating - e.g. lw.com.pl). The issue is while managerial cognition is shaped gradually (as it occurs when managers are being reinforced by economic success and are focusing their effort on the behavior leading to it – Prahalad, Bettis, 1986), here the situation is that the organization should attempt to introduce changes relatively quickly due to the requirements on the part of a threat of the loss of legitimacy. What is more, due to the existence by a presumably longer period (as the declining industrial sector is expected to go through all stages of the industry life cycle although exceptions are possible) one may expect that there is more than one institutional logic[3] present. That is why when referring to some seemingly obvious rules or points of reference members of these organizations may differ from each other.

The above-mentioned conditions may lead to the emergence of reasons why in the declining industrial sector special conditions for making social value (legitimacy) judgments are created. Similarly like in the case of the legitimation of a new market category (Navis, Glynn, 2010), there is the need to take into account the confluence of factors internal to the activity (e.g. views and assessments related to its importance or indispensability) to be deinstitutionalized as well as factors external to the activity (e.g. legitimacy judgments related to its appropriateness and credibility) to be deinstitutionalized. The below-mentioned relations (point 1.3) show how conditions that are present in the sector that deems to be in the last stage of its development may influence social judgments made by evaluators. In addition to an internally generated identity shaped by cognitive frames of managers (point 1.2), these attitudes performed by the external audience are to be the next factor to be taken into account when considering the framework for the analysis of how the companies could maintain their legitimacy when the general context is losing its legitimacy.

1.2. The issue of organizational identity and managerial cognition. Organizational context

As it has been stated the concept of boundaries of identity, in addition to the theoretical strain focused on managerial cognition and cognitive frames (e.g. Prahalad, Bettis, 1986), also draws from the works related to organizational identity and how organizations may gain their distinctive character (e.g. Albert, Whetten, 1985). As being related to each other these two strains are to be discussed below.

It may be said that the proposition according to which central and enduring features of the organization should be regarded as important for organizational identity stems from the concept of the deepest commitment of the organization. Among these features, one is to find distinctive

features of the organization[4]. What has been created as a result of these commitments can be ascribed to the notion of organizational identity. Put differently, when organizing the organization makes choices, and the reminders of these choices that were institutionalized can be treated as "identity referents" (Whetten, 2006, p. 224). By analyzing the deepest commitments of the organization it becomes possible to recognize the most important aspects of the organization since these commitments are not to be changed because of passing time or changing conditions. It is worth noticing that this view relates to “path-dependent conceptions” of how organizations evolve (Stinchcombe, 1965 as cited in Whetten, 2006, p. 224), and in order for processes of organizing and identifying to be considered as "parallel processes" one of the assumptions that are to be shared is that only rarely organizations are successful when introducing "core changes" (Barnett, Carroll, 1995 as cited in Whetten, 2006, p. 230). The next result of the adoption of this view is that the possession of self-defining commitments should result in persistent consequences thanks to which organizations are identifiable and their constitutions as social artifacts occur. These commitments are said to be important to the extent that in addition to being strongly related to emotions, they should play the role of decision guides in "profoundly difficult situations" that are to be used as a kind of a tool of last chance for resolving this situation (Whetten, 2006, p. 222). To sum up, it is especially important that organizational identity is ascribed to those features of the organization that have been institutionalized as a result of the choices made during the process of organizing (Whetten, 2006). From the point of view of the discussed topic, it is important to find whether the organization that both operates in the declining industrial sector and attempts to maintain its legitimacy can introduce necessary changes in a way that does not mean a complete dilution of its organizational identity as it may have serious consequences regarding managers engagement (Dattée et al., 2022). At the same time, the issue is how changes that are to be introduced are transferred (especially in comparison to the intensity of the emergence of the messages that have their source in the group of external evaluators who is in opposition to the organization). At the intersection of real effort put into maintaining the legitimacy and the level of awareness of it on the part of external evaluators, the prospects for the organization are believed to be shaped.

In general, the term organizational identity is said to be a broad one (Cyfert, 2012) as it may include organizational basic values, organizational culture, next also ways in which products are prepared and these products themselves (Dutton, Dukerich, 1991 and Stuart, Whetten, 1985 as cited in Konecki, 2002, p. 82). What is also important, organizational identity could be said to be shaped e.g. by the identity of the industry (Melewar, Karaosmanoglu, 2006 as cited in Zarębska, 2009, p. 40). Although Santos and Eisenhardt (2005, p. 501) regarded organizational identity as mainly immutable due to “deep emotional attachment”, research conducted by Kreiner et al. (2015) allow them to argue that the definition created by Albert and Whetten (1985) when being applied to members of contemporary organizations facing more radical changes can be modified since organizational identity is to be experienced not only as

a characteristic but it is also experienced as a process. The core of their argument appears to lie in that thanks to identity work it is possible to expand hitherto identity by interpreting new kinds of situations as being in some way related to (or as ones that can be treated as being the same as) those in the past (Kreiner et al., 2015). At the same time when being performed in such a way that new events are commented as a threat to what has been known from the past, identity could remain static or even be constricted. Hence, Kreiner et al. (2015) pay attention to that organizations, when adjusting to the demands of their environment, may lead their members to renegotiation who they are as a given organization. As a result of this process, organizational identity will be subjected to the above-mentioned processes (of expansion or contraction) that are socially constructed and their presence requires that the concepts of identity centrality, endurance, and distinctiveness need to be revised (Kreiner et al., 2015).

With regard to centrality, how elasticity can be enabled involves prioritizing plurality as being central to identity. This is because then multiple interpretations of identity are allowed. To set the limits on the elasticity of the identity it is also important that there remains a clear symbol of unity present that members agree on. If so, all these aspects that are not said to matter most can be variously defined (Kreiner et al., 2015). So, even if there are some differences in beliefs in order to extend the elasticity it is possible to subordinate them instead of making them problematized and to focus on e.g. this event that is commonly perceived as being important. It is also possible to perceive e.g. the fact that 3% of people have other views on something as relatively not disturbing or even helping the elasticity. Alternatively, this 3% of disagreement can be perceived as an "over-extending the diversity" and as a "deal breaker" of elasticity (Kreiner et al., 2015, p. 999). With regard to endurance, the elasticity is said to be facilitated by positioning objections to contested identity claims as being consistent with identity. The core of the matter is that instead of viewing one change as a big one and as such which is against the past of the organization, this change can be seen as a similar one to some extent to some changes that have already been accepted and in this way, there is not a break in the continuation of the previous identity. What is more, instead of seeing a given change as a catastrophic one, the change may not be problematized and seen as "business as usual". When there is a debate about whether a new social group should be allowed to enter the organization, it can be made compared to the other groups. And despite being in some respect different to these groups that entered earlier as a result of the comparison this new group should be let enter as well. In this way "the notion of inclusion" continues to expand and the identity of the organization as well (Kreiner et al., 2015, pp. 1000-1001). With regard to distinctiveness, the facilitation of elasticity goes through embracing outside trends or social movements because then the degree to which members construct their organizational identity by drawing on outside influences is increasing. Here the issue of a referent to which one compares organizational distinctiveness is of primary importance. For example, a given trend when being accepted by the organization can be perceived to make this organization lose its distinctiveness as this organization becomes to be believed like previously perceived other ones (e.g. Church is to be like a secular organization

as Kreiner et al., 2015 discuss it). But when having the referent changed the same organization can be perceived as having its distinctiveness enhanced when being compared to organizations previously regarded as belonging to the same class (e.g. Church that accepts some trends may become unique with comparison to other Churches again as Kreiner et al., 2015 discuss it). The issue is also even when there are some divisive issues, members can "carve out" a distinctive space within the organization. Put it differently, e.g. when there are camps in the organization although these camps may try to look for optimally distinctive space, this happens still within the organization. Organizational identity work can construct not only gain or loss in the level of distinctiveness because of external trends but also this distinctiveness may be crafted internally. When deciding on leaving the organization due to these issues, then these already former members are to constrict identity since due to incompatible views and failure with the creation of internal distinctiveness these people decided to abandon the organization (Kreiner et al., 2015, pp. 1002-1003).

Hence, it could be emphasized that the term elasticity includes not only changes in relations with the environment as well as changes in structures and processes inside the organization due to the trigger from outside but also includes the role of internal triggers (Krupski, 2006). In general, the term elasticity is said to have a few dimensions (like e.g. the ability to create a few options of operation at the same time or to react to changes that are expansive but destructive as well) (Osbert-Pociecha, Grzesik, 2009) which at least potentially should create much space for coping with difficult situations resulting from the necessity to answer the question of who we are to be posed by organizational members.

In the case of declining industrial sectors, there are now a few points worth considering. Primarily, the issue which needs to be discussed relates to how one should understand the impact which the fact of operating in the industry for a longer period could have on managers (Hahn et al., 2014, see also Janiszewski, 2021). To appropriately assess this issue, it is needed to show how the significance of conditions under which managerial cognition is shaped should be taken into account. While how cognitive frames are built and work is discussed in detail elsewhere[5] here the main arguments focused on the roots of this discussion on managerial cognition with regard to strategic decisions are presented as these aspects are especially important from the point of view of organizational boundaries. Then it will appear to be clearer what is the extent to which the increasing awareness of the growing demands of legitimacy gaining (https://tax.thomsonreuters.com) may allow one to assume that managers even if reluctantly may be able to adjust their operations and, in general, features of the organization to the new demands in the field for gaining further acceptance for their operation in the industrial sector which is under high pressure.

Prahalad, Bettis (1986) defined a “dominant general management logic” as “the way in which managers conceptualize the business and make critical resource allocation decisions - be it in technologies, product development, distribution, advertising, or in human resource management” (Prahalad, Bettis, 1986, p. 490). The term "dominant general management logic"

was used by Prahalad and Bettis when they consider the linkage between diversity and performance. These dominant logics were said to consist of mental maps and such "intimate aspects" like belief structures or frame of references that were being developed by managers (including both the corporate level and business level) through experience in the core business (Bettis, Prahalad, 1995, p. 7; Prahalad, Bettis, 1986, p. 485). The dominant logic can also be viewed as a fundamental aspect of organizational intelligence, that is the ability of the organization to learn (Bettis, Prahalad, 1995, p. 7). As the dominant logic is set to permeate the organization and at this same time it remains invisible, its importance can be shown in such a way that by revolving around some unrecognized assumptions it may embed in e.g., the strategy. The dominant logic was also believed to be one of the emergent properties of the organization in case of which other examples would be "political coalitions, values, informal structure, and suboptimization" (Bettis, Prahalad, 1995, p. 11). What is important here, is the role of the dominant logic in making strategic decisions in industrial sectors doomed to decline.

Following the literature on cognitive psychology (e.g. Norman, 1976 as cited in Prahald, Bettis, 1986), Prahalad and Bettis (1986) emphasized that instead of approaching the majority of organizational events as unique, these events are processed by managers through preexisting knowledge systems (schemas). The core of the issue here was that managers' personal experiences may be treated as a basis for the development over time of beliefs, theories, and propositions that could be represented by these systems (schemas). These schemes can be said to store a shared dominant general management logic (Prahalad, Bettis, 1986, p. 490). When describing the main role of these schemes, Prahalad and Bettis were initially focused on making it possible for managers to "categorize an event, assess its consequences, and consider appropriate actions (including doing nothing)" (Prahalad, Bettis, 1986, p. 489).

What is important now, by operating over a long period the business is expected to gain legitimacy based on taken-for-grantedness (Suchman, 1995). It may suggest that when making decisions about dealing with the problems to be solved in the declining industrial sector managers are to perceive organizational activities as being taken for granted by external evaluators. Simultaneously, they strongly link the dominant top management logic to the characteristics of the business which was the "historical basis for the firm's growth" (Prahalad, Bettis, 1986, p. 491). Managers are expected to define problems in ways that turned out to be useful from the point of view of tasks of that business. When institutional change occurs, it is especially probable that what Kiesler and Sproul (1982 as cited in Prahalad, Bettis, 1986, p. 490) initially argued that representations over which managers operate are likely to be "historical environments" is true. Nevertheless, it does not happen that all people immediately assess the situation in the exactly same way (Reay, Hinings, 2009). By looking at sources of the dominant logic like linkage to personal experiences and the state of high uncertainty resulting from rules being changed, it appears to be reasonably assumed that some significant differences with regard to how the situations should be assessed emerge among managers.

For example, the extent to which the company should take into account the period to be left for the declining sector can be assessed differently as it may be impacted by the general assessment of a political party or European Union policy. These issues could have quite a different impact on e.g. those industries within which managers operated before they start work for the analyzed organization that operates in the declining industrial sector. As a consequence of this, the above-mentioned product of managers' interpretations of experiences collected when operating within a given company and industry (organizational scheme) is not to give unequivocal suggestions as to the responses.

Indeed, what Kreiner et al. (2015) argued about differences in the assessments of what combinations of old and new practices could be tolerated, which impacted next revised views as to what centrality, endurance, and distinctiveness as features of organizational identity are, may result from the above-mentioned differences. As at the sectoral/field levels, multiple institutional logics are present and permeate organizations engaged in a given field, managers when being faced with challenges resulting from e.g. the necessity of the addition of a new business that is dissimilar from existing businesses, are to decide on how to create the capacity for multiple dominant logics at the organizational level. This is the place where differences may arise again as some managers may have previous experience in this new sector while others could lack it which is to impact which elements of institutional logics they are prone to recognize first and attempt to combine in the dominant logic. It is postulated that when considering the problem as being internally solved by a group of people, it is especially advisable to pay attention to individual differences in managerial cognition that may result in that different organizations may to some extent differently response and deal with complexity at the field level (Prahalad, Bettis, 1996, p. 496). The issue is whether these decisions will be regarded by the external evaluators (as well as to some extent by other members of the organizations) as remaining within the scope of the previously shaped identity.

At the same time, it may be noticed that one of the cognitive biases discussed by Prahalad and Bettis (1986) is the availability heuristic that causes people to make decisions "by using information that can easily be brought to mind" (Prahalad, Bettis, 1986, p. 493). Being unaware of the arising pressure or not treating it in a sufficiently serious way, as it will be discussed further, managers who may believe in a taken-for-granted legitimacy of their organization are not to produce messages that would balance the number of messages produced by those external evaluators who opposed organizational operations. By interfering with both *the coherence* and *the structure* of the messages present at the field/sector level (these messages may be actually treated as discourses that are to constitute which institutional logics are present at the field/sector level) this tendency, as time goes by, is assumed to impact decisions taken by managers which will result in a kind of response to the problem of weakening legitimacy. For example, it is worth mentioning that nowadays one source of the pressure for organizations, which operate in industrial sectors deemed to have problems with the legitimacy of their activities, may be withdrawing by financial institutions from financing (cire.pl) which may push

these managers in these organizations to attempt to gain access to limited resources by the use of mechanisms discussed in the literature on organizational boundaries (ownership ones like acquisitions or nonownership ones like lobbying or alliances). Then it is worth paying attention to that, in addition to the conception of the boundary identity, the issue of the boundary of power is to be taken into account in the analysis as well. Although the power conception is said to apply to environments characterized by rather a high level of ambiguity or dynamism, there is also possible to apply it to environments that are regulated or in markets dominated by influential players (like in the case of oligopoly) (Santos, Eisenhardt, 2005). By the use of the above-mentioned ownership and especially nonownership mechanisms, the organization can have its organizational boundaries - understood by the prism of its "sphere of influence" - extended (Pfeffer, Salancik, 1978 as cited in Santos, Eisenhardt, 2005, p. 496). What is important, even though identity boundary is argued to have in general dominance over power boundary, it is possible to discuss examples of when power considerations can dominate over identity considerations when making decisions on the boundaries of the organization. However, it is not often to be like that, but the appropriate conditions have to be present. This is also why attention is paid to the declining industrial sectors.

It is not until some extreme circumstances occur that power considerations can dominate over identity considerations. For example, when external forces are to make critical resources for the organization inaccessible (like in the discussed example of financial resources for developing projects in the declining industrial sectors), it may trigger sensemaking (Louis, Sutton, 1991 as cited in Santos, Eisenhardt, 2005, p. 502) as a result of which organizational identity can be reevaluated and boundaries adjusted based on this reevaluation (Santos, Eisenhardt, 2005). The power concept of organizational boundaries can be useful to understand the behavior of the organization that in order to avoid being forced to adopt activities that would be divergent in relation to its goal needs to improve its performance by reducing its dependence on external forces or putting it differently, by gaining more and more control over these external forces (Thompson, 1967). Here, by making use of the ownership mechanism (acquisition) or non-ownership mechanism (alliance) the company can gain access to a necessary resource, which although dictated by power boundaries premises has finally impact on how the identity boundary of the company is shaped. What this example suggests and what is next developed is that for the abandonment of practices the previously made reconfiguration of power-knowledge relation in a field/sector is necessary (Maguire, Hardy, 2009). The next point is to show the sources of signals from external evaluators who being first to imagine that a given organization may cease to exist at least indirectly may influence organizational identity changes.

1.3. The issue of organizational identity and deinstitutionalization forces. External evaluators' context

In the beginning, what is worth emphasizing is that researchers in the field of management science are still encouraged to deal with legitimacy issues (Łada, 2016). Considerations presented in this section are conducted from the specific point of view related to the situation when pillars supporting institutions appear to weaken. To begin with, some remarks related to legitimacy and their types in declining industrial sectors are to be made[6]. In general, sociopolitical/moral legitimacy is to rest on the judgment whether the activity of the organization is "the right thing to do" - here the issue of whether this activity benefits or does not benefit external evaluators[7] actually is not considered (Suchman, 1995, p. 579). It can be argued that sociopolitical/moral judgment is the kind of legitimacy in case of which the organizational form, processes, and outcomes are assessed as to whether they can be socially acceptable, or they rather should be sanctioned (Bitektine, 2011; Suchman, 1995). In addition to sociopolitical/moral legitimacy, Suchman also emphasized in his seminal paper the importance of legitimacy that is not based on interest (like in the case of pragmatic legitimacy not being discussed here) or evaluation (like in the case of moral legitimacy) (Suchman, 1995). As Bitektine (2011, pp. 156-157) argues, in the case of cognitive legitimacy the emphasis is put on a set of organizational characteristics that are recognizable (these could be e.g. structural properties, technical features) and are used to classify a given organization as a member of a "class of organizations". Put differently, Suchman argued that cultural models are available that may make organizational behavior predictable or meaningful and the possibility of "dissent" is submerged as e.g. only one organization is believed to be able to use a given technology or realize a new project (Suchman, 1995, p. 583). It can be argued that cognitive judgment is the kind of legitimacy in case of which the organization is to be classified as a member of a class (e.g. of organizations that are members of a given industrial sector) based on its recognizable organizational characteristics (Bitektine, 2011; Suchman, 1995). What is important is that the effort that needs to be put into building these judgments is greater in the case of sociopolitical legitimacy (Bitektine, 2011). This issue will be next taken into account in the construction of the conceptual framework.

The problem that may appear in the case of declining industrial sectors may be that even if the product offered by the sector can be regarded as valuable by some users, there may be more and more critical messages (opinions) as to e.g. materials used by organizations in operations that are potentially harmful to the environment (put differently, when demands related to the consequential legitimacy appear to be met, however, in case of demands of the procedural legitimacy the matters are not so obvious - Suchman, 1995). The problem then may arise as it turns out that an effort made by organizations so far being assessed as done in good faith now becomes to be considered a sign of poor results or ignorance on the part of managers of organizations that operate in the sector. When describing the institutional environment one can use the term institutional complexity - the issue is that there are many prescriptions for behavior

that can be “divergent” or even “conflicting” with reference to each other (e.g. Martin et al., 2017 as quoted in Regany et al., 2021, pp. 6-7). For example, as there is growing emphasis on water-saving activities as the water should not be wasted during the production process (e.g. jsw.pl), one can assume that the organization should have implemented some solutions and actually has achieved some progress. Throughout some periods it may cause their stakeholders to be more lenient for controversies related to the specificity of the functioning of the organization (that to some extent may be still harmful to the environment in some way). Nevertheless, assuming that it will turn out that the industrial sector which produces substitutes will be able not to waste water at all, then not only results but also hitherto acclaimed procedures used by the organization operating in the declining sector may lose their value in the eyes of stakeholders (Suchman, 1995). The issue to be considered now is what are the conditions under which those unfavorable judgments directed at the whole declining industrial sector may (or may not) outweigh steps made by the organization that attempts to maintain its legitimacy. If so, both (the declining industrial sector and the organization that operates within it) would lose their legitimacy – put differently, it may be said that their all practices would become deinstitutionalized (Maguire, Hardy, 2009). The issue that needs consideration relates to how messages from external evaluators are formed and transferred as in this space the reasons why more and more evaluators may oppose the organization emerge and as a consequence, unfavorable judgments begin to dominate discourse at the field/sector level interfering with hitherto established coherence and structure of this discourse.

In order to refer to the topic of deinstitutionalization Maguire and Hardy (2009) drew on two theoretical streams within institutional theory. The first is the organizational discourse theory (e.g., Phillips, Lawrence, Hardy, 2004). The second is the metaphor of "translation". To understand it well, it is important to be aware that the general meaning of the message is not unequivocal. When being “negotiated” between the author of the message and the receiver of the message who also interprets it (Czarniawska, 1997 as cited in Maguire, Hardy, 2009, p. 151) the meaning is not passed from one source to another without being changed in some way. In their research, Maguire and Hardy (2009) showed that a process of translating problematizations can influence the discourse about given practices in such a way that, firstly, institutional pillars supporting practices become undermined, and, secondly, the practices become abandoned (Maguire, Hardy, 2009). When being understood as a set of legitimate practices institutions become deinstitutionalized when their "taken-for-grantedness" is called into question and as a consequence, the above-mentioned pillars do not grip those practices any longer (e.g. Douglas, 1986 as cited in Maguire, Hardy, 2008, p. 150). In this way, the status quo may be “delegitimized” and meaning “managed” (Pettigrew, 1979 as cited in Maguire, Hardy, 2008, p. 151).

Due to the fact that meanings of existing institutionalized practices stem from well-entrenched belief systems they are not to be changed easily (Reay, Hinings, 2009). What is more, as Maguire and Hardy (2009) point out, when e.g. considering the transitions from

existing "brown" practices to an ecologically sustainable economy as the example of deinstitutionalization, the effort put by those who demand the change should focus not only on the negative impacts of existing practices, but it must also show why alternative practices can be considered as being acceptable so that the issue of the acceptability of sustainable (green) alternatives needs to be taken into account as well. Although it is difficult to deinstitutionalize legitimated practices (among other reasons why it is like this one can mention those like lacks on the part of centrality, communication networks, or simply legitimacy among those actors who try to lead to changes in the field, e.g. Phillips, Lawrence, Hardy 2004 as cited in Maguire, Hardy, 2008, p. 150) deinstitutionalization may happen. To better understand how it may happens it is necessary to introduce the term disruptive institutional work (Lawrence, Suddaby, 2006).

When actors are to perform actions to “create, maintain or disrupt institutions” (e.g. Dolbec, Fischer, 2015 as cited in Regany et al., 2021, p. 7) they can be said to perform institutional work. More generally, Regany et al. (2021) mention that factors like “contestation between alternative institutions” (e.g. Seo, Creed, 2002 as cited in Regany et al., 2021, p. 5), “disconnecting” individuals on their own from certain sets of practices, technologies, rules, and laws (e.g. Leblebici et al., 1991 as cited in Regany et al., 2021, p. 5) or “coercive work” (e.g. Fligstein, 1990 as cited in Regany et al., 2021, p. 5) may lead to deinstitutionalization. Nevertheless, this issue can be extended when combined with the concept of institutional logic that is said to "infuse institutional work" (Dolbec, Fischer, 2015 as cited in Regany et al., 2021, p. 7). According to the categorization regarding institutional work prepared by Lawrence and Suddaby (2006) the core of the matter relates to how actors are expected to behave with regard to mechanisms that cause others to comply with institutions - they may support these mechanisms or attack them. By referring to this categorization, Regany et al. (2021) pay attention to that in order to introduce disruptive institutional change, people could create sanctions (here through the state apparatus so that the regulative dimension is involved) or they could make the practice inappropriate from a specific context (here the normative dimension is involved as the context may be cultural, political or religious).

What is worth adding in addition to the issue of disruptive institutional work is that other kinds of activities may be performed when organizations attempt to maintain a given institution (like the creation of rules that are to support the institution, this target may also be achieved by the creation of a positive public image or by the creation of a routine, Regany et al., 2021). The organization that operates within the declining industrial sector but attempts to maintain its legitimacy would be expected to perform this kind of institutional work but it finally depends on how managerial cognition has been shaped. The issue of managerial cognition has already been discussed as it was argued that due to the belief in a taken-for-granted legitimacy of their organization managers may not perform necessary activities. The issue of how evaluators are to assess the organization is to be explained in greater detail from the point of view of issues that are next important when trying to understand why as time goes by external evaluators are

to rely more and more on their own judgments and by being more and more focused on the situation of the analyzed organization they are believed to be the first group which starts produce unfavorable judgments (in the form of messages that are to build discourse important from the point of view of supporting institutions).

External evaluators who need to manage uncertainty resulting from simply unknown social properties of organizations are believed to use different "heuristics" (Tversky, Kahneman, 1974 as cited in Bitektine, 2011). Following Tversky and Kahnemann (1986), Bitektine (2011) emphasizes that cognitive heuristics may be replaced by an "extensive evaluation" when contextual characteristics for the process of social judgment formation are to include (in addition to the availability of resources) e.g. the high economic and social stakes for the evaluator or the intensity of social pressure to have and express a judgment (e.g. Kruglanski, 2001 as cited in Bitektine, 2011, p. 170). From the point of view of the discussed topic, it is important to emphasize that having resigned from an extensive evaluation, the external evaluators formulating social judgment are to be focused more on a less "expensive" category-based form of judgment (here cognitive legitimacy may be considered) than on a more complex form of judgment (here sociopolitical legitimacy may be considered). These relations are to stem also from cognitive economy which suggests that people seek to process "maximum information with the least cognitive effort" (Rosch, 1978 as cited in Bitektine, 2011, p. 164).

Depending on the context external evaluators may be more focused on looking for reasons as to why the procedures or results of the organization are to be delegitimized or may simply not perceive a given organization as being taken for granted any longer without any greater effort being put into the assessment. In the case of declining sectors, there are now a few points worth considering. It appears to be reasonable to assume that because of the last stage of its existence, the industry could be expected to include organizations that operate within the sector throughout rather a long period so that their characteristics should be rather known. It is not until problems begin to arise that those characteristics are to entail a considerable interest among people that could lead them to comments, and discussions on the state of things. However, especially when being exposed to pieces of information about global trends (e.g. in the field of environment protection) external evaluators may sooner or later (the consequences of the introduction of time lag to the analysis are to be discussed later) start changing the bases for their evaluation. This could be because the spreading knowledge about trends may cause them to put more effort into how they approach the task of evaluating the organization. This is because at least social stake appears to be high and the perceived necessity to have a judgment as well is increasing. When assuming that (like it occurs e.g., in the case of the mining industry) there are serious technological advancements that are to be more sustainable and possible to be implemented by the organization, one may expect that evaluators would be under strong pressure to express judgments. At last, evaluators then know that expressing a judgment allows them to lead to a form of sanction being imposed on the organization.

Here, the role on the part of other external evaluators' actions with respect to the organization that takes a form of discourse could play a role as well. This is because the dissemination of judgments occurs when the external evaluator's judgment is expressed to other external evaluators' judgments (Bitektine, 2011). When the action in the form of a nondiscursive one may involve e.g. imposing sanctions, the discursive one occurs when social networks, the media, or channels like agency ratings can be used to express given judgment to other evaluators (Bitektine, 2011, p. 164). This results in that validity cues that external evaluators are to obtain from the environment are to have less impact on external evaluators as they would rather use their independent propriety assessment than take into account validity, which is a "collective consensus" about legitimacy (Bitektine, Haack, 2015, p. 50)[8.] It can be assumed that the fact that some external evaluators are believed to perform disruptive institutional work (with differentiated levels of engagement and following prescriptions related to different institutional logics in accordance with the previously introduced term institutional complexity – these factors make the transfer of evaluations exposed to modifications which cause these evaluations to become increasingly unclear) causes collective cues as to how the organization should be assessed become undermined (which is not to be changed even if some external evaluators appear to support the organization). The necessity on the part of external evaluators to refer to their propriety judgments is to result in demands that the organization is to implement many different changes in line with these expectations, which is believed to lead to higher pressure for the organization. As it will be shown in the analysis to follow, the changes in the coherence and the structure of the discourse at the field/sector level are believed finally to make managers aware that they need to introduce some steps as well.

2. Discussion

The above-mentioned aspects are to be outlined especially when the pressure from the institutional environment becomes sufficiently high that the question needs to be posed whether a given organization that introduced changes has still the same identity or its identity broke or is to break. This is because tensions arising from the linkage of the external evaluators' perception of decisions about these changes to validity cues influence whether the organization is to last even though its sector declines. The issue relates to how the extent to which an organizational identity changed or did not change as a result of social judgments formed by external evaluators should be assessed. It might be, as Kreiner et al. (2015) show, that although some significant changes were implemented, the identity of a given organization can be extended rather than lost. However, as it has been postulated in the paper, the consideration of the time dimension on when changes were introduced may interfere with what could be considered a normal course of action. This issue is developed below when discussing the framework. Before some additional interpretative challenges are briefly outlined.

For the adopted way of theorizing in the paper, it is important to consider those factors which primarily may impact the final abandonment or a lack of the abandonment of a given organizational practice or an attribute. From the point of view of the pillars on which institutions are based, on the one hand, it may be said that the shift from considering the practice or the attribute as being taken for granted to allowing for the practice or the attribute to be called into question, is not sufficient for the abandonment of the practice or the attribute. Then it can be noticed that either the practice or attribute is not to be abandoned (deinstitutionalized) when during the translation process the counter positions are to make problematizations related to the practice or the attribute disappear (Maguire, Hardy, 2009). For this phenomenon, it is important to notice that when one hypothetical group of actors can support problematizations, there could be a second hypothetical group of other actors who are to begin to produce more positive messages (assumed counter positions). This is to have an impact on the next issues important from the point of view of analyzing institutional change, that is the level of previously signaled coherence of discourses that constitute logics and the extent to which the structure of these discourses could be recognized. When both coherence and structure turn out to be difficult to be achieved it is possible that some consequences resulting from the complexity of institutional logics are to emerge - lack of predictability (in case of the lack of structure, it means that messages of which the discourse is comprised are not to draw on each other in a predictable way) as well as the presence of strong contradictions that make it impossible to follow a common path (in case of the lack of the coherence, Maguire, Hardy, 2009).

Considerations made so far gave light firstly on the process of creation of the special conditions for making social judgments in the declining sectors and secondly, on the links between the analyzed conditions on the one hand, and (especially) unfavorable social judgments made by evaluators. This knowledge could be made used by managers who should pay more attention to the answer to the question of why external evaluators may be especially prone to formulate unfavorable judgments during the declining stage of the industrial sector life cycle. Then managers being aware e.g. how a given event is expected to influence social judgment may be able to influence this relation and cause it to be weakened. But the issue is that some of these consequences may be difficult to be managed consciously - as it has been stated the change in power boundaries made under the pressure from evaluators next can have an impact on how organizational identity is shaped. Hence, the issue is that the reaction on the part of managers faced with the necessity to gain again access to new resources is first to be reflected in how external evaluators are to behave and secondly is to be reflected in the identities of their organizations. What is more, although some relations may appear to be quite obvious, the task for managers is to try to understand how they possibly participate in bringing about those relations (Weber, Glynn, 2006). It is important because following the main paths along which expectations of stakeholders are formed, managers may not notice the whole spectrum of effects that are caused by their decisions.

When it is the case that power boundary appears to be more important than identity boundary, actually it may also mean that some considerations as to whether a given step is to be legitimate could be of lesser importance. Nevertheless, when taking into account impacts on organizational identity and its role, there is a requirement that possible difficulties that may arise as a consequence of the acquisition of new kinds of resources or forging the alliance (entailing activities to be performed in new fields) be dealt with in internal as well as external dimension. Here some additional possibilities to those next presented in Figure 1 that are based on alternative assumptions could be considered before focusing on Figure 1. It could be mentioned that e.g. it may be that even if a given step is considered problematic from the point of view of centrality argument (Albert, Whetten, 1985) when taking into account the cognitive pillar of one of institutional logics, then the possibility of subordinating it to regulative dimension (due to lack of formal bans) and competitive dimension (due to lack of risk of the bankruptcy) may lead to that what is the deepest commitment of the organization (serving clients, delivering value to shareholders, taking care of poor local communities depending on how the organization defines it) does not change at all. Moreover, triggers related to e.g. the long-term plans of the organization to start operations in the sector in which the organization did not operate in the past, may be too quickly interpreted as the premise of that the existence of the organization otherwise is to be stopped. Hence, the external context can actually be of lesser importance (at least from the point of view of decision-makers). Further, assuming that the organization faced difficulties decided on acquiring the other company, even if this step is to be relatively quickly interpreted as the way for the building of the resources which may be rather less successful, it could turn out that this organization followed prescriptions (related to how to grow) present in this organization from the early years of its existence. Again internal (and not external) context may be more decisive than one could assume. The problems may also arise when paying attention to how one can assess whether some organizational operations meet the requirements on the part of the endurance argument. Due to the long tradition of operating in the industry and the region, it is rather impossible to say that organization that starts operations in this new and unique (from the point of view of this region) field could be still assessed positively from the point of view of the endurance. Similarly, when taking into account the issue that the company is unique because it e.g. combines operations in the declining industrial sector that is harmful to the environment and in the new industrial sector that is not harmful, the issue is whether it can define mutual advantages derived from these operations. Alternatively, the organization may be said to be one of the many organizations that operate in this new sector and its past activities related to the old sector can then be perceived as being a kind of burden. Of course, it is not possible to take into account each possibility that may emerge and that is why only selected issues are to be taken into account next. Further analysis is conducted by reference to the conceptual framework outlined in Figure 1.

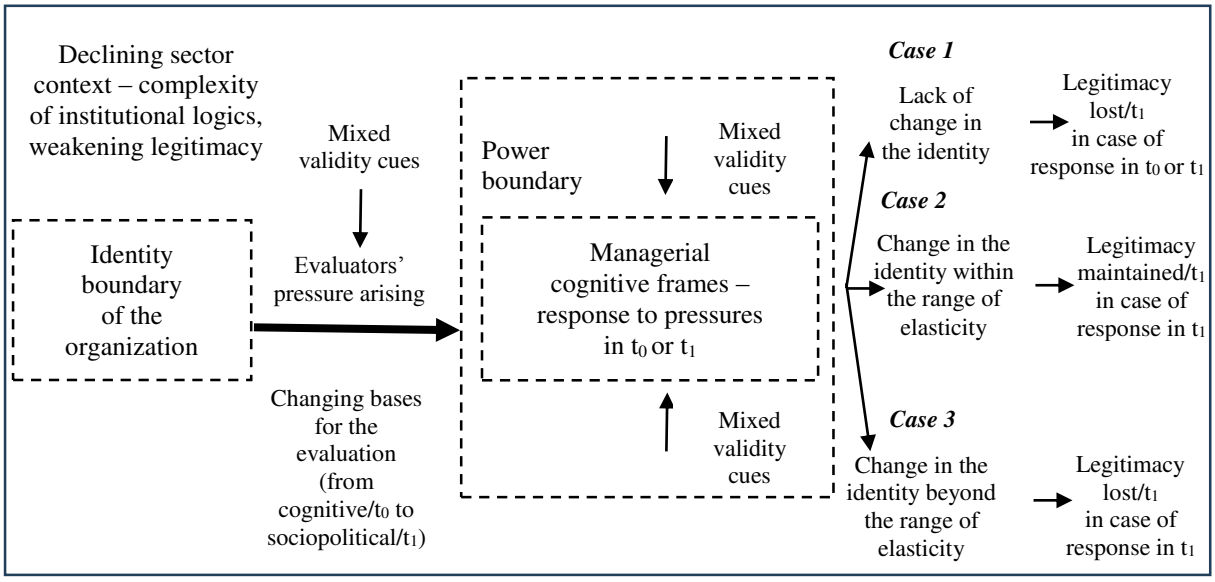

Figure 1. Conceptual framework.

Source: Authors'own.

Taking into account both the difficulties that managers may have with overcoming their viewpoints resulting from how their managerial cognition has been shaped in the industry now being in the declining stage and time lags related to when external evaluators may change their viewpoints on organizational activities (and at the same time to start building their social judgments less on cognitive bases and more on sociopolitical bases) three cases can be analyzed as follows.

When analyzing case 1 it can be noticed that due to previously discussed postulated managerial attachment to logics shaped by managers' long-lasting engagement in a given industrial sector that makes them perceive (at least) initially cognitive bases adopted by external evaluators for their assessment, the lack of change of identity is to result in that the organization has its legitimacy lost. Potentially, when the process of the change of the bases for social judgments formed by external evaluators will be long-lasting due to rather a distant perspective of the final decline of the industrial sector, the organization may operate over a longer period exposing itself to the risk of the accumulation of unfavorable social judgments. This is because when external evaluators are to refer to their (individual) propriety judgments and next inform others in such a way that many translations will be occurring simultaneously, more and more messages will be brought about. Although they do not have to be all unfavorable, due to the lack of sufficient opposition on the part of managers who should create a counter position, the majority of unfavorable messages are expected to emerge, which is why managers will have arising difficulties dealing with the situation.

Case 2 refers to the situation when managers decide to introduce a change in organizational identity that does not lead to the organization becoming perceived as having a new organizational identity (hence, it is argued that the change remains within the range of the elasticity). This kind of change can be conceptualized as e.g. an alliance. Here those attributes

or practices which turned out to be the decisive ones in the past still may be perceived as being the same from the point of view of both groups, these are managers and employees (the first group) and external evaluators (the second group). Hence, it becomes easier to say that those other issues are of lesser importance so that the fact that there are some minor identity conflicts is not important as well. Then those differences by leading to crafting the distinctiveness within the organization (by the creation of some independent groups that differ from each other because of some less important viewpoints) are not to lead to a break in the organization. Although the discourse created by this kind of organization is not to be entirely coherent it may be predictable because in the organization there is a foundational consensus e.g. one related to the belief that the alternative ways of operations that are supported by external evaluators have their value and sooner or later (here could be the issue for minor disagreement) they will be introduced. The fact that there is some predictability introduced to the institutional environment may help external evaluators to regain greater trust toward validity cues. Then due to normative reasons, the organization is to have still its legitimacy. Nevertheless, due to regulative reasons, the sector as a whole is doomed to decline, which could have importance with regard to how the situation is to develop. Generally, the external pressure that is common in the sector when being directed at the organization is alleviated. Then the organization within its new boundaries will gain some additional time to pursue its operations in such a way that its identity boundary is not problematized but it may have still legitimacy. However, this kind of change is especially to take place when there is a distant perspective of the final decline of the industrial sector since it is more probable that decisions on investments regarding new fields of operations are made because these investments are to be useful for the operations in the declining industrial sector as well. If the perceived time to the decline of the industrial sector is close, either the company from the declining industrial sector or the potential alliance partner could not be interested in this form of cooperation. What is also important, the reaction on the part of external evaluators may change sooner than it would be desirable. This is because it may become distressing for everyone that e.g. in the field of potential harms caused by organizational activity nothing may change for an even longer period when the pressure exerted for the organization is not to increase. Hence, the kind of change discussed here is expected to involve a greater intensity of transfer of messages between the organization and external evaluators. This kind of change as resulting from the decisions to introduce not a radical change in response to how to make access to external resources safe shows that the value of non-ownership mechanisms as being analyzed in the power conception of the organizational boundary may become important from the point of view of how quickly the identity of the organization can be shaped.

Now the issue of time lags can be considered. Let's first consider that by admitting problems resulting from new legitimacy requirements more quickly, organizations are more probable not to lead to the situation when legitimacy requirements are to destroy their identities. In order to admit to problems and next to avoid having declarations detached from operations, managers need to be in favor of alliances before problems with legitimacy and identity are to arise.

The possible achievements in this ground are to result from applying mechanisms that can extend the power boundary of organizations but in such a way that the resulting pressure for identity boundary is not to impact central, enduring, and distinctive features of the organization in a way that nobody could see the continuity with the past any longer. However, a different scenario can be considered. When e.g. the organization is to introduce changes that remain within the range of identity elasticity when the bases for evaluation among the majority of external evaluators are still cognitive, then these changes may go unnoticed among external evaluators. However, employees may be satisfied as from their point of view the fact that the organization managed to go beyond fixed managerial cognition in such a way that they can both still be attached to the main practices or attributes and expect that external evaluators' pressure will be more focused on other organizations in the declining industrial sector. But when the change of the bases for the evaluation among external evaluators is completed then it may turn out that these evaluators being unaware of the changes taking place in the organization are starting to withdraw their support for the organization. Nevertheless, employees may be still engaged. Here the issue opens whether it is possible that although the organization is losing its legitimacy it can pursue its operations as if the legitimacy would be untouched.

Case 3 refers to the situation when managers, although believed to be attached to their managerial logic shaped so far, decide on radical change (reasons as to why it may happen are hypothesized later), which can be conceptualized as e.g. diversification, especially one unrelated and made by acquisition. The change beyond the range of the elasticity is the one that makes it less visible what key attributes or practices of the organization cause in a more or less intended way new propositions with this regard to emerging. It may lead to the situation that some combinations of these propositions will begin to be noticed as radical departures from the past. As it may require new competencies, the organization by investing in e.g. new technologies needed in a new field of operations and resigning from the development of its current competencies may lead to the situation that instead of being assessed through the prism of its hitherto innovativeness that is to be continued in the new field, the organization is to be perceived by the prism of the majority of other organizations operating in the declining industrial sector that are less willing to invest. Then the distinctiveness of the organization with regard to how it would like to pursue its operations in both the old (now declining industrial sector) and the new sector may become vanished. Then anxiety may arise among employees because what was regarded as characterized by long endurance and centrality due to being helpful in case of earlier crises now becomes questioned. This is the point when the issue of identity conflicts may gain some additional significance as members will be perceiving the matters of the disputes as impossible to be subordinated. The perceived differences among organizational members may easily become enlarged to the extent that their organization stops being like it was when operating only in one sector and becomes more like those in the new sector or even it would be difficult to say. Under these conditions, it appears to be impossible to find a proper point of departure for crafting internal distinctiveness. Coherence of the

discourse or discourses created in this situation by the organization and next transferred to the environment will be weak. From the point of view of external evaluators, their predictability will be weak as well and these evaluators may not be able to trust in any direction of further operation proposed by the organization. Taking into account that the organization could leave the sector, external evaluators are not expected to maintain their willingness to support this organization any longer. That is why the organization is not to maintain its legitimacy. Because of the lack of validity cues that could have significance for greater collective in addition to problems arising regularly when approaching the time of the final decline of the industrial sector, some further problems are expected in the cognitive dimension of the institutional environment as the effort put into building legitimacy judgments by external evaluators is not to decrease. It is difficult to imagine that the organization when facing this kind of situation is to continue its operations under the same brand, or management team. This kind of change resulting from the decision to introduce new ways of functioning that can be described as radical ones to some extent (discussed unrelated diversification) and implemented in response to the question of how to make access to external resources safer shows that ownership mechanisms as being analyzed in the power conception of organizational boundary may become important from the point of view of a break in organizational identity.

Now the issue of time lags can be considered. It may be assumed that when losing its legitimacy the organization in a hardly to be explained way introduces radical steps in order to meet requirements resulting from unfavorable judgments about its attributes or practices (based on the more demanding bases of sociopolitical legitimacy) and next this organization (its attributes or practices) may be exposed to further problematizations. This is because when attempting to distance itself from its previous operations so much the organization may encourage external evaluators to exchange their doubts and the translation resulting from it may lead to possible deep hesitation among external evaluators as to the intentions of the organization and the way in which the organization creates messages about it. The issue may be that when changes that are to occur beyond the range of elasticity when external evaluators' bases for the evaluation are still cognitive, it may cause firstly that employees leave the organization before the new bases for the evaluation on the part of external evaluators are to be set as sociopolitical ones. At the same time as long as the bases for the evaluation are not turned into sociopolitical ones, external evaluators are not to react to these foundational changes that occur in the organization. At last, when they start evaluating the organization with more emphasis put on the sociopolitical bases, due to new employees and other changes in organizational attributes or practices implemented so far by them, the new identity of the organization may turn out to be more persuasive regarding this foundational need to build new legitimacy. Then, external evaluators could be in favor of changes that took place in the organization that can maintain its legitimacy.

The discussion on conceptual framework lets us consider what different kinds of changes are possible to be recognized when being assessed regarding consequences they have for organizational identity and legitimacy. The perspectives of both organizations whose decisions are led by managerial cognition and external evaluators whose social judgments are formed based on validity cues were presented. The adopted social constructionist view allows the problem to be discussed from the point of view of messages created by companies and their external evaluators and their possible impact on how the organization is assessed. An attempt was made to consider dynamic dimensions related to time lags. The framework is believed to provide some incentives to develop current discussion on legitimacy and identity issues, however, it has some limitations. These are to be discussed in the next section.

3. Conclusions

By drawing on the concept of organizational boundaries with special attention paid to identity boundary and power boundary this paper shed light on the issue of how it happens that despite increasing pressure exerted on the declining industrial sector it may be that some organizations appear to maintain their legitimacy. The point of departure made it possible to take into account both sides that are expected to deal with tensions. On the one hand, external evaluators losing trust in validity cues supporting collective judgments tend to view more and more critically how the organization operates. On the other hand, managers need to introduce some changes simultaneously dealing with their established points of reference which are rather ascribed to the past than to the present. The possible results of how these situations are dealt with were said to depend on decisions on organizational boundaries that in addition to the ability to deal with managerial cognition and the way in which social judgments are formed were shown to be dependent on sectoral context including the issue of institutional complexity and how discourses, which were assumed to be consisted of messages, impacted possible development paths of institutions.

The contribution of this paper rests on the use of the construct organizational identity elasticity (Kreiner et al., 2015) in the context of considerations on organizational boundaries when posing the question of how the organization can maintain its legitimacy when at the industrial sector level deinstitutionalization occurs. It is postulated that in order to understand whether the changes to be implemented by managers will cause positive evaluations to dominate one is to take into account the extent to which these changes make it possible to transfer as soon as possible clear messages among external evaluators. At the same time, following Kreiner et al. (2015) notions about the possibility of organizational identity being extended, it can be assumed that it is some space for significant changes that could satisfy both - external stakeholders (external evaluators) and internal stakeholders. It also means that the

employees' perception of internally implemented changes should not be forced to go beyond what is known for employees at least to some extent if these changes are to succeed in the organization. Here it means that as it has been assumed that managerial cognition under this high pressure is a decisive factor, managers can not avoid thinking about institutional complexity in the environment. The additional aspect of the analysis conducted in the paper is that when taking into account the important issue of the changing bases for making evaluations (or changing assumptions as to what these bases could be) the dynamic dimension was included.

The paper could be thought of as providing some additional notions on relationships between the different conceptions of organizational boundaries. When justifying that the power concept can be sometimes more relevant than the identity concept, it suggests that how consequences of the power concept can influence identity may be related to the use of some mix of ownership and non-ownership mechanisms that causes different kinds of discourses to be transferred to the institutional environment. Next, it extends the way of thinking about how identity can be shaped and what kind of possibly not typical situations may emerge. Based on how the problem was analyzed in the paper and by referring again to Kreiner et al. (2015) it can be noticed that e.g. when the issues of primary importance in the organization are clear, it may turn out that those issues on which members of the organization disagree are not commented as having any importance. Nevertheless, despite this importance being maintained the state of things that members have identity conflict is of lesser significance. Then crafting internal distinctiveness may not be hindered and the question may be posed what are the mechanisms that cause (or even more accurately - why) organizational members to fail to subordinate non-central issues but at the same time to avoid both having open conflicts and possibly quitting the organization? Another possibility is that members are to be disrupted by the identity conflicts even if they see these non-central elements as being subordinated and here it may turn out that there will be some difficulties with crafting internal distinctiveness understood through the prism of the creation of independent groups that still operate within organizational boundaries.

The analysis possesses some limitations that may relate primarily to the assumptions regarding the characteristics of the declining industrial sector. As it has been shown industry life cycles are primarily focused on the assessment of how revenues and costs change. Then searching for additional assumptions related to features like those discussed in this paper may sometimes cause some doubts. Indeed, when being focused on the mining industry to which some references in this paper were made, one may provide arguments for some differences with comparison to a generic model presented in this paper. Nevertheless, the assumed features of the declining industrial sector presented in the paper appear to have sufficient validity.

Other possible limitations may result from the fact that some additional arguments could be introduced to the analysis e.g. the one related to whether external evaluators operate within or beyond the boundary of the sector, which was shown to have significance for occurring

processes (Maguire, Hardy, 2009). What is next, the paper follows suggestions that argue that although the interests, values, and strategies of actors within fields/sectors and professions are present individuals do not have to always "strictly adhere to the dictates" of these institutional logics (e.g. Seo, Creed, 2002 as cited in McPherson, Sauder, 2009, p. 167). Although in the paper there is a departure seen from one-way thinking about how institutional logics providing different cues for both managers and external evaluators can influence decisions, the issue is considered at the level of general propositions and not at the level of detailed activities which are to lead to the postulated results. Nevertheless, the field of research focused on organizational boundaries and strategic decisions related to them is suggested as a valuable one for investigating the impacts of field-level constructs on how decision-makers are to choose their paths for further development.

Conducted analysis provides some inspiration to propose some further paths of investigation, however, due to its conceptual character the paper may only make some minor suggestions. Future analyses may focus on whether postulated difficulties with changing managerial logics due to a long period of operation in a given sector are a real problem for managers when they are faced with the threat of deinstitutionalization. Here it appears to lurk one possible issue that will be especially worth being investigated, however, it may be difficult to be assessed. The core of the matter is that, as it has been observed when there are quite serious changes to be implemented by managers, by deciding on them managers expose their organizations to threats related to the feelings of legitimacy being lost. It is assumed to occur when the change will extend the acceptable range dictated by the elasticity of organizational identity. The question is whether this kind of radical change is the result of the possible awareness among managers of fixed managerial cognitive frames that need to be overcome then. While these frames even if do not prevent the organization from introducing changes, the willingness to overcome them could possibly result in decisions being far away from the optimal one.

Future research may also focus on the question of why it is so difficult to limit the importance of the cognitive pillars of institutions. On the one hand, taking into account the above-mentioned concept of cognitive economy, it may appear to be understandable that there is a reluctance toward changing social judgment. On the other hand, sociopolitical legitimacy by demanding more effort put into the assessment process should give a greater assurance that a given social judgment may be considered as being correct, and, which is postulated by the social psychology perspective on legitimacy studies (Tost, 2011), the possibility of internally generated shock that is to cause the delegitimation is not to happen as the individual is more willing to revise her or his social judgments.

Some interesting paths of future research would be to take into account different stages of the industrial life cycle and to make comparative studies of the implementation of organizational change that would be both perceived as being within the range of the elasticity of organizational identity (as viewed by members of organizations) and perceived as being

incomprehensible (according to dominating external validity cues). In the case of such a research project, a clear demarcation line between new initiatives realized by the organization that can be treated as related to their previous activities and new initiatives that are to be treated as unrelated ones would be useful. Last but not least, with regard to the organizational boundaries concept, the analysis conducted in this paper suggests that a possible interesting line of further argumentation may relate to that before organizational identity is to be changed as a result of external evaluations, the change in organizational boundary understood through the prism of the sphere of influence is necessary. Then this change possibly could be interpreted as a mediator in the analysis of the change in the organizational identity invoked by external pressures. However, to establish what could be the exact conditions under which this relationship could occur further empirical investigation is necessary.

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Footnotes

[1] The approach that treats legitimacy as a property has its roots in functionalism and the literature emphasizes, in this case, the problematic assumption of the stability, the universality, and the endurance of properties being said to be "the component elements of the equation - legitimacy, the organization, the social environment". However, this view still remains "arguably" a dominant one (Suddaby et al., 2017, pp. 453, 458). With regard to the construct presented by Albert and Whetten, some views appear that it has too much complexity for it to be successfully applied to organizations (Mujib, 2017). But taking into account further attempts to show how it can be done (Knorr, Hein-Pensel, 2022), here it may only be emphasized that the construct should be analyzed with caution to avoid drawing oversimplified conclusions. Primarily, it should be said that in this paper the main emphasis is put on the views adopting a constructivist/interpretivist approach. Especially, these views that are more focused on viewing legitimacy or identity as processes are based on a social constructivist approach to the topic. Both identity and legitimacy can be considered to be relational concepts as well, the consequences of which are discussed next. In general, by emphasizing at the beginning the epistemological position adopted the discussion of relations between identity and legitimacy appears to be correct without making paradigmatic issues problematized.

[2] Here the issue may turn out to be more complex as the innovativeness of such companies operating in the industrial sector that is doomed to decline may remain reasonably high, especially when it may still be a quite long period before the decline becomes reality (as it is in case of Polish mining industry, e.g. lw.com.pl).

[3] This phenomenon can be described as the complexity of institutional logics that can compete with each other. While institutional logics are discussed in detail elsewhere, here it may only be added that these logics can be understood as the belief systems that constitute rules that impact the behavior of field-level actors by both providing the organizing principles for this field and creating a sense of common purpose within the field (Reay, Hinings, 2009; Friedland, Alford, 1991; see also Janiszewski, 2022). What is important here is that in a given field (here being viewed through the prism of a community of actors operating in the declining industrial sector) more than one institutional logic may be present at the same time (e.g. Reay, Hinings, 2009). Meanwhile institutional logic is a concept at the field level of analysis, it is further assumed that the decision which is made by a given individual is additionally influenced by managerial logics which are ascribed to individuals and e.g. may result in different decisions as to which mechanisms (Reay, Hinings, 2009) they prefer to deal with competing institutional logics or, putting it differently, how they mediate both the requirements of day-to-day activity in the organization and institutional demands (McPherson, Sauder, 2013).

[4] In general, elements like "organizing principles" introduced by founders and first leaders of the organization that are in some way distinctive for a given organization may be considered as important here (np. Buenstorf, Murmann, 2005 as cited in Whetten, 2006, p. 225). This also explains why, on the one hand, institutional logics can be considered important since these logics being the concept regarded on the field level are to permeate the organization influencing how it is expected to operate (Thornton, 2002). On the other hand, it allows for the understanding of why individuals (especially the above-mentioned leaders or founders) and their individual managerial cognition shaped with the development of their whole professional experience should be considered as being important since interpretations of their experiences are to result in a given organizational schema (Prahalad, Bettis, 1986). It appears that especially when the necessity to choose from competing logics arises as hitherto legitimized practices are to lose their legitimacy, then individual managerial cognition should be regarded as having an impact primarily at the organizational level.

[5] Cognitive frames with their specific contents and structures are conceptualized by the prism of the considerations on strategic responses as their role is to admit some pieces of information for decision-makers while other pieces of information are not available to them (Porac, Thomas, Weick, 1995 as cited in Hahn et al., 2014, p. 18; see also Janiszewski, 2021).

[6] For a more detailed discussion, also from the point of view of other typologies of legitimacy, see Janiszewski, Dziubinska (2022).

[7] The examples of external evaluators cover actors like associations, interest groups, or the government. Their opinions may be especially influential when being supported by judgment validation institutions like the media (Bitektine, Haack, 2015).

[8] While propriety can be defined as "an individual evaluator's own judgment of social acceptability" (Bitektine, Haack, 2015, p. 51), validity can be named as being "a collective consensus about legitimacy that is present at some higher level" (Bitektine, Haack, 2015, p. 51). These individuals are said to use a validity belief which is a judgment about what the collective consensus is as one of perceptual input while forming their legitimacy judgments. I general, it has been shown that when individuals are to make their own propriety judgment, they are to rely to great extent on the collective opinion that is represented just by validity (Bitektine, Haack, 2015).

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

DIGITIZATION AS A SOURCE OF BENEFITS IN THE HEALTHCARE SYSTEM – A REGIONAL APPROACH

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Purpose: The main objective of this article is to identify the implications of digital technologies for the practices of healthcare organizations. The author evaluates the benefits arising from the potential use of digitization for patients, healthcare workers, and the healthcare system.
Design/methodology/approach: The article utilizes a literature review and presents the findings of original research conducted on the digitization process in hospitals, using the example of the Łódź Voivodeship. The intended goal was achieved through the application of computer-assisted telephone interviews (CATI).
Findings: In recent years, significant changes in the digitization of the healthcare sector have been observed. The research results demonstrate that, in the context of the epidemiological situation, these transformations have accelerated even further, leading to the positive development of innovative digital solutions in the field of medicine.
Practical implications: The healthcare system engages a substantial number of human and financial resources. The challenges arising due to an aging society, epidemic crises, and increasing citizen expectations are the most important issues that the healthcare system needs to address. Fostering innovation in healthcare digitization, as well as enhancing the skills of healthcare workers, increasing efficiency, and ensuring the sustainability of the healthcare and medical care system, all constitute steps towards improving public health and access to medical services.
Originality/value: This article presents original empirical research findings on the benefits resulting from the implementation of digital technologies in hospitals. It is aimed at all parties involved in the healthcare sector to raise awareness of the need for further digital technological changes in this field.

Keywords: digital technologies, digitization, health system care.

Category of the paper: Research paper.

1. Introduction

Healthcare systems around the world are grappling with problems, with aging societies and Western lifestyles heavily contributing to the increase in healthcare spending (Schütte, Acevedo, Flahault, 2018). Entities providing medical services under severe financial constraints must address the challenges associated with epidemic crises and increasing citizen expectations. Fostering innovation in healthcare digitization is thus a step towards improving public health and access to medical services, as well as enhancing the skills of healthcare workers, increasing efficiency, and ensuring the sustainability of healthcare and care systems. In many international rankings comparing healthcare systems, the Polish system ranks among the lowest in the European Union. According to the "Future Proofing Healthcare" report, Poland ranked 23rd out of 30 EU countries in the Sustainable Development of Health Care Systems Index (Future Proofing Healthcare..., 2021). The COVID-19 pandemic has only intensified the flaws of the healthcare system in Poland, leading to an increased demand for healthcare services and a deterioration in access to medical services, particularly specialist ones. A study on digital health in the EU conducted by the French Ministry of Health and Solidarity reveals that 25 out of 29 countries covered by the study have already implemented national digital health strategies, among them Poland. Most countries have defined strategic goals and development directions for digitization focused on "creating a patient-centered healthcare system" (Study on Digital Health…, 2022). The future of healthcare should be based on pillars such as people's well-being and prevention, shifting the focus from reactive healthcare approaches to proactive measures. It cannot be expected that diseases will be completely eliminated, but the use of digitization tools based on interoperable data and artificial intelligence can help detect diseases at an early stage and enable swift intervention, thus reducing healthcare expenses. Digital technologies can also overcome barriers such as costs and geographical location, which are among the most common limiting factors when it comes to accessing specialist doctors.

The aim of this article is to present the directions for the development of the healthcare sector in the context of modern technological solutions, with a particular focus on digital solutions, and to indicate the benefits of implementing digital tools for patients, medical personnel, and entities operating in the healthcare system, using the example of the Łódź Voivodeship.

The article utilizes a literature review and presents the findings of original research regarding the digitization process in hospitals in the Łódź Voivodeship.

2. The Role of Digitization in the Transformation Process of the Healthcare System

The ongoing scientific and technological revolution, driven by digital technologies, has led to the emergence of the so-called information civilization and has changed the way services are perceived and treated. Digitization has become a driving force, energizing the economy and the organizations within it, motivating leaders to undertake interventions to improve current operations, enhance quality, and open up new possibilities for creation and transformation their performance. As a result, products, services, processes, as well as management concepts and organizational structures undergo changes (Matt et al., 2015). Digital transformation serves as the foundation for initiatives related to the Fourth Industrial Revolution, proposed as the next stage of development for many organizations supported by the governments of the European Union, China, and the USA (Liao et al., 2017). Their further development aims for continuous interaction and even coexistence of the virtual and real world, where humans collaborate with machines, achieving unprecedented effects (Śledziewska, Włoch, 2020).

Digitization leads to the integration of advanced technologies into all processes, products, and services, driving organizations to transform organizational elements tailored to the previous era, dominated by human interactions (Parida, 2018). This brings about sudden and rapid changes that impact the values guiding the members of organizations and their external partners. Many organizations are not ready to undergo these changes, as the broad scope and transformative nature may be perceived as a threat.

The definition of digitization itself has not yet been fully formed, as indicated by the interchangeable use of terms like digitization and digital transformation, as well as the multitude of perspectives present in the literature. The diversity of definitions is particularly noticeable depending on the industry for which they were developed. According to Wysokińska (2021), digitization depends on organizations adopting technologies such as artificial intelligence, robotics, big data, machine learning, the Internet of Things, or blockchain. Zimnoch (2021) identifies several paths of digital transformation, distinguishing between successive stages: digitalization, digitization, and digital transformation. Digitization is seen as an innovation that focuses on progress in information-related processes. The implementation of digital technologies leads to the transformation of processes within organizations and influences the redefinition of society's way of life. Wiktor et al. (2021) argue that digital transformation is a coherent combination of sudden and rapid changes in technological methods used and value creation, accompanied by equally significant social changes. Digital transformation encompasses technical aspects and involves replacing analog technologies with digital systems, as well as social transformations resulting from technological changes, providing the background for the acceptance and transformation of organizations. The basic techniques that make up digitization include (Pieriegud, Paprocki, Zawieska, 2016):

- ubiquitous connectivity, the Internet of Things, and the Internet of Everything,
- cloud-based applications and services,
- big data analytics and big data as a service,
- automation and robotics,
- multichannel and omnichannel models of product and service distribution.

A review of the literature identifies certain elements that are common to different definitions of digitization. Firstly, the aim of digitization is to improve the performance of organizations in terms of higher added value resulting from better communication with customers and more efficient and effective operational processes. The method of achieving these goals involves modifying the organization, primarily its strategy, structure, and culture. These elements are introduced through broadly understood information technologies that constitute digitization. These changes are not one-time events but rather evolutionary, suggesting that if an organization embarks on the path of digitization, the values guiding its development gradually change. Therefore, when we talk about digitization, we mean a true transformation of the entire organization. To fully leverage digital technologies, organizations need to prepare for a complete transformation of their entity.

In EU documents, the need for the use of technological solutions in healthcare is emphasized. The "EU4Health Programme", with a budget of 5.3 billion euros for the period 2021-2027, represents unprecedented financial support from the European Union in this field, indicating that public health is a priority for the EU. It was established in response to the COVID-19 pandemic with the aim of increasing readiness for crisis situations. It aims to address long-term health challenges by building stronger, more resilient, and more accessible healthcare systems (https://health.ec.europa.eu…, 2021). Establishing a unified single market, within which actions for the development of e-health are supported, is a key priority. From 2021 to 2027, the European Union implements the "Digital Europe Programme," which aims to support the digital transformation of European society and the European economy, providing various benefits to EU citizens and organizations. The program strengthens Europe's capabilities in key areas of digital technology and enhances their dissemination and uptake in public interest areas and the private sector (https://health.ec.europa.eu…, 2021). Another program, under the slogan "No dreams for the European Health Union without a tipple www," plans to increase activities and funding sources for the development of healthcare based on information and communication technologies (Regulation the European Parliament…, 2021). At the national level, the e-Health Development Program implemented by the Polish Ministry of Health aims to better utilize data and utilize artificial intelligence, among other things, to provide medical staff with guidance on areas requiring greater attention. The program implements the development of central systems (including patient services) as well as provider systems, which will also be used by healthcare professionals (Program Rozwoju E-Zdrowia…, 2022). At the regional level, the Health Policy Strategy for the Łódź Voivodeship for the years

2021-2027 includes improving the quality of healthcare units through infrastructure improvements and increased utilization of modern technologies and digital solutions (Uchwała Nr 738/21…, 2021).

In many international rankings comparing healthcare systems, the Polish system ranks among the lowest in the European Union (Raport: System ochrony zdrowia…, 2019; Future Proofing Healthcare…, 2021; State of Health in the EU Poland…, 2021).

3. Material and methods

Between January and April 2021, a study was conducted using Computer-Assisted Telephone Interviews (CATI), with the aim of presenting the directions of development in the healthcare sector in the context of modern technological solutions, with a particular focus on digital innovations and the benefits of implementing digital tools in healthcare entities. The selection of entities for the study was based on a non-random purposive sampling method, targeting healthcare units. The study was conducted on a sample of N = 57 entities operating in the Łódź Voivodeship. According to Article 2(1)(9) of the Act of April 15, 2011 on medical activity, a hospital is a healthcare entity where medical activities of a hospital nature are performed, as well as comprehensive 24-hour healthcare services involving diagnosis, treatment, care, and rehabilitation that cannot be provided within other stationary and round-the-clock healthcare or outpatient services. Table 1 and Table 2 present the characteristics of the entities participating in the study, categorized based on their organizational affiliation (e.g., local government units such as voivodeships, counties, or municipalities, the Ministry of Health, the Medical University of Łódź, the Ministry of the Interior and Administration) and their profiles.

Analyzing the research sample in terms of ownership, it can be observed that the predominant form was entities owned by county or municipal self-governments (47.36%), followed by voivodeship self-governments, accounting for 36.84% of the sample. The group also included entities with the Medical University as the owner (12.29%), as well as the Ministry of Health and the Ministry of the Interior and Administration (3.51%).

Table 1.
The number and structure of surveyed hospitals according to the ownership body

Ownership	%	The Number of Hospitals Participating in the Study
County or Municipal Self-government	47,36%	27
Voivodeship Self-government	36,84%	21
Medical University of Łódź	12,29%	7
Ministry of Health, Ministry of the Interior and Administration	3,51%	2
TOTAL	**100%**	**57**

Source: Author's own research.

When characterizing the surveyed group of hospitals, attention was also paid to the profile of their activities. In the overall sample, multispecialty entities were found to be dominant (89.48%), while the remaining portion consisted of single specialty hospitals (10.52%).

Table 2.
The number and structure of surveyed hospitals according to their specialty profiles

Specialty Profiles	%	The Number of Hospitals Participating in the Study
Multispecialty Hospitals	89,48%	51
Single Specialty Hospitals	10,52%	6
TOTAL	**100%**	**57**

Source: Author's own research.

With the aim of obtaining reliable information from hospitals and highlighting the benefits of digitization in healthcare entities, interviews were conducted with representatives of the management team who were directly responsible for the implementation of digital technologies.

4. Results and discussion

During the conducted research, a hypothesis was formulated, assuming that under the influence of digital transformation, the management approach of healthcare entities undergoes changes. In order to increase the efficiency of operations and the effectiveness of employees' work, it is necessary to introduce changes that allow for a more optimal utilization of limited resources.

Regarding the implementation of digital tools in hospitals operating in the Łódź Voivodeship, it was primarily the management staff of the hospitals who initiated the digitization processes.

Analyzing the types of digital solutions, the chart below presents the digital tools implemented in hospitals.

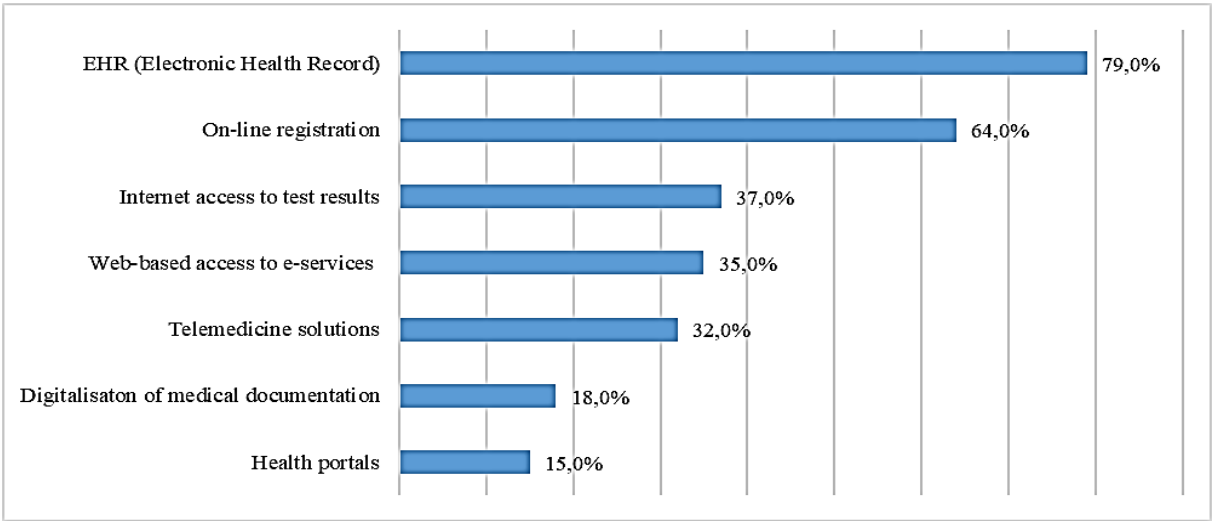

Figure 1. The digital tools implemented in hospitals.

Source: Author's own research.

79% of hospitals declare that they have implemented an Electronic Health Record (EHR) platform, which contributes to improving the quality and expanding the scope of stored medical data, as well as eliminating excessive and duplicating reporting obligations imposed on healthcare entities. It allows for processing individual medical data relevant to patients and healthcare providers involved in the treatment process, including the course of treatment, types of procedures performed, and laboratory and diagnostic test results. 18% of entities digitize paper-based documentation and store it in electronic form. 64% of entities have implemented an e-registration service, which allows for online registration to reserve appointments for diagnostic tests, specialist doctors visits, or hospital admissions.

35% of the surveyed entities indicate that in their facilities, patients have access to e-services through the website. E-services based on doctor-patient relationships involve the diagnosis and monitoring of patients' health, telemedical consultations, e-prescriptions, and e-referrals. By utilizing e-services, medical personnel save time that can be used to accommodate additional patients. This also contributes to reducing and relieving queues for specialist doctors appointments, resulting in shorter waiting times for appointments or medical examinations.

Telemedicine solutions, which have been implemented by 32% of the respondents, is another digital tool utilized in hospitals. Telemedicine, as one of the directions of digitization, promotes the development of home and community-based care, as well as the optimization of the medical services pyramid, which supports patients and their caregivers in their daily functioning.

Health portals are the least indicated digital tool implemented by healthcare organizations (11% of responses). Designed for patients, these portals aim to support them in maintaining a healthy lifestyle and engaging in preventive and diagnostic screenings.

Research findings indicate that the implementation of digital tools in the healthcare sector is associated with numerous positive implications for the healthcare system.

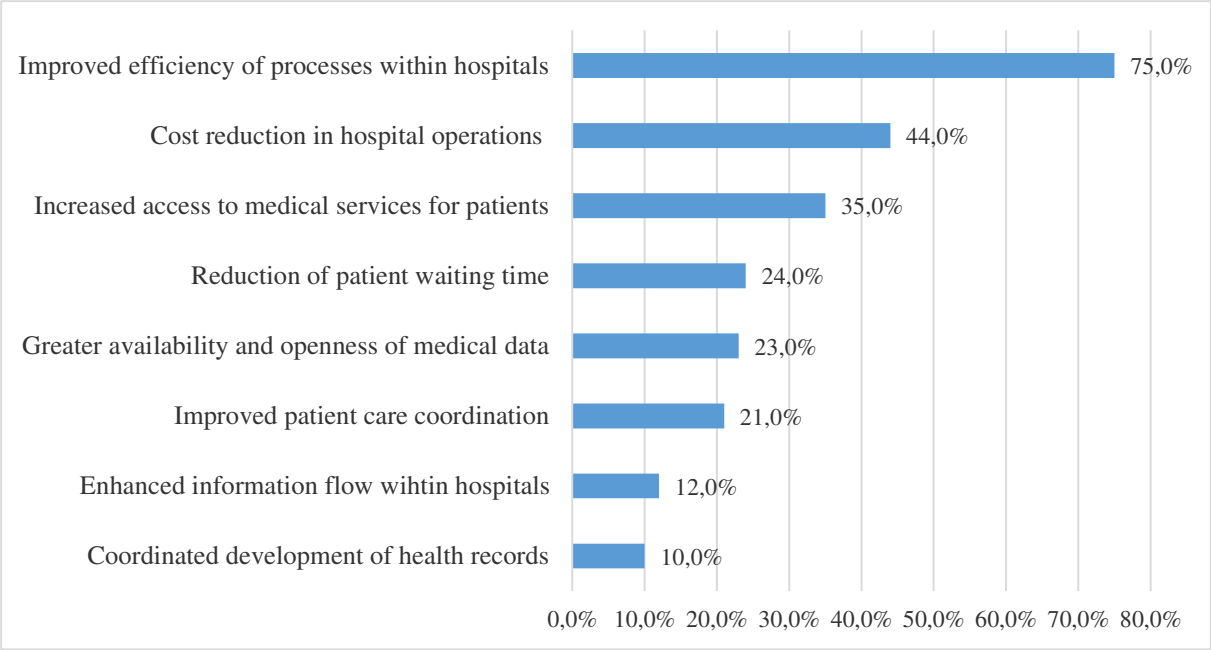

Figure 2. The benefits of implementing digital tools for the healthcare system.
Source: Author's own research.

According to 75% of respondents, the implementation of digital tools improves the efficiency of processes within hospitals. 44% of entities stated that digitization allows for cost reduction in hospital operations. 35% of respondents indicated that the use of digital tools in hospitals increases the access to medical services for patients. According to the respondents, digitization reduces waiting time for consultations/appointments (24% of responses) and improves the accessibility and openness of medical data (23% of responses), resulting in the development of transparent rules and methods for sharing data for diagnostic, therapeutic, research, and developmental purposes that are beneficial for all parties involved in the healthcare system.

The implementation of digital tools in hospitals also improves patient care coordination (21% of responses) and enhances the flow of information between healthcare entities (12% of responses) within the healthcare system. In patient care coordination, digitization instruments enhance collaboration with other healthcare entities such as Primary Healthcare (POZ), Outpatient Specialist Care (AOS), and Health Care Centers (ZOL). They support healthcare professionals in coordinated patient care, providing solutions that optimize the utilization of available resources and facilitate value-based care delivery. They engage patients in the treatment process, allowing monitoring of adherence to the treatment plan and progress in health improvement. The flow of information enables the exchange of orders, data, and medical documentation among all participants in the healthcare system and provides patient feedback on satisfaction and the assessment of the quality of services rendered.

Digitization in the healthcare system also contributes to the establishment and development of medical registries (10% of responses), enabling the monitoring of treatment quality, including the registration of adverse events and the exchange of information between system entities.

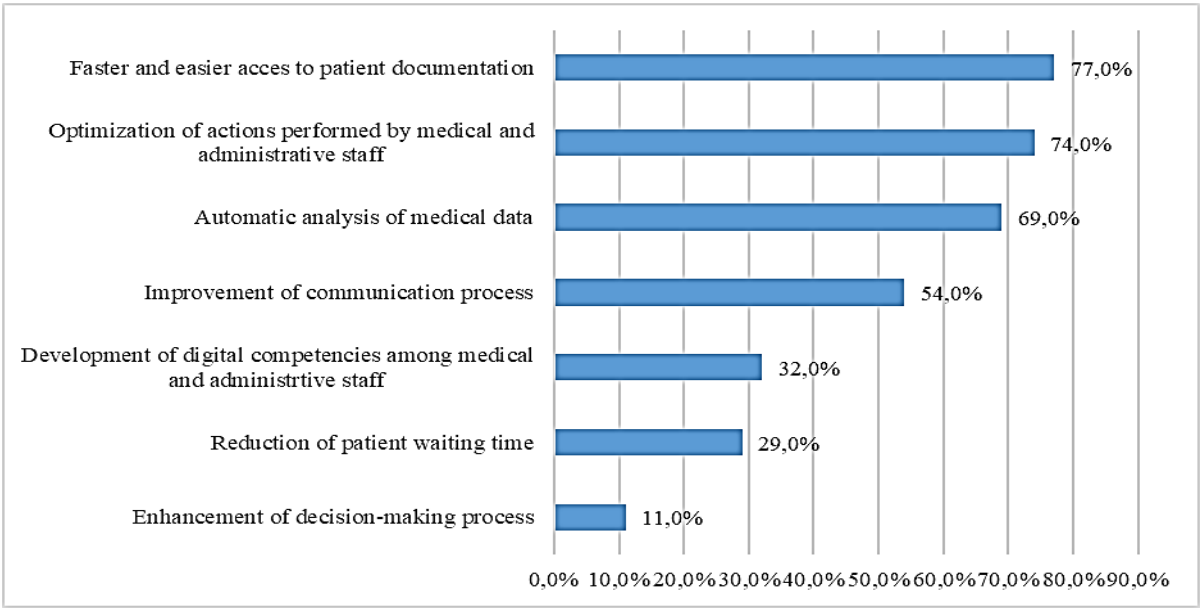

Figure 3. The benefits of implementing digital tools for employees.

Source: Author's own research.

Additionally, it is crucial to note that the implementation of digital tools in hospitals brings benefits for employees. The highest percentage of responses (77% indications) is faster and easier access to patient documentation, as well as optimization of actions performed by medical and administrative staff (74% responses). The implementation of digital tools in hospitals is a necessary condition for building an efficient healthcare system. Moreover, it streamlines the work of doctors, nurses, and pharmacists. The more advanced the digital tools, the better the process of patient diagnosis and treatment. Digitization contributes to the automatic analysis of medical data, as indicated by 69% of the participating hospitals in the study. As a result, transparent principles and methods for sharing medical data are developed, which improves the healthcare process.

As per 54% of entities, digitization improves the interaction between patients and healthcare professionals, providing patients with clear information about their healthcare history. According to 32% of respondents, digitization contributes to the development of digital competencies among medical and administrative staff, while 29% of participants believe it reduces patient waiting times and improves the efficiency of care. Moreover, digitization positively influences the decision-making process, with 11% of respondents emphasizing its role in supporting clinical decisions and enhancing diagnostic effectiveness.

The presented studies indicate that the pandemic has acted as a catalyst for the adoption of digital tools in healthcare institutions in the Łódź Voivodeship. The use of digital technologies has become even more prominent as a result of the COVID-19 outbreak. Digital tools have facilitated the rapid implementation of solutions to address the challenges posed by the virus, particularly in situations where minimizing direct contact and enabling individuals to stay at home during isolation or quarantine was necessary. Digital technologies contribute to increased investments in healthcare and help reduce costs while improving the quality of care. They are focused on facilitating information flow, exchanging medical data, and coordinating medical services between staff and patients.

The research findings presented in this article align with other studies in this area. The digitization benefits include the positive impact of digital technology on support (Givertz et al., 2017) and improvement of treatment outcomes for patients (Schmier, Ong, and Fonarow, 2017, pp. 430-436; Givertz et al., 2017), as well as the reduction in hospitalization time, cost reduction, and increased access to medical services (Davis et al., 2016). In some cases, better adherence to therapeutic recommendations has been demonstrated through the use of telemedicine tools in the treatment process. The influence of the pandemic on accelerating digitization processes has been emphasized across various contexts.

Drawing upon emerging technology, it is certain that digital transformation plays a significant role in driving substantial changes in healthcare. Therefore, there is an absolute necessity for further development of digitization to create conditions that enable increased access to modern medical technologies, allowing for treatment in line with European guidelines. Efforts should be made to strengthen digitization initiatives, enhance their coordination, and utilize more advanced e-health solutions, while striving for their sustainable implementation. As a result, the functioning of the healthcare system will be improved, enabling rapid diagnostics, timely interventions in treatment, and the possibility to embrace value-based healthcare concepts. This will optimize resource utilization, enhance long-term access to services, and foster the development of a patient-centric system.

5. Conclusions

Digitization poses a significant challenge for healthcare entities, requiring them to undergo profound changes in their operations. It encompasses a range of comprehensive, holistic actions that should be guided by a shared vision and unified strategy. Digitization initiatives are diverse, and technologies and market requirements are rapidly evolving. The identified phenomena associated with implementing digital transformation call for a strategic and operational approach. Implementing and sustaining digitization efforts in hospitals, through the gradual

adoption of innovative solutions and new technologies, call for access to high-quality, educated, and skilled medical and administrative personnel.

The digitization of medical services is strongly rooted in the concept of the so-called information society. On the one hand, it aligns with its fundamental principles, and on the other hand, it constitutes an essential part of it. It is a significant area for interventions within the development of the information society, enabling social integration, improved medical services, and a higher quality of life. It is one of the ways to ensure the reliability and security of network infrastructure, as well as effective management and maintenance of this infrastructure.

Digital solutions bring about comprehensive modernization of healthcare services, and with the advancement of digital technologies, it can be presumed that the cost of medical services will decrease while their availability and utilization will increase. Digitization contributes to strengthening the healthcare system, supporting the resolution of contemporary issues by enhancing the efficiency of the treatment process and promoting disease prevention and health promotion in an aging society.

The analyses conducted in this article are limited by the scope of the research. Such results are a major impediment to more complex and in-depth analyses, as it is difficult here to adopt normative limits for the range of values for individual evaluation criteria - the results of the research depend on the specifics of the entities included in the research sample. The degree of digitization of the health sector may also vary between voivodeships.

Undoubtedly, conducted research has demonstrated the importance and fascinating nature of this subject, which should continue to be explored. Further research areas should focus on the utilization of telemedicine solutions and artificial intelligence tools in healthcare.

Acknowledgements

The paper financed by the Faculty of Security, Logistics and Management of the Military University of Technology, grant in the discipline of management and quality studies.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

JOINT PRACTICES OF GREEN IT AND QUALITY MANAGEMENT AND THEIR INFLUENCE ON LOGISTICS PERFORMANCE

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Purpose: The paper aims to investigate the joint management practices within green Information Technology (IT) and quality management, and to explore the implications of this amalgamation on the logistics performance of freight transport enterprises. Furthermore, the study examines the mediating influences of logistics customer service performance and environmental management on the relationship between the joint adoption of green IT practices, quality management, and the logistics performance of the companies.
Design/methodology/approach: The research utilized a dataset comprising 278 enterprises operating in the Polish freight transport sector, conducted through a CATI survey employing a structured questionnaire. Initially, a confirmatory factor analysis (CFA) was employed to assess the adequacy of the conceptual model, evaluating whether the constructs in the study adequately represented the observed data. Subsequently, a structural equation modelling (SEM) approach was applied to investigate the hypothesized relationships among the constructs.
Findings: This study investigates the impacts of combined management practices: the integration of green Information Technology practices and quality management practices, on the performance of logistics operations. Within the results of the research, two significant trends are identified: the mediating roles played by logistics customer service performance and environmental management. These factors are found to influence the relationship between the integrated adoption of green IT practices and quality management, and the overall performance of logistics operations within the enterprises.
Originality/value: This research endeavour has undertaken a contribution to enhancing comprehension regarding the determinants that shape the decision-making process for integrating diverse management practices with technological support.

Keywords: management practices, green Information Technology, quality management, logistics customer service, logistics performance.

Category of the paper: Research paper.

1. Introduction

Environmental subjects no longer exclusively command the attention of scientists and international and national regulators. Instead, they have emerged as focal points within the business domain. The implementation of sustainable business practices, particularly the adoption of green Information Technology (IT) practices, seeks to establish a mutually beneficial outcome for both internal and external stakeholders of a company (Gajdzik et al., 2020; Radu, 2016). Consequently, it has become imperative for organizations to integrate the principles of sustainability into their strategies. Furthermore, global competitive paradigms have undergone revisions due to the pervasive influence of environmental management on all aspects of a company's strategic framework (Chen, 2013; Chen et al., 2014).

Green IT practices encompass a range of measures aimed at addressing concerns related to the consumption of material and energy resources, environmental pollution, waste management, recycling, and associated processes. Companies utilize Information Technologies directly or indirectly to realize the economic, environmental, and social advantages of adopting greener practices (Gajdzik, Wolniak, 2022). Extensive research has demonstrated that embracing sustainable business practices yields various benefits for firms, including improved financial value and economic performance resulting from increased revenues and reduced costs, as proved by Christmann (2000). Simultaneously, the adoption of green IT practices enables firms to effectively address normative pressures exerted by diverse stakeholders, including regulatory bodies, customers, competitors, communities, and other interest groups and associations (Epstein, 2008). Consequently, achieving a harmonious balance between economic performance and environmentally friendly practices has become a pivotal strategic concern for companies (Molla et al., 2009). In light of this, leading companies worldwide have increasingly recognized the significance of environmental performance management.

The deliberation regarding the adoption of green IT strategies, policies, and tools poses a significant challenge for organizations. Investing in environmentally sustainable IT solutions holds the potential for future success (Ozurk et al., 2011). There is a noticeable shift among an increasing number of IT vendors and users towards embracing green IT practices, which in turn contributes to the establishment of a sustainable society and economy. Vendors recognize the necessity of enhancing the quality of environmental information and technologies to distinguish themselves from their counterparts in the market.

Lubin and Esty (2010) conducted a comprehensive analysis of managerial megatrends, including quality management, and observed that sustainability is evolving in a similar manner, related to how quality management emerged as a megatrend in the 1980s and 1990s and continues to hold relevance today. Notably, various authors have drawn parallels between environmental and quality programs in terms of their underlying philosophies and practical applications (Karapetrovic, Casadesús, 2009; Klassen, McLaughlin, 1996; Curkovic et al.,

2000; Narasimhan, Schoenherr, 2012). Conceptually, both green and quality practices adopt a proactive managerial approach that emphasizes long-term objectives and the preservation of performance accomplishments. In terms of practical implementation, there exist numerous resemblances, such as the pursuit of zero defects, waste reduction, and employee engagement and training (Sroufe, Curkovic, 2008). Despite extensive exploration of the driving role of quality management, the literature has predominantly overlooked the potential synergistic relationship between green management practices and quality practices in positively reinforcing operational performance improvements within enterprises' activities.

Contemporary enterprises are increasingly inclined to prioritize IT solutions as a means to enhance their logistics and customer service performance. The emergence of Industry 4.0 technologies and digitalization has sparked the need for innovative supply chain arrangements and business models, particularly in the current business activity circumstances characterized by rapid customization and delivery requirements (Anwar et al., 2022; Jelonek, Mesjasz-Lech, 2019; Schönfuß et al., 2021). Information Technologies applied within the transportation sector also present a novel perspective for integrating efficient green practices of high quality. Service providers, particularly those operating in the freight transport sector and adopting a corporate strategic outlook, are poised to emerge as long-term winners. Nevertheless, in order to thrive in this market, it is crucial for organizations to adopt a comprehensive approach that encompasses the inclusion of IT within a broader endeavour to enhance environmental responsibility and quality management, satisfying the comprehensive needs of their customers.

Regardless of the existing literature acknowledging the importance of sustainability, the research area still has much to contribute to the ongoing discourse. The exploration of IT potential in addressing ecological sustainability, fostering green reputation capital, and reinforcing the integration of green strategies with quality management practices remain relatively limited (Curkovic et al., 2000; Molla, Abareshi, 2011). The explicit understanding of the synergistic effects of joint IT practices for promoting environmentally conscious businesses and quality management practices seems to remain lacking among businesses. Thus, it is crucial for scholars to engage in discussions and research endeavours that shed light on how IT can contribute to the sustainable development of high-quality businesses (Trimi, Park, 2012).

This paper aims to investigate the joint management practices within green Information Technology and quality management and to explore the implications of this amalgamation on the logistics performance of freight transport enterprises. Furthermore, the study examines the mediating influences of logistics customer service performance and environmental management on the relationship between the joint adoption of green IT practices, quality management, and the logistics performance of the companies.

2. Literature review

Green Information Technology encompasses the development and implementation of information systems that contribute to the establishment of sustainable business practices (Chen et al., 2009). Presently, the pursuit of IT sustainability is a paramount objective, encompassing the economic, environmental, and social impacts of organizations. Molla et al. (2011) provide a conceptualization of green IT from the viewpoint of IT infrastructure and capability. This signifies the need to integrate sustainability considerations into both the technical and human aspects of IT infrastructure, as well as the managerial capabilities, in order to address sustainability challenges, both IT-related and non-IT-related. Consequently, in order to achieve environmental objectives, it is essential for enterprises to align their environmental targets with the encompassing sustainability goals of the organization. As stated by Mann et al. (2009), the concept of green IT can be concisely defined as the strategic utilization of operations and Information Technology to align business-oriented objectives with green practices that promote environmental goals throughout the entire operational activity. Brookes et al. (2010) expand on this definition, encompassing various dimensions of green IT, including power consumption and management, manufacturing practices, data centre design and operations, recycling, the total cost of ownership concerns, micro and macroeconomic implications, system performance and efficiency, as well as environmental, social, and ethical practices associated with acquisition, utilization, and disposal of IT resources. The prevalent definitions of green IT primarily emphasize environmental practices related to sourcing, operations, and allocation of IT infrastructure. However, Molla et al. (2009) incorporate elements of IT management within their conceptualization of green IT. Moreover, the concept of green IT consistently acknowledges the enabling role of information systems (IS) in facilitating environmentally sustainable business and production processes, while its aptitude for greening products and related customer services is less explored. Typically, the term green pertains to technologies and processes that exhibit environmental friendliness, having a reduced negative impact on the natural environment compared to prevailing alternatives. The ecological ramifications of green technologies are directly linked to their comprehensive environmental footprint thoroughout their life cycle (Molla, Abareshi, 2011), and in the context of green processes, the environmental consequences are associated with the diminished demands for resources, mitigated pollution levels, and the reutilization of materials (Albino et al., 2009).

As posited by Loeser (2013), green IT practices encompass a triad of key focal points:

1. Incorporating environmental parameters in the procurement of IT equipment and services.
2. Implementing energy-efficient IT operations within data centres and office settings.
3. Embracing environmentally conscious practices pertaining to the disposal of IT equipment.

The adoption of green IT practices presents advantageous outcomes for both organizations and individuals, encompassing financial and other benefits. Osch and Avital (2010) delve into an extensive list of advantages associated with green IT. Among these benefits, the highest proportions are attributed to the reduction of power consumption and cost, as energy efficiency and cost control imperatives take precedence in most companies' environmental agendas. With regulations and market-driven approaches addressing climate change gaining prominence, businesses are increasingly prioritizing sustainability. To transition their IT practices towards sustainability, organizations must systematically evaluate both internal and external limitations, such as financial constraints, customer demands, and governmental regulations. Once the decision to adopt green IT is made, enterprises ought to formulate a comprehensive green IT policy. This policy should encompass clear objectives, targets, action plans, and timelines, enabling the effective implementation of green IT strategies within the organization (Murugesan, 2008). In the current business landscape characterized by relentless competition and rapidly changing circumstances, companies are confronted with challenging decisions essential for their survival. The complexities are further amplified during economic downturns. Empirical evidence has substantiated the indispensable nature of addressing sustainability concerns, such as embracing green IT practices, for the enduring existence of enterprises (Porter, Kramer, 2006). Moreover, Unruh and Ettenson (2010) conducted a study involving prominent companies like Toyota, GE, Timberland, and Starbucks, revealing that a significant proportion of executives recognize the adoption of green IT initiatives as a potent driver of revenue generation. When considering social performance, the examination encompasses both the internal community (i.e., employees) and external community (i.e., customers) within an organizational context (Gimenez et al., 2012). However, the primary emphasis is placed on the external community, which consists of customers, given that they serve as the primary motivation for organizational operations. The utilization of sustainable technologies, such as green IT, has the potential to enhance customer satisfaction (Chen, 2013), as customers derive satisfaction when processes and products align with environmental sustainability principles. At the organizational level, the adoption of green products is predominantly influenced by available opportunities and resources, as highlighted by Atlas and Florida (1997). While some studies have examined individual or managerial factors driving the adoption of environmental strategies, limited attention has been given to investigating the simultaneous individual-level determinants of green IT practices in conjunction with quality management considerations (Gholami et al., 2013; Ainin et al., 2016).

Curkovic et al. (2000), Rusinko (2005), Simon et al. (2012) have highlighted numerous resemblances between environmental management and quality management practices, particularly concerning managerial tools. In the contemporary business landscape, the concept of quality management has become indispensable for enterprises, encompassing various management measures and strategies aimed at enhancing quality, reducing costs, improving productivity, and enhancing overall corporate performance and competitiveness. Quality

management programs and practices have been the subject of extensive research in the field of operations management and are considered fundamental to the discipline. Within the literature, several commonly identified practices include leadership, people management, planning, information and analysis, process management, supplier management, customer/stakeholder focus, and design. Notably, some of these practices also serve as catalysts for sustainable development and green innovation (Sila, 2007; Molina-Azorín et al., 2015). Certain studies have embraced the view that the realm of quality management is closely intertwined with the advancement of sustainable development at large, including the realm of green innovation (Siva et al., 2016; Zeng et al., 2017). The consensus within the literature indicates that these quality management initiatives yield improvements in customer satisfaction, operational performance, and financial performance (Withers, Ebrahimpour, 2002). Noteworthy connections and resemblances between quality management and environmental management programs and practices have been underscored by various authors. Klassen and McLaughlin (1993) delineated specific parallels between Total Quality Management (TQM) and environmental management. Much like quality management, environmental management also adopts a proactive approach, considering environmental factors holistically across product design, manufacturing processes, marketing, product delivery, customer service, and post-consumer stages (Klassen, McLaughlin, 1996; Sroufe, Curkovic, 2008). These shared conceptual and practical elements imply that the impact of environmental practices on performance can be enhanced by integrating quality practices. In summary, the literature review lends support to the proposition that the operational performance outcomes of environmental management practices are strengthened when combined with quality management practices and programs.

In this regard, certain studies indicate that quality management practices, such as ISO 9001 certification programs and supplier TQM, can facilitate and expedite the adoption of green practices while enhancing their efficacy (Pereira-Moliner et al., 2012; Llanch et al., 2013). Additionally, empirical evidence presented by Wiengarten and Pagell (2012) demonstrates that companies achieve improved performance in terms of cost, flexibility, and delivery when environmental management practices are present, largely attributed to substantial investments in quality management practices.

Equally noteworthy, a multitude of scholars have underscored the incessantly escalating expectations placed on organizations in terms of both quality and environmental aspects (e.g., McGuire, Dilts, 2008; Wiengarten, Pagell, 2012), establishing a connection between the examined interaction and the dynamic capabilities theory's emphasis on a changing environment. In essence, the research delves into the potential complementary outcomes that can arise from the fusion of two capabilities, namely quality management and environmental management, which exhibit apparent overlap within an environment characterized by ever-increasing and evolving demands from numerous stakeholders.

Corroborating this standpoint, several management practices have been scrutinized and revealed to exert a positive influence on firm performance for those that adopt them on average. Nevertheless, given the diversity in the adoption of management practices among enterprises, it becomes crucial to inquire why certain firms opt for practices that are less effective than others (Agarwal et al., 2013). To fully capitalize on the advantages offered by both quality management and environmental sustainability, managers should embrace an integrated, cross-functional, and enterprise-wide approach that encompasses the entire value chain (Rusinko, 2005).

To fulfil this requirement, it may be beneficial for organizations to implement environmental management strategies as a means to mitigate the environmental impact of their activities (Dai et al., 2017; Haden et al., 2009; Liu et al., 2017; Jabbour et al., 2014). By adopting measures that focus on reducing energy consumption, minimizing waste generation, and promoting the use of environmentally friendly and sustainable resources, enterprises can effectively reduce their environmental footprint (Bansal, Roth, 2000). The complexity and varied approaches employed by companies in addressing environmental challenges have led to an increasing number of business leaders and scholars evaluating firms based on their environmental practices (Aragón-Correa, Rubio-López, 2007; Tomomi, 2010). This recognition highlights the diverse nature of environmental management and the need for companies to develop tailored approaches to environmental issues (Kolk, Mauser, 2002; Zhu et al., 2017; Zhu et al., 2008). The examination of environmental management cannot be confined to an organization, as the entire entity influences the supply chain (Seuring, Gold, 2013). Therefore, enterprises are interconnected due to their involvement in the flow of materials and information, spanning from raw material suppliers to end consumers. Environmental management encompasses the development of an organization's environmental policies and the establishment of objectives aimed at safeguarding the environment (Çankaya, Sezen, 2019). This includes activities such as managerial endorsement of environmental practices, interdepartmental collaboration for environmental enhancements, and the implementation of an environmental management system (Zhu et al., 2005). Additionally, it is a response to mounting customer demands for environmentally conscious practices, compelling enterprises to adopt green strategies that mitigate the detrimental environmental effects of their products and services (Ahmed et al., 2019).

Environmental management and the utilization of diverse Information Technology solutions have emerged as critical strategic enablers for organizations aiming to enhance their operational capabilities, seize new market opportunities, or foster customer loyalty (Chen, Tsou, 2007; Evangelista et al., 2012). By empowering enterprises to align supply and demand more effectively, IT solutions enhance the ability to deliver a broader range of offerings and improve responsiveness to customer needs. This, in turn, leads to reduced lead times, costs, and improved logistics efficiency, ultimately enhancing the performance of logistics services provided to customers (Bag et al., 2020; Skowron-Grabowska, 2020). Concurrently,

the implementation of high-quality environmental solutions augments the value of overall logistics processes, further enhancing sustainability and environmental performance (Cichosz et al., 2020).

In accordance with scholarly discourse, logistics effectiveness and efficiency represent the comprehensive evaluation of logistics operations within organizational contexts. This entails the systematic assessment, examination, and administration of diverse performance metrics to gauge the efficacy of logistical processes, functions, and activities (Celebi, 2019; Ciesielski, 2006; Świerczek, 2006). The domain of logistics performance encompasses a broad spectrum of endeavours, encompassing transportation, storage, inventory control, order fulfilment, packaging, and distribution, among other key facets (Blecker et al., 2009; Fawcett, Cooper, 1998; Harrison, 2019; Hausman et al., 2013). The primary objective of logistics performance is to optimize the flow of goods, information, and resources across the supply chain, ensuring alignment with customer requirements while minimizing costs and maximizing service levels (Witkowski, 2006). Within logistics customer service performance, the measurement and evaluation refers to the effectiveness of the organization's needs and expectations of its customers in terms of service quality, responsiveness, and overall customer satisfaction (Ballou, 1998; Daugherty et al., 2019; Kempny, 2001). Extensive scholarly inquiries have consistently evidenced a robust affirmative association between the implementation and utilization of Information Technology and the holistic logistics performance of organizations, particularly with regard to enhancing the efficiency and efficacy of logistics service provision. These research findings have received validation from investigations carried out by various scholars, including Evangelista et al. (2012), Lai et al. (2008), Zawawi and Wahab (2018).

In the quest for attaining superior performance in logistics, the adoption of Information Technology has garnered widespread recognition as a pivotal determinant, as also confirmed by investigations conducted by Anwar et al. (2022). The implementation of IT empowers organizations to optimize their logistics service levels and effectively manage costs, as emphasized in research was undertaken by Barbosa and Musetti (2010) and Kirono et al. (2019). Moreover, logistics enterprises are leveraging IT endeavours to embrace emerging technologies, acquire novel knowledge, and cultivate innovative skills, as evidenced by research conducted by Bag et al. (2020). The utilization of IT in business operations has been observed to exert a transformative influence on the dynamic nature of organizational processes, resulting in enhanced performance in supply chain management, as noted by Li et al. (2009), and demonstrating a significant impact on the performance of contemporary logistics firms, as underscored by Evangelista et al. (2012). Moreover, the integration of cutting-edge IT systems has been shown to have a favourable impact on the efficiency of organizations' operations, their overall productivity, and the level of customer service provided, as demonstrated by studies carried out by Liu et al. (2010). In view of these research findings, it can be concluded, in line with the findings reached by Evangelista et al. (2012), that the implementation of IT plays a pivotal role in shaping the performance outcomes of firms.

Drawing upon an extensive examination of the available scholarly literature, which has not been exhaustively presented in this particular paper but rather alluded to, there exists substantial empirical support suggesting that the incorporation of integrated IT practices and quality management practices within the domain of freight transportation enterprises and their corresponding logistics and customer service performance remains constrained and selectively implemented. Additionally, a critical analysis of the existing body of literature pertaining to logistics and customer service performance, encompassing both the broader management domain and the sphere of information technology, reveals notable gaps and limitations.

Hence, the aforementioned insights gleaned from the existing literature provide the foundation for formulating the following hypotheses:

H1a. Joint practices of green IT and quality management (JGITQM) positively influence logistics customer service performance (LCSP).

H1b. Joint practices of green IT and quality management adoption (JGITQM) positively influences environmental management (EM).

H2a. Logistics customer service performance (LCSP) positively influence logistics performance (LP).

H2b. Environmental management (EM) positively influence logistics performance (LP).

H3a. Logistics customer service performance (LCSP) mediates the relation between joint practices of green IT and quality management (JGITQM) and logistics performance (LP).

H3b. Environmental management (EM) mediates the relation between joint practices of green IT and quality management adoption (JGITQM) and logistics performance (LP).

Figure 1 illustrates a conceptual framework which introduces the proposed relationships.

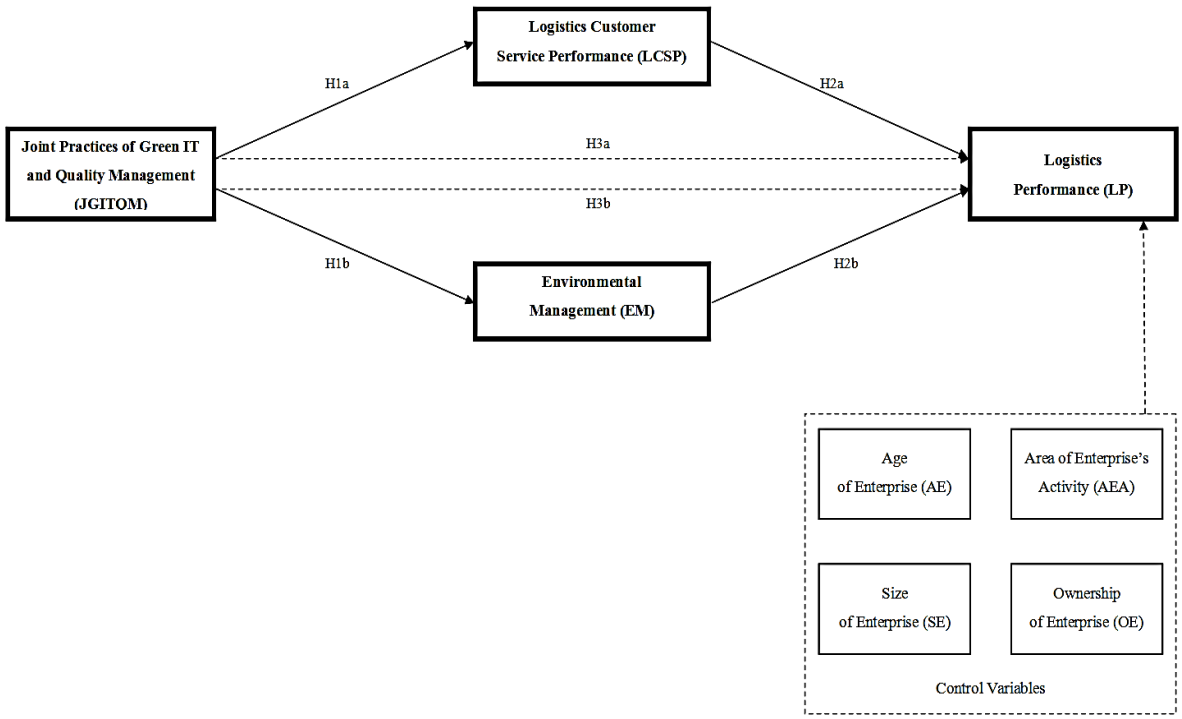

Figure 1. Conceptual model.

Source: Own elaboration.

3. Research materials and methods

The study was intended with the objective of investigating the association between joint practices of green Information Technology and quality management and logistics performance, as well as the mediating effects of logistics customer service performance and environmental management.

The research utilized a dataset comprising enterprises operating in the Polish freight transport sector. The data collection was conducted in the last quarter of 2022 through a Computer Assisted Telephone Interviewing (CATI) survey employing a structured questionnaire (Czakon, 2015). A thorough examination of the existing literature studies necessitated the inclusion of essential constituents in the questionnaire structure, encompassing four domains: joint practices of green IT and quality management, environmental management, logistics customer service performance and logistics performance. The proposal research tool underwent multiple rounds of piloting to validate the appropriateness of its format and questions' arrangement, while also enhancing its content validity. The revised questionnaire form subsequently was subjected to evaluation by distinct experts from organizations engaged in the fields of transportation, shipping and third-party logistics.

In the survey, 390 participants representing freight transportation enterprises were engaged. Among the gathered data, 112 questionnaires were identified as incomplete or inaccurate, consequently eliminating them from the research sample. Ultimately, 278 interviews were conducted with individuals representing the specific freight transport sector, yielding pivotal research insights.

Table 1 provides a concise overview of the key attributes of the research sample. The sample encompasses mostly small and medium-sized enterprises (over 85% of the total) with international areas of activity (nearly 68% of the total). The average age of the included firms is between seven and ten years, while the dominant type of ownership of the companies is national (more than 76% of the total). The distribution of the research sample, in terms of the type of business activity, is as follows: freight transport enterprises – nearly 71%, shipping companies – 20.5 %, and third-party logistics – 8.6%.

Table 1.
Characteristics of research sample

Features	Responses	Number
Type of economic activity	Freight transport	197
	Shipping	57
	Third-party logistics	24
Size of enterprise	Large enterprise	31
	Medium enterprise	62
	Small enterprise	176
	Micro enterprise	9

Cont. table 1.

Age of enterprise	less than 3 years	46
	3-6 years	98
	7-10 years	76
	11-20 years	31
	more than 20 years	27
Type of ownership	National	212
	Foreign	66
Area of activity	International	189
	Domestic	54
	Regional	35

Source: Own elaboration.

The measurements of the items were conducted utilizing a five-point Likert scale, where a rating of 1 corresponds to "strongly disagree" and a rating of 5 corresponds to "strongly agree" (Kock, 2015). The core component of the survey questionnaire comprised 32 measurement items that were categorically allocated across four pivotal domains explored in the study, presented in Table 2. The proposed constructs were chosen as inferred outcomes of the research, substantiated by the sources in the published literature.

Table 2.
List of measurement items

Variables	Items' acronyms	Constructs	Authors
Joint practices of green IT and quality management (JGICTQMA)	JGITQM1	In our enterprise green IT solutions and quality management attempts act intelligibly to encourage the general goals of the company.	Mann et al., 2009; Karapetrovic, Casadesús, 2009; Radu, 2016; Simon et al., 2012
	JGITQM2	In our enterprise green IT solutions and quality management attempts are launched conjointly in the planning proceeding.	
	JGITQM3	In our enterprise green IT solutions and quality management attempts are launched conjointly while the aims and objectives of the company have been specified.	
	JGITQM4	In our enterprise the practices of green IT and quality management are entirely joint in one distinct system.	
	JGITQM5	In our enterprise the control processes of green IT and quality management are launched conjointly.	
	JGITQM6	In our enterprise the analysis of the results of green IT and quality management are realized conjointly.	
	JGITQM7	In our enterprise the discrepancies in handling of green IT and quality management are launched conjointly.	
	JGITQM8	In our enterprise corrective and preventive activities regarding green IT and quality management are realized conjointly.	
	JGITQM9	In our enterprise processes of resources management regarding green IT and quality management are realized conjointly.	
	JGITQM10	In our enterprise assessment of data possessed from green IT and quality management is realized conjointly.	
	JGITQM11	In our enterprise all employees are in organized constant contact with conjointly realized green IT solutions and quality management attempts.	

Cont. table 2.

Logistics customer service performance (LCSP)	LCSP1	In our enterprise the quality management processes improve the level of excellence of the logistics service provided to customers.	Ballou, 1998; Curkovic et al., 2000; Daugherty et al., 2019; Kempny, 2001
	LCSP2	In our enterprise the quality management processes improve the general effectiveness of the logistics service provided to customers.	
	LCSP3	In our enterprise the quality management processes improve the ability to offer the logistics service of higher standards than competitive companies.	
	LCSP4	Our enterprise assesses pre-, post- and transactional indicators of logistics customer service, among others time of service, flexibility, frequency, accuracy and reliability of services, conveniences of orders, complaints, availability of information, facilitation of order placement, innovativeness of services, environmental friendliness of services, sustainability of services.	
	LCSP5	In our enterprise the quality management processes reduce the cost of quality of logistics customer service.	
	LCSP6	Our enterprise assesses the customer satisfaction of logistics service.	
Environmental management (IEM)	EM1	In our enterprise all top and middle-level managers support environmental management.	Dai et al., 2017; Liu et al., 2017; Zhu et al., 2017; Zhu et al., 2008
	EM2	In our enterprise total quality environmental management is realized.	
	EM3	In our enterprise environmentally-friendly technologies and green solutions are used in all desired domains.	
	EM4	Our enterprise achieves better results in pro-environmental activeness than other companies in our branch.	
	EM5	Our enterprise acquired green compliance and programs.	
	EM6	Our enterprise adopted environmental management systems.	
Logistics performance (LP)	LP1	In our enterprise logistics processes and activities participate in the growth of sales.	Blecker et al., 2009; Fawcett, Cooper, 1998; Harrison, 2019
	LP2	In our enterprise logistics processes and activities participate in the growth of market share.	
	LP3	In our enterprise logistics processes and activities participate in the growth of operational profit.	
	LP4	In our enterprise logistics processes and activities participate in the reduction of costs.	
	LP5	In our enterprise logistics processes and activities participate in the growth of competitive advantage in the branch.	
	LP6	In our enterprise the overall efficiency of logistics processes and activities has improved.	
	LP7	In our enterprise logistics processes and activities participate in the decline of employee turnover.	
	LP8	In our enterprise logistics processes and activities participate in the development of new services for the customers.	
	LP9	In our enterprise logistics processes and activities participate in the increase of advancement of new services for the customers.	

Source: Own elaboration.

The independent variable of the study, denoted as joint practices of green IT and quality management construct, encompasses eleven items that have been adapted from antecedent scholarly investigations by Mann et al. (2009), Karapetrovic and Casadesús (2009), Radu (2016) and Simon et al. (2012). Proposed items of the construct are referred to as conjointly realized green IT solutions and quality management attempts, acting intelligibly to encourage the general goals of the enterprises, launched in the planning proceeding and control processes, analyzed within corrective and preventive activities, in organized constant contact of all employees.

The dependent variable of the research is the logistics performance of the enterprises with nine measurement items selected from recommendations determined by Blecker et al. (2009), Fawcett and Cooper (1998), and Harrison (2019). The postulated components of the construct include logistics processes and activities participation in the growth of sales, market share and competitive advantage in the branch, increase of advancement of new services for the customers, as well as reduction of costs.

Both mediator variables' structures comprise six measurement elements. The construct of the first mediator variable, logistics customer service performance, is based on the literature features offered by Ballou (1998), Curkovic et al. (2000), Daugherty et al. (2019), and Kempny (2001), by assessing customer satisfaction and pre-, post- and transactional indicators of logistics customer service, by considering the quality management processes improving the level of excellence of the logistics service provided to customers, its general effectiveness, the ability to offer the logistics service of higher standards than competitive companies, as well as reducing the cost of quality of logistics. The second mediator variable is environmental management determined by all top and middle-level managers' support, including total quality environmental management, use of environmentally-friendly technologies and green solutions, acquiring green compliance and programs, and adopting environmental management, according to Dai et al. (2017), Liu et al. (2017), Zhu et al. (2017), and Zhu et al. (2008).

Moreover, four control variables were included in the research procedure: size and age of enterprise, type of ownership and area of activity. All data examination was conducted in a two-step process. Initially, a confirmatory factor analysis (CFA) was employed to assess the adequacy of the model for each construct, evaluating whether the constructs in the study adequately represented the observed data. Subsequently, a structural equation modelling (SEM) approach was applied to investigate the hypothesized relationships among the constructs, as depicted in Figure 1 of the conceptual framework.

4. Results of research and discussion

In the first step of the research procedure, in accordance with the guidelines proposed by Johnson and Wichern (2007), one measurement item from the environmental management construct and four measurement items from the logistics performance construct were excluded from the analysis by reason of low factor loadings. The items that remained after the exclusion of the aforementioned ones are presented in Table 3 along with the outcomes of the first-order confirmatory factor analysis (CFA). The evidence implies that the model's fit indices fall within accepted ranges (Field, 2009), signifying a remarkable alignment with the observed data, with chi-square = 1.50, CFI = 0.94, AGFI = 0.82, IFI = 0.94, TLI = 0.94, RMR = 0.052, RMSEA = 0.047. Moreover, Table 3 demonstrates that all items are in significant associations with the majority of their underlying constructs, as evidenced by standardized loadings exceeding 0.60 ($p < 0.001$).

Table 3.
Results of confirmatory factor analysis

Items' acronyms	Standardized loadings*	Average Variances Extracted	Cronbach's Alpha	Composite Reliability
JGITQM		0.75	0.95	0.95
JGITQM1	0.64			
JGITQM2	0.85			
JGITQM3	0.84			
JGITQM4	0.86			
JGITQM5	0.79			
JGITQM6	0.90			
JGITQM7	0.90			
JGITQM8	0.92			
JGITQM9	0.95			
JGITQM10	0.90			
JGITQM11	0.90			
LCSP		0.64	0.91	0.90
LCSP1	0.82			
LCSP2	0.71			
LCSP3	0.84			
LCSP4	0.84			
LCSP5	0.75			
LCSP6	0.80			
EM		0.51	0.85	0.86
EM1	0.60			
EM2	0.59			
EM3	0.70			
EM4	0.83			
EM5	0.80			
EM6	0.72			

Cont. table 3.

LP		0.52	0.89	0.89
LP1	0.61			
LP2	0.69			
LP3	0.65			
LP4	0.62			
LP5	0.73			
LP6	0.84			
LP7	0.66			
LP8	0.67			
LP9	0.73			

* significant value at $p < 0.001$.

Source: Own elaboration.

The internal consistency of all constructs is assessed using Cronbach's Alpha and composite reliability. The results indicated in Table 3 confirm that all constructs surpass the threshold value of 0.70 for both measures, thus demonstrating satisfactory levels of construct reliability (Bagozzi, Yi, 1988). Table 3 also provides insights into the convergent validity of the model through an analysis of the average variance extracted values for the constructs which surpass the established threshold of 0.50 (Fornell, Larcker, 1981), providing empirical support for the robust convergent validity of the constructs. Furthermore, the presence of profoundly considerable standardized regression weights of the variables is considered as strong evidence supporting the convergent validity of the study.

The measurement model's discriminant validity is assessed by evaluating the extent to which each construct converges with its corresponding values. This evaluation involves examining the covariance between pairs of constructs, which demonstrate significant differences from unity. The test results pertaining to the discriminant validity of the model are presented in Table 4. The pairwise comparisons provide robust evidence supporting the criterion of discriminant validity. Further, Table 5 presents descriptive statistics, which include the intercorrelations among the variables, providing a comprehensive overview of the data.

Table 4.
Results of discriminant validity

Domains of the constructs	**Chi-square model**	**Chi-square unconstrained model**	**Difference[2]**
JGITQM → LCSP	82.1	115.2	33.1
JGITQM → EM	87.5	119.0	31.5
JGITQM → LP	163.1	199.3	36.2
LCSP → EM	54.0	97.1	43.1
LCSP → LP	164.7	202.6	37.9
EM → LP	152.6	182.1	29.5

* significant value at $p < 0.001$.

Source: Own elaboration.

Table 5.
Descriptive statistics and intercorrelations

Variables	Mean	Standard Deviation	LP	JGITQM	LCSP	EM	AE	SE	OE	AEA
LP	3.60	0.78	1							
JGITQM	3.57	1.01	0.44**	1						
LCSP	3.82	0.71	0.75**	0.51**	1					
EM	3.69	0.78	0.65**	0.59**	0.70**	1				
AE	0.55	0.47	0.08	0.01	0.07	0.05	1			
SE	0.37	0.47	0.17*	0.03	0.06	0.11	0.20*	1		
OE	0.18	0.38	0.06	0.07	0.02	0.17**	0.07	0.29**	1	
AEA	0.51	0.49	0.03	-0.01	0.02	-0.02	0.12**	0.01	0.02	1

* significant value at $p < 0.01$.
** significant value at $p < 0.001$.

Source: Own elaboration.

Next three distinct statistical examinations were conducted on the common method bias. Initially, Harman's single-factor test was employed to ascertain if a solitary factor could account for the majority of the variability (Podsakoff et al., 2003). To achieve this, the exploratory factor analysis imposed a constraint on the number of factors by fixing it to one, as opposed to fluctuation based on eigenvalues. The syllogism determining the single-factor approach is that if the fit statistics of the confirmatory factor analysis results are significantly distorted when considering a single factor for the common method bias, it indicates that the method does not exert substantial control over the data. The results of chi-square = 4.30, RM = 0.14, and AGFI = 0.30 suggest that the variations observed cannot be primarily attributed to the common method bias. In the next step of examination, the common latent factor test was employed. The conducted analyses unveiled that the shared variance accounted for a mere 36% and did not represent the predominant part of the variability observed among the variables (Richardson et al., 2009). In the third stage of examination, the zero-constrained test was realized. The findings indicate that there is no significant presence of common method bias in the data, as demonstrated by the statistical comparison between the unconstrained common latent factor model with $\chi2 = 646.8$, d.f. = 424, and the constrained model with $\chi2 = 615.1$, d.f. = 402, revealing no substantial variation ($p = 0.49$). The cumulative outcomes unequivocally indicate that the common method bias does not bear significant relevance in the context of this survey (Podsakoff et al., 2003).

Within hypotheses testing for the model's direct associations, a robust statistical significance was denoted for all four hypotheses. For the relations between JGITQM → LCSP (H1a) and JGITQM → EM (H1b), the standardized regression coefficient is respectively 0.64 and 0.54 ($p < 0.001$). Furthermore, the associations between LCSP → LP (H2a) and EM → LP (H2b) obtained the results of the standardized regression coefficient respectively of 0.43 and 0.65 ($p < 0.001$).

According to Hair et al. (2010) in the presence of a mediating effect within a theoretical framework, a formerly statistically significant association between the predictor and outcome variables is expected to lose its significance. Within the confines of the model, in the absence of mediating factors or additional interactive effects, the direct associations between JGITQM and LP, LCSP and LP, as well as EM and LP, all exhibit statistical significance at a level of $p < 0.001$. The corresponding standardized regression weights for these associations are 0.47, 0.82, and 0.70, respectively.

To assess the significance of the mediating effects of LCSP and EM between JGITQM and LP, the conventional Sobel test methodology was initially employed. The Sobel test as a statistical procedure utilized to approximately evaluate the significance of the indirect influence of the independent variable on the dependent variable through the mediator (Baron, Kenny, 1986), in the study allowed for two measurements. Initially, it was found that LCSP acts as a complete mediator in the relationship between JGITQM and LP, with the Sobel test 5.32 ($p < 0.001$). In the subsequent analysis, it was revealed that EM exerts a complete mediating effect in the connection between JGITQM and LP, with the Sobel test 4.09 ($p < 0.001$). Consequently, hypotheses H3a and H3b are upheld, thereby confirming the complete mediation effects of LCSP and EM. These findings affirm that the impact of JGITQM on LP is dependent on the mediating influences of LCSP and EM. Thus, the effectiveness of JGITQM in influencing LP is solely achieved through the indirect effects mediated by LCSP and EM.

The presence of mediation effects was also examined utilizing the bias-corrected bootstrap approach to establish confidence intervals. In accordance with the suggestions of Hayes and Preacher (2014), the bias-corrected bootstrapping technique was employed, creating 6000 resamples to assess the significance of the deviation of the indirect effects from zero. The indirect impacts of JGITQM on LP, mediated by LCSP and EM, were assessed with results of 0.64 and 0.42 ($p < 0.001$), correspondingly, and were determined to be significantly distinct from zero. Hypotheses H3a and H3b, concerning the mediating influences of LCSP and EM, received complete support. Additionally, no statistically significant effects were observed between any of the control variables and the dependent variable, LP.

In the last part of the research procedure, to mitigate potential endogeneity bias, the study employed the two-stage least squares regression method (Liu et al., 2016). To address endogeneity concerns, instrumental variables were first identified for the variable LCSP in the two-stage least squares regression analysis. AE and OE were chosen as instrumental variables for LCSP as their relationships with LP were found to be statistically insignificant (Table 5). To address potential endogeneity, two instrumental variables, SE and the AEA, were selected. These variables were chosen based on their anticipated lack of significant correlation with LP but significant correlation with LCSP, as presented in Table 6.

Table 6.
Models within endogeneity

Variables	Model 1: ordinary least squares	Model 2: two-stage least squares
	LCSP	**LP**
JGITQM	0.35*	0.10
AE	0.06	
OE	-0.04	
SE	0.06	0.19*
AEA	0.06	
LC	0.15*	
LCSP		0.62*
R^2	0.29	0.59
	F-value = 14.19*	Wald chi-square = 121.82*

* significant value at $p < 0.01$.

Source: Own elaboration.

Before conducting the two-stage least squares regression approach, a regression model was performed to estimate the relationship between LCSP and all the variables in the analysis that are susceptible to endogeneity. The first model, presented in Table 6, employs a one-stage ordinary least squares regression technique. The R-squared value of this regression is 0.29, which is substantially higher than the R-squared value obtained from the regression model containing only the control variables (ΔR-squared = 0.26, Δ F-value = 12.02, $p < 0.01$). This outcome confirms the effectiveness of AE, OE, SE, and AEA as instrumental variables for LCSP in the study.

Due to the outcomes from the first model in Table 6, the anticipated value of the presumed endogenous variable, LCSP, was assessed (Bellamy et al., 2014) to examine the association between LCSP and LP in the second stage. As demonstrated in the second model of Table 5, a positive and statistically significant relationship was observed between LCSP and LP ($\beta = 0.62$, $p < 0.01$).

As remarked by Bernardo et al. (2009), a convergence of multiple discrete management practices with technological support, each with unique objectives, fosters the creation of a cohesive and streamlined system that harnesses existing synergies, resulting in heightened efficiency and effectiveness for the organization. Also according to Molina-Azorin et al. (2009), the integration of green Information Technology practices and quality management practices brings about various advantages, including enhanced organizational efficiency and effectiveness, alignment of aims, objectives, and processes, as well as improved communication throughout the entire organization. Hence, the establishment of capabilities through the implementation of joint green IT and quality management practices is anticipated to amplify firm performance across multiple functional domains. In conjunction with the advantages offered by integrated systems, in consideration of Gianni and Gotzamani (2015), it is imperative to emphasize that the long-term viability of joint management practices with technological support relies on collaborative auditing and performance-driven management approaches. The empirical results of this study provide empirical evidence that establishes a significant and

positive relationship between joint green IT practices and quality management practices, even in the absence of mediating effects. As suggested by Hofmann et al. (2012), embracing advanced technological solutions, demonstrating innovative prowess, and forging partnerships with customers - alongside their established strategic advantages - could equip enterprises with capabilities to effectively address sustainability challenges. These capabilities are also relevant in establishing robust quality management practices that extend beyond a mere management system.

The results additionally confirm that the association between joint green IT practices and quality management practices and logistics performance is completely mediated by logistics customer service performance and environmental management. Despite the apparent simplicity and clarity of this discovery upon initial examination, it harbours significant implications that hold value for both practitioners and managers. Merely implementing joint management practices such as JGITQM does not guarantee enhanced performance. Instead, an organization must convert this integration into a capacity by achieving elevated levels of logistics customer service performance and environmental management. This critical element signifies the organization's aptitude to cultivate a unique competence, which can be accomplished by taking into account specific factors pertinent to the organization.

5. Conclusions

This research endeavour has undertaken a contribution to enhancing comprehension regarding the determinants that shape the decision-making process for integrating diverse management practices with technological support. In pursuit of this objective, a conceptual model has been formulated, primarily grounded in the fundamental principles of the resource-based view theory. It is crucial to recognize that joint management practices have a pivotal role in fostering the development of organizational capabilities aimed at achieving a sustainable competitive advantage. Consequently, implementing integrated management practices is predominantly centred around acquiring capabilities essential for fostering strategic orientation. In light of this, the study explores the effects of integrated management practices, specifically green Information Technology practices and quality management practices, on logistics performance.

The study yields a multitude of managerial implications that arise from the obtained results. Primarily, by highlighting the optimal utilization of particular organizational capabilities to effectively integrate green IT practices and quality management practices, enterprises can achieve favourable outcomes by concurrently attaining high levels of logistics customer service performance and environmental management. Furthermore, upon analyzing the effects of logistics customer service performance and environmental management on the overall logistics

performance, it becomes evident from the findings that distinct capacities can be employed for varying objectives. In accordance with the literature findings discussed earlier, the adoption of state-of-the-art technological solutions, showcasing innovation capabilities, and fostering collaborations with customers - in addition to their recognized strategic benefits - can endow enterprises with the necessary capacities to effectively tackle sustainability challenges. Furthermore, these capabilities hold relevance in establishing resilient quality management practices that surpass the boundaries of a mere management system. It is noteworthy that the interrelationships among joint green IT and quality management practices, logistics performance, logistics customer service performance and environmental management are seemingly more intricate and multifaceted than initially envisioned. The principal managerial implication derived from this study pertains to the necessity of acknowledging intricate interconnections and relationships (such as cumulative impacts or synergies) among management capabilities concerning management practices and the expectations of external stakeholders. Therefore, based on the research findings, it is advised that executives actively explore potential avenues to cultivate and enhance their logistics customer service performance and environmental management with the aim of fostering their overall logistics performance.

Nevertheless, it is important to acknowledge certain limitations when interpreting the results. Firstly, this study has solely investigated the associations between joint green IT and quality management practices and logistics performance within the context of a single emerging country and one branch. Therefore, caution must be exercised in generalizing the findings, as they should be regarded as inquiring in nature. Moreover, relying on perceptual data obtained solely from managers may introduce biases, including measurement errors. Mitigating these biases can be achieved by collecting data from multiple respondents, thereby enhancing the validity and reducing the impact of such limitations. To obtain a comprehensive perspective, future research endeavours could also expand upon the current study by incorporating additional management practices into the integration framework.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

ANALYSIS OF THE LEVEL OF AWARENESS AMONG THE ACADEMIC COMMUNITY IN THE FIELD OF CYBERSECURITY

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Purpose: The purpose of the work was to discuss various forms of social engineering and to conduct a survey among the academic community in the field of cybersecurity.
Design/methodology/approach: Survey was conducted by google forms.
Findings: The paper discusses the issue of social engineering and its types, such as: phishing, pharming, vishing, whaling, skimming and rubber ducky devices. Subsequently, "good practices", i.e. recommendations to be used in order to increase security against a cyberattack, were discussed. In the research part, a survey was conducted among the academic community. 111 respondents took part in the survey. The answers were analyzed and conclusions were drawn. Research among the academic community on cybersecurity awareness has been conducted for the first time. The results show the level of awareness and demand for cybersecurity training.
Social implications: The survey was aimed at examining the awareness of the academic community in the field of cybersecurity. Based on the responses, it can be concluded that the demand for training in this area is high.

Keywords: cybersecurity; social engineering; awareness; cyberattack, academic community.

Category of the paper: Research paper.

1. Introduction

Over the years, the Internet has become not only a tool, but also a meeting place, work place, library, school, cinema, bank and many other facilities. Today, every generation, from children to seniors, uses the Internet. Opportunities offered by access to the network, unfortunately, also create threats, opportunities for fraudsters, a voice of hatred and facilitations

for all kinds of crimes (Dudzińska et al., 2020; Kiljan et al., 2022, Kowolik et al., 2021). That is why it is so important to make users aware of the dangers and threats.

The aim of the work was to discuss various forms of social engineering, to present "good practices" in order to increase the security of network use, and to conduct a survey among the academic community in the field of cybersecurity.

The survey was anonymous, and the respondents were students and employees of the Silesian University of Technology. The survey was aimed at examining the level of awareness in the field of cybersecurity and an indication of the need for training in this topic.

2. Social engineering

Due to the constant development of new hacking techniques, network security and protecting your computer becomes quite problematic. Unsecured hardware results in data loss through, for example, malware that can steal personal data after getting into the device, or malware that can damage or destroy files on the device (Lewandowska 2019; Garwol 2018; Furmanek 2012; Wojtkowiak et al., 2013).

Not only companies are attacked, but also individual network users. In order to protect against such events, you should block applications that seem suspicious, do not click on links of unknown origin, or do not connect unknown devices to the USB port, because dangerous software can be knowingly installed. You should also pay attention to the Internet network, whether it is properly secured and how it is made available. Another danger awaits users of social networking sites, providing information about themselves, posting photos without checking their privacy settings. It is important to encrypt data and important documents, and using the so-called virtual disk, i.e. the "cloud", files should be protected before being sent (Lewandowska, 2019; Czekaj, Stecko, 2016; Grubicka et al., 2019; Grubicka, Jopek, 2017).

The most popular threats in cyberspace include (Grzelak, Liedel, 2012; Walendzik, Wilkosz, 2018; Gronowicz, Woś, 2018; Jopek, Kinda, 2019; Noga et al., 2018; Kujawińska et al., 2021; Samociuk, 2023; Wawrowski et al., 2023):

- malware attacks (malware, viruses, worms, etc.);
- identity theft;
- theft (extortion), modification or destruction of data;
- blocking access to services (mail bombs, DoS and DDoS19);
- spam (unsolicited or unnecessary e-mails);
- social engineering attacks (e.g. phishing, i.e. phishing for confidential information by impersonating a trustworthy person or institution).

The elements of social engineering that are described in the next section are social engineering attacks. Social engineering is any attack that uses human psychology to perform certain actions or to transfer information in order to influence the target of the attack (Gray, 2023; Tomczyk, 2019). Online scammers sometimes work on their target for several months, gathering information about the victim, following social networks, analyzing behavior and trying to sense where they will hit in the search for information of interest to them. Research shows that the most common targets of social engineering attacks are people in managerial positions (Lizut et al., 2014; Kujawińska et al., 2021; Kowolik et al., 2021).

Social engineering can be an extremely effective tool for data mining. Internet fraud has been happening since the very beginning of the Internet. Cybercriminals come up with newer and newer techniques and tactics to deceive users. Only the vigilance of the user depends on recognizing the problem and avoiding fraud. If vigilance fails, the result is usually a financial loss (Cisowski et al., 2021).

3. Cybersecurity awareness survey

Recently, there has been an increasing interest in the topic of cyber security. Cybersecurity is also one of the pillars of Industry 4.0. However, due to the occurrence of cyberattacks and a lot of information in social media on this topic, it was found that conducting a cybersecurity awareness survey among the academic community of the Silesian University of Technology would be a good idea. 111 people responded to 307 questionnaires sent. The questionnaire was sent to employees and students of the Silesian University of Technology.

The survey consisted of 12 single and multiple choice questions. It was possible to answer "Other" than listed. The survey was conducted using a Google form. The survey was anonymous.

4. Summary of survey research

The results of the survey are presented below. Out of 307 respondents, 111 people answered.

111 people took part in the survey: 55 women, 52 men, while 4 people preferred not to disclose their gender (Fig. 1).

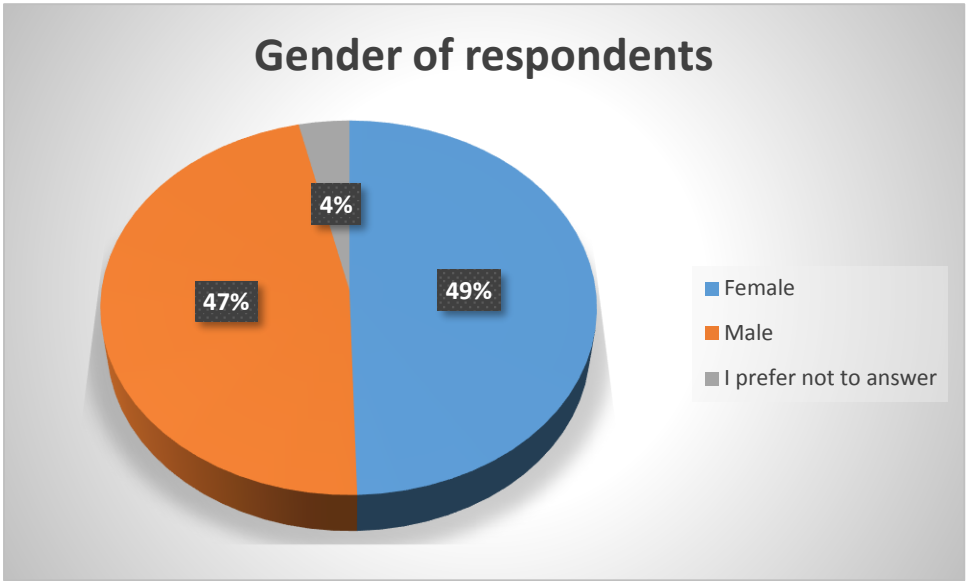

Figure 1. Gender of respondents.

Source: own elaboration.

Among the respondents (Fig. 2), the largest group of 70 people was aged 19-25, i.e. students. Subsequently, 15 people aged 37-47, 14 people aged 26-36, 11 people aged 48-58 and 1 person over 59 years of age.

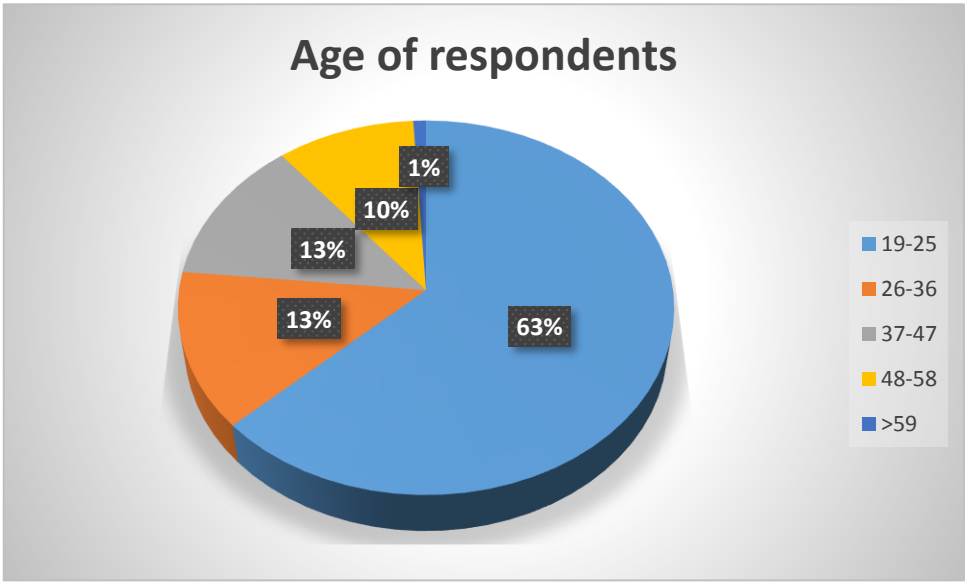

Figure 2. Age of renspondents.

Source: own elaboration.

The largest number of respondents (Fig. 3), as many as 50 people had secondary education. Another group, 33 people, higher education. 18 people had a PhD degree. 6 people had a habilitation, 2 people had higher education with post-graduate studies or MBA, and 2 people with a professorship.

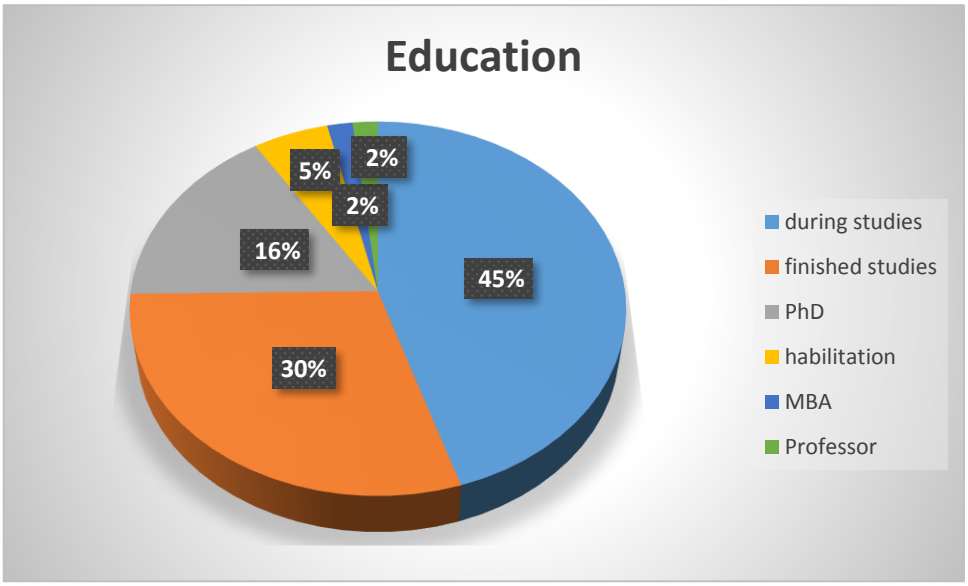

Figure 3. Education of respondents.

Source: own elaboration.

As many as 61 people declared the level of technical skills as medium. 47 people high level, i.e. advanced use of databases, programming and/or script execution. Only 3 people declared their level of technical skills as basic (Fig. 4).

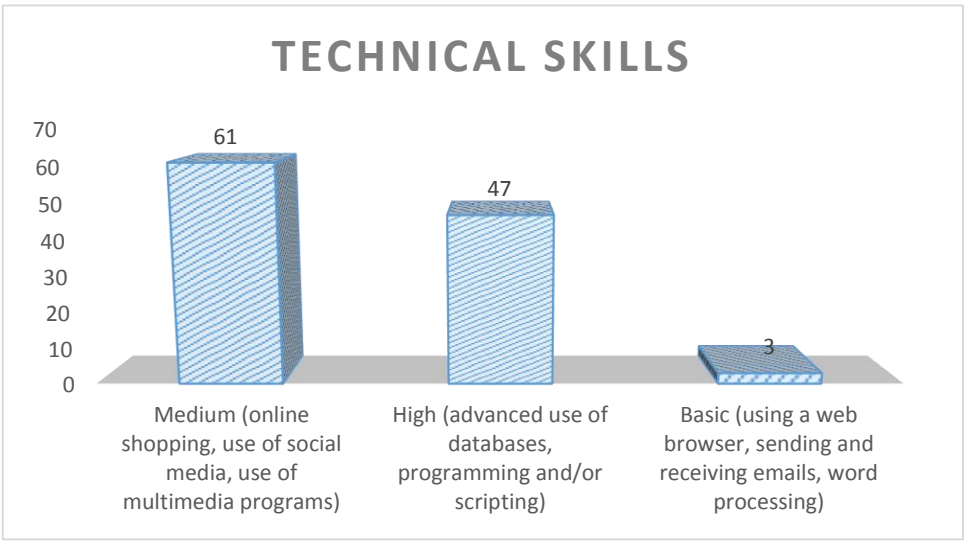

Figure 4. Technical skills of respondents.

Source: own elaboration.

Among the respondents (Fig. 5), the most well-known form of social engineering is phishing (more than half of the respondents). Unfortunately, as many as 45 people do not know any of the given forms. 29 people have heard of skimming. 16 people know what vishing is, 15 people know what rubber ducky is, 14 people know about pharming and whaling. Individuals also added: baiting, CEO, fraud, scareware, quid pro quo, bribing a company employee to install a suspicious program on the company's computer, ARP and XAMPP attacks.

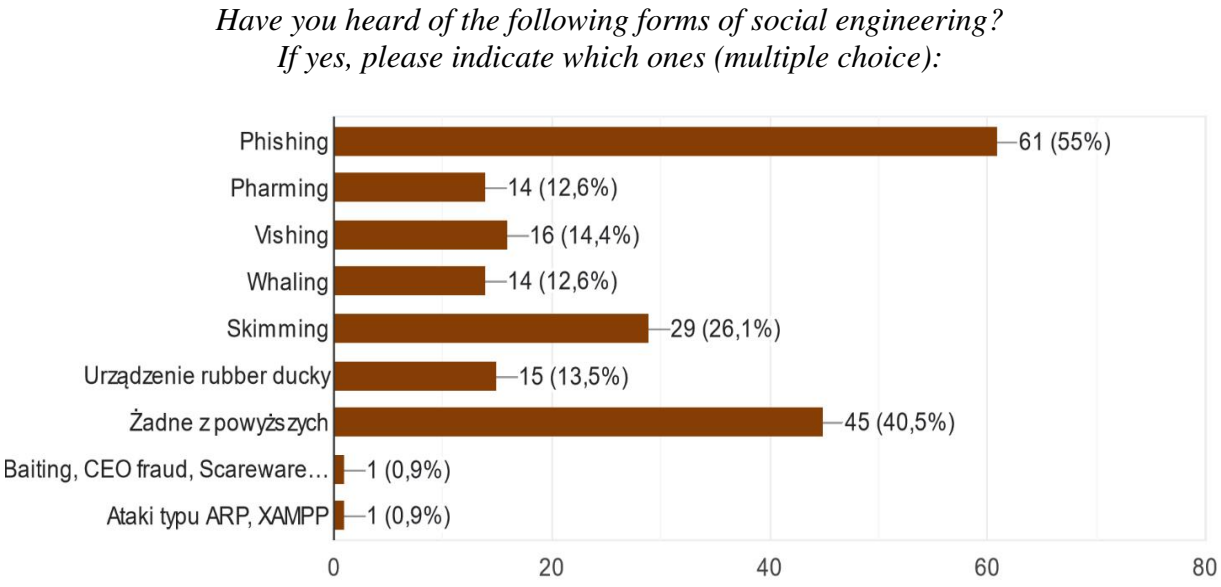

Figure 5. List of forms of social engineering.

Source: own elaboration.

101 people out of 111 respondents have had contact with a cyberattack, 10 people declare that they have not had such contact (Fig. 6).

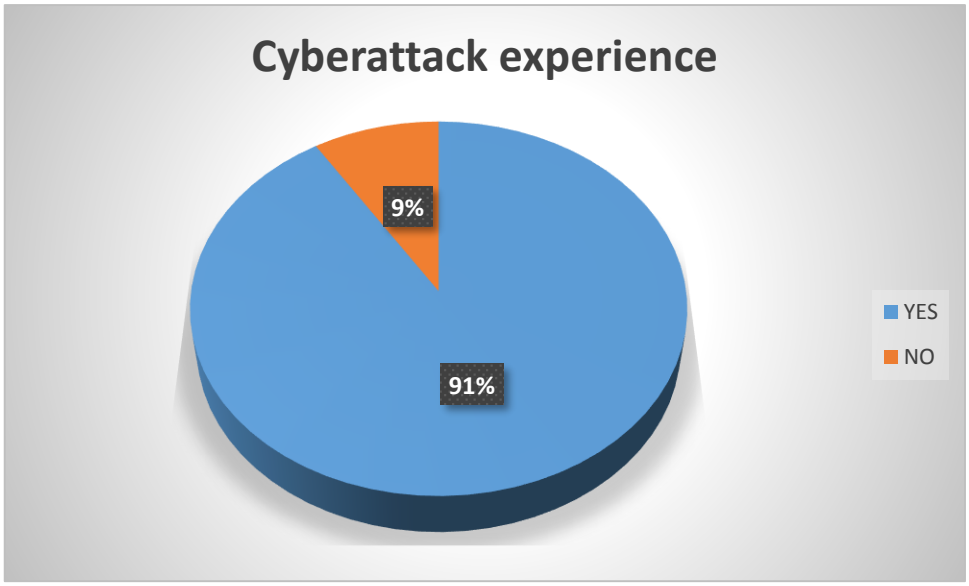

Figure 6. Cyberattack experience.

Source: own elaboration.

99 people declared that they had received a suspicious link sent by email or SMS in their lifetime. 79 received spam, which is quite a common and common form. 56 people were contacted via a fake profile on a social networking site. Almost 1/3 of people had telephone contact with a fraudster, for example, claiming to be a bank employee. 12 people had contact with installing dangerous software, also via USB devices. One person was not in contact with any attack.

Individuals mentioned:

- Scripts in pdf files, in MS Word editor files, in MS Excel spreadsheet files, e-mail attachments.
- Testing your own equipment to check security.
- Account hacking.
- Chatbots, intrusive ads with fees.
- Email messages testing the caution of plant employees.

109 people are aware (Fig. 7) that online activities are tracked to create an online profile and send advertisements. Only 2 people don't mind. There are no ignorant people among the respondents.

Are you aware that your online activities (internet surfing, social media usage, online purchases) are tracked to create an online profile and send you advertisements?

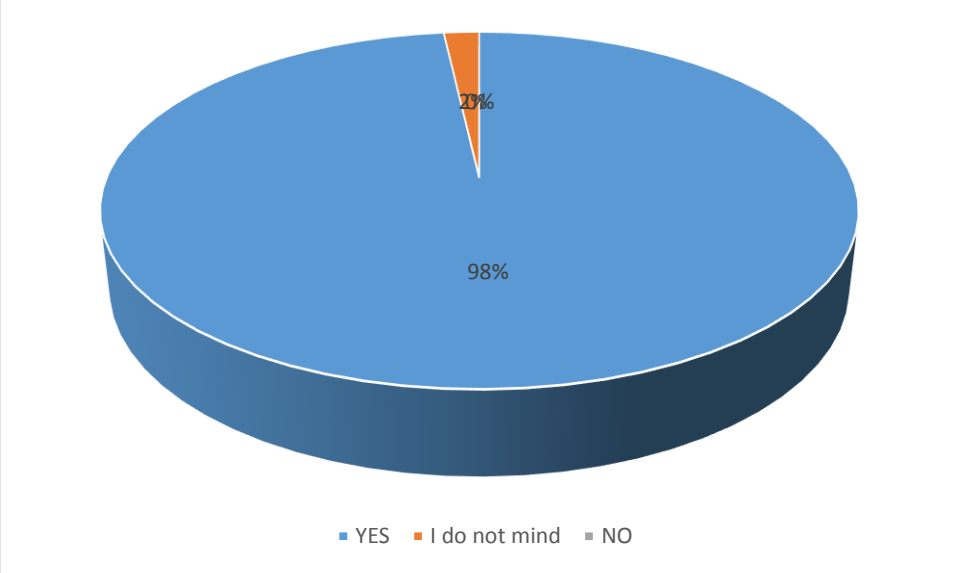

Figure 7. Respondents' awareness of creating an online profile and personalized ads.
Source: own elaboration.

Which of the following or used tools have you customized on your device?

The largest number of respondents (79 people) set privacy in social media. Nevertheless, 77 people track location and 76 installed an ad blocker. 70 people changed their passwords and 64 set the private mode in the web browser. 34 and 33 people deleted unused accounts and used anti-tracking tools. 3 people did not use any of the listed tools. Individuals applied DNS filtering through an external server.

How often do you change your e-mail password?

One of the questions that had the largest number of different answers concerned the frequency of password changes in e-mail.

Almost half, as many as 50 people, do not change their password in e-mail at all, they have the same password all the time. 36 people change their password once a year. 12 people change their password once a month. And the responses from individuals were as follows:

- Rarely.
- I prefer not to give.
- Every day.
- Quarterly.
- Once every 2 or 3 years, and if viruses are detected.
- Depends.
- If necessary.
- Every now and then.
- Once every 2 years.
- Every 3 months.
- once happened.
- From time to time, but not regularly.
- Mail has 2 passwords set by a program to create several hundred bit passwords.

40 people out of 111 were trained in cybersecurity, while as many as 71 people were not trained (Fig. 8).

Figure 8. Number of people trained in cybersecurity.

Source: own elaboration.

81 people expressed their willingness and interest in training in cybersecurity, the remaining 30 people do not see such a need (Fig. 9).

Figure 9. Number of people interested in cybersecurity training.

Source: own elaboration.

5. Conclusion

In recent years, the increasing use of the Internet has been observed. The Covid-19 pandemic has made people more willing to do various activities online, such as shopping. However, it carries many dangers that can cause many losses, not only financial.

Online threats are becoming more and more frequent, which is why it is so important to be aware of the threats lurking on the Internet, hence the idea of conducting a survey among the academic community.

Unfortunately, the reluctance to complete surveys, even short and anonymous ones, is still visible. Only 1/3 of the people answered the survey questions. On the other hand, as many as 70 out of 111 respondents were people aged 19-25, i.e. students.

Based on the survey, the following conclusions can be drawn:

- Most of the respondents knew forms of social engineering.
- Almost everyone has been in contact with a cyberattack and knows what it is.
- Respondents can indicate the form of a cyberattack.
- Respondents are aware of what they publish on the Internet.
- Respondents use various types of tools to protect their data.
- The problem among the respondents is low awareness of password change in e-mail.
- Most of the respondents do not change their password at all or do it very rarely.
- Most of the respondents (71) were not trained in cybersecurity.
- Most of the respondents (81) are interested in cybersecurity training.

The results of the research indicate that there is an increasing awareness of the community in the field of cybersecurity and the need for training in this field. It is a satisfactory fact that some people have already undergone such training, which proves that the employer cares about raising awareness of employees or the employees themselves have such a need.

Acknowledgements

The work was carried out as part of the Cyber Science postgraduate studies "Cybersecurity Management".

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

APPLICATION OF THE KNOWN SUB-SEQUENCE ALGORITHM TO SELECT THE IMPUTATION METHOD FOR TIME SERIES OF ELECTRIC ENERGY CONSUMPTION

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Purpose: The key element of effective electricity management is to improve the accuracy of forecasting its consumption. To create a forecast, data on customers' energy consumption in previous periods is required, and the accuracy of the forecasts depends on the quality and availability of data. The acquired historical data is often incomplete and contains missing values. The aim of the article is therefore to choose an appropriate method of imputation of missing values for one-dimensional time series of energy consumption.
Design/methodology/approach: The aim of the article was achieved by using the Known Substring Algorithm (KSSA) to verify the imputation precision. The KSSA algorithm allowed to test of eleven imputation methods, most of which are implemented in the 'ImputeTS' package in R. Based on the RMSE error, the best imputation method was selected for the analyzed series.
Findings: As a result of the analyzes carried out, it was shown that the KSSA algorithm is a good tool for selecting the appropriate imputation method in the case of one-dimensional series of electricity consumption series. Based on the RMSE error, 'auto.arima' turned out to be the best imputation method for the analyzed objects
Research limitations/implications: Future research will concern the use of the KSSA algorithm for a larger number of energy consumption series and with greater variation.
Originality/value: The article presents an important problem of the imputation of missing values in the electricity consumption series. Increasing the accuracy of electricity consumption forecasting depends on the quality of the collected data, which are often incomplete and contain missing values. Therefore, the selection of the appropriate imputation method is so important.
Keywords: Time series, Missing data imputation, Electricity consumption data, Data quality, Missing value.

Category of the paper: Research paper.

1. Introduction

In this study, we analyze data on electricity consumption because, as Wang et al. (2021) emphasised, economic development leads to an increase in electricity demand and, consequently, generates the need for energy-saving measures, i.e., better energy management systems. Such systems are mainly dedicated to electricity consumers, which is why we analyze data on electricity consumption from individual consumers. To create a forecast, data on a customer's energy consumption in previous periods, i.e., historical data, is required. It should be noted that the accuracy of electricity consumption forecasting depends on the quality of the collected data (Kim et al., 2019; Chen et al., 2017). The obtained historical data often lacks completeness and contains missing values. This is a common issue when data is measured and recorded (Moritz, Bartz-Beielstein, 2017; Sefidian, Daneshpour, 2019). In the case of energy consumption data, these can be communication errors, sensor failures, power outages (Bokde et al., 2018), but also deficiencies due to the lack of readings (values are then not measured).

There are many different techniques that can be used to deal with missing values (Liu et al., 2020; Garcia-Laencina et al., 2010). These include missing values deletion, mean substitution, and model-based imputation. When the data set contains less than approximately 10-15% missing data, it can be simply removed from the data set (Strike et al., 2001). However, as shown by Lin and Tsai (2019), even small amounts of missing data can have a significant impact on the final analysis results. An appropriate approach to handling missing values in our analyzed data is imputation, which is one of the most reliable methods for dealing with missing values (Demirhan, Renwick, 2018). In the literature, various algorithms can be found for replacing missing data with estimated values. The most common data imputation techniques rely on correlations between attributes to estimate values for missing data. These include Multiple Imputation (Rubin, 1987), Expectation-Maximization (Dempster et al., 1977), Nearest Neighbor (Vacek, Ashikaga, 1980), and Hot Deck (Ford, 1983). In the case of electricity consumption data, we often deal with one-dimensional data series where additional attributes are missing. Therefore, imputation algorithms specifically tailored to such data should be applied (Moritz, Bartz-Beielstein, 2017; Kowalska-Styczeń et al., 2022). For example, Bokde et al. (2018) propose the imputePSF method, which is a modification of the pattern sequence based forecasting (PSF) method. Demirhan and Renwick (2018), on the other hand, compare the performance of methods available in the "imputeTS" package, which are dedicated to one-dimensional time series with irregular intervals.

An important element to pay attention to when using imputation methods is the type of data. In the case of electricity consumption data, these are usually one-dimensional time series without additional attributes. The aim of our article is to find the best method of imputation of missing values for one-dimensional electricity consumption series.

As mentioned earlier, effective energy management is very important for electricity trading companies. Such companies often have to buy energy on the wholesale market and then distribute it to individual customers. In this process, there is a need to ensure continuous and accurate balancing of electricity demand and production, i.e. better forecasts of energy consumption. To prepare the forecast, data on energy consumption by customers in previous periods is required. The accuracy of the forecast depends on the data, which often contains missing data. The results of our work may therefore be interesting for energy trading companies that are looking for efficient tools for the imputation of missing values.

After analyzing the available data imputation tools, we chose the Known Sub-Sequence Algorithm (KSSA) proposed by Benavides et al. (2021). The cited authors used this algorithm to assign missing values in the time series for landings of six fish species. We noticed similarities between the series they analyzed and the series of electricity consumption (in both cases these are one-dimensional time series). Our approach allows for the selection of the best imputation method by comparing 12 imputation methods from the "ImputeTS" (Moritz, Bartz-Beielstein, 2017), "forecast" (Hyndman, Khandakar, 2008), and "Rssa" (Golyandina, Korobeynikov, 2014) packages. To select the best method, RMSE and MASE errors are computed between the actual and imputed time series.

We believe that the proposed approach is a good solution that can be used by trading companies.

2. Data structure

The article used historical data on electricity consumption for 6 homes (facilities) in British Columbia (Makonin, 2019). The data for selected facilities were analyzed for missing values. The number of days with missing data, the number of data gaps (where a gap is defined as one or more consecutive days with missing data), the average gap size, the longest data gap, and the percentage of missing data were calculated. Further details can be found in Table 1.

Table 1.
The data structure for the facilities, based on missing data

FACILITY	start of observation	end of observation	number of days	number of days with missing data	number of gaps	average gap size	the longest gap	missing data %
Facility A	January 27, 2015.	January 29, 2018.	1099	57	39	1.46	14	5.19
Facility B	February 21, 2015.	February 20, 2018.	1096	54	43	1.26	6	4.93

Cont. table 1.

Facility C	February 21, 2015.	February 20, 2018.	1096	40	35	1.14	5	3.65
Facility D	November 01, 2017.	February 18, 2019.	475	90	37	2.43	10	18.95
Facility E	November 01, 2017.	June 05, 2018.	217	9	9	1.00	1	4.15
Facility F	July 27, 2017.	April 05, 2020.	984	59	45	1.31	14	6.00

As indicated in Table 1, series of different lengths and structures were selected for analysis. Subsequently, the selected series were analyzed in terms of electricity consumption in kWh. The minimum, maximum, and average energy consumption in each series, along with the standard deviation of consumption and median, were identified. Details are provided in Table 2.

Table 2.
Data structure for facilities by electricity consumption

FACILITY	minimum value in series	maximum value in series	average daily consumption in kWh	standard deviation of energy consumption	median daily consumption
Facility A	11.23	41.89	22.2	5.1	21.30
Facility B	5.8	38.31	16.0	5.3	15.13
Facility C	6.57	50.83	21.8	7.6	21.00
Facility D	0.69	46.28	13.9	8.6	11.72
Facility E	1.63	17.12	5.5	2.7	5.11
Facility F	1.11	66.83	13.1	10.7	9.84

The distribution of missing data in the consumption series is shown in Figure 1. The figure displays daily data from 6 objects, with missing values marked in red.

As can be observed in Figure 1, time series of electrical energy consumption can exhibit different characteristics. In particular, the distributions of missing data vary greatly. Based on the analysis of the plots presented in Figure 1, it can be assumed that the mechanism of missing data is random (Liu et al., 2020; Kowalska-Styczeń et al., 2022; Sefidian, Daneshpour, 2019).

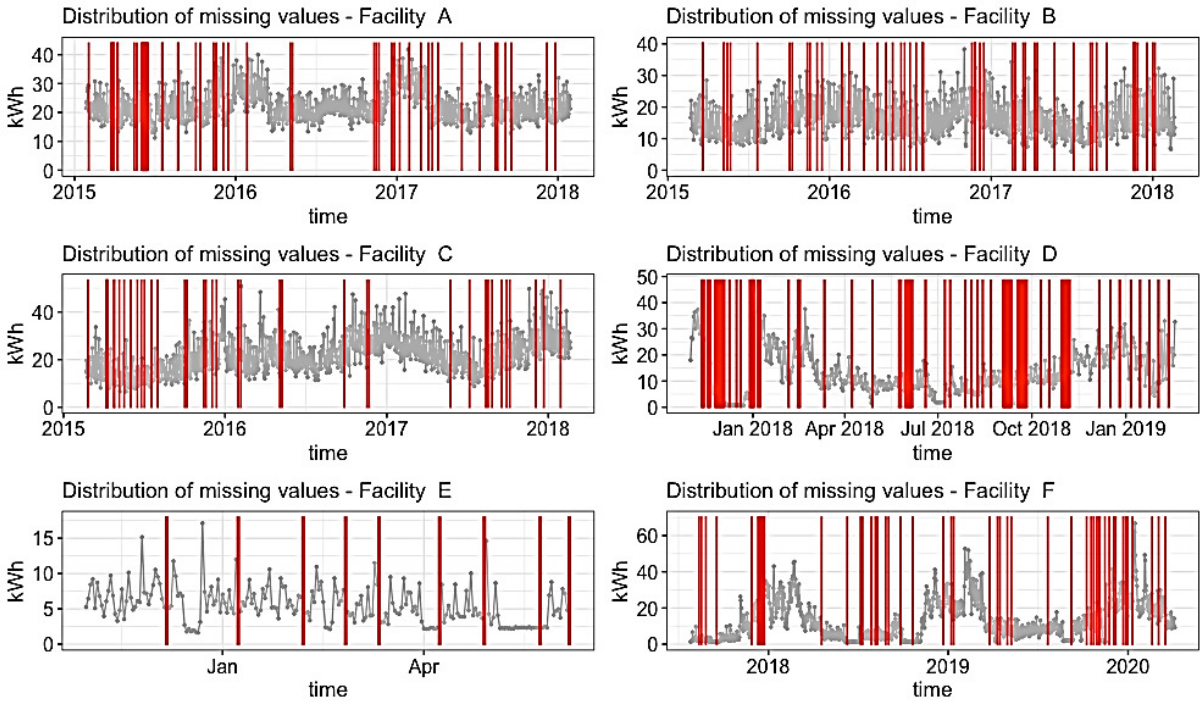

Figure 1. Time series with marked missing data.

Source: own study.

3. Methods

In this article, we employ the Known Sub-Sequence Algorithm (KSSA), which is based on Multiple Imputation. Originally, this algorithm was used for imputing missing values in one-dimensional time series of marine catch offloading for six fish species in the Colombian Pacific (Benavides et al., 2021). Since electrical energy consumption data is often in the form of one-dimensional time series, the use of the KSSA algorithm seems appropriate for our research.

The operation of the KSSA algorithm can be described as follows:

1. the true missing data (MD) in the original time series under investigation is imputed using a single imputation algorithm, x;
2. the time series is divided into time segments (year, quarter, month, etc.);
3. moving and expanding windows are set in each segment, simulating chunks of missing data of varying sizes in (known) sub-sequences that do not contain original missing data;
4. imputing simulated chunks of missing data in each segment using a single x-algorithm and calculating the errors (RMSE, MASE "metrics" of the R package) between the actual and imputed values in the time series;
5. repeating steps 1-4 n times using bootstrapping;
6. repeating steps 1-5 for all algorithms;

7. repeating steps 1-6 for all time series;
8. all results are saved in a final data frame containing the size of missing data, RMSE, and MASE for n runs of each algorithm and time series.

KSSA utilizes missing value imputation methods mainly from the "ImputeTS" package in R (Moritz, Bartz-Beielstein, 2017), which include:

- "State space representation of an ARIMA model" (auto.arima) - imputations using an ARIMA model (Hyndman, Khandakar, 2008);
- "State space representation of a structural model" (StructTS) - imputations using a structural time series model (Harvey, 1990; Durbin, Koopman, 2001);
- "Seasonal decomposition with Kalman smoothing" (seadec) - imputations on seasonally adjusted series using Kalman smoothing (Aravkin et al., 2017) and then considering the seasonal component in imputations (Cleveland et al., 1990);
- "Linear interpolation" (linear_i) - imputations using linear interpolation;
- "Spline interpolation" (spline_i) - imputations using cubic spline interpolation (Hall, Meyer, 1976);
- "Stineman interpolation" (stine_i) - imputations using Stineman interpolation (Stineman, 1980);
- "Simple moving average" (simple_ma) - imputations using simple moving average of neighboring observations;
- "Linear moving average" (linear_ma) - imputations using linearly weighted moving average;
- "Exponential moving average" (exponential_ma) - imputations using exponentially weighted moving average;
- "Last observation carried forward" (locf) - imputation by replacing the missing data with the last known observation;
- "Seasonal and trend decomposition with Loess" (stl) - imputations using time series decomposition with local smoothing (Cleveland et al., 1990).

The description of our procedure, where we utilize the KSSA algorithm, is as follows:

1. Perform a time series analysis - calculate the percentage of missing data.
2. Determine one of the evaluation criteria for imputation methods: correlation coefficient, RMSE, MASE, SMAPE - RMSE is chosen.
3. Choose one of the available methods for missing data imputation: auto.arima, StructTS, seadec, linear_i, spline_i, stine_i, simple_ma, linear_ma, exponential_ma, locf, stl.
4. For the selected method and time series, set the parameters of the KSSA algorithm:
    - Time series with missing data.
    - Imputation method - chosen in step 3.
    - Number of segments - 5 segments.

- Number of iterations - 100 observations.
- Percentage of missing data - consistent with the percentage determined for each object.

5. Run the KSSA algorithm and obtain the imputation results.
6. Repeat steps 3-5 for different imputation methods.
7. Based on the established criterion, select the best imputation method.

The chosen error measure, RMSE (root-mean-squared error), calculates the square root of the average squared difference between the actual and imputed values. It measures the average deviation of the actual variables from the imputed values.

4. Results and discussion

The procedure proposed in section 2 was used to analyze electricity consumption for 6 objects (6 houses). As was shown earlier, the analyzed time series of electricity consumption show different characteristics (especially the distribution of missing data is very diverse).

The purpose of the analysis is to find the best imputation method. The chosen error measure, RMSE (mean squared error), measures the average deviation of real variables from imputed values. The smaller the RMSE, the better the method of imputation of missing values.

The results of applying the proposed method are shown in Figures 2-7. The figures show the RMSE errors for each object and each of the 11 imputation methods for missing values.

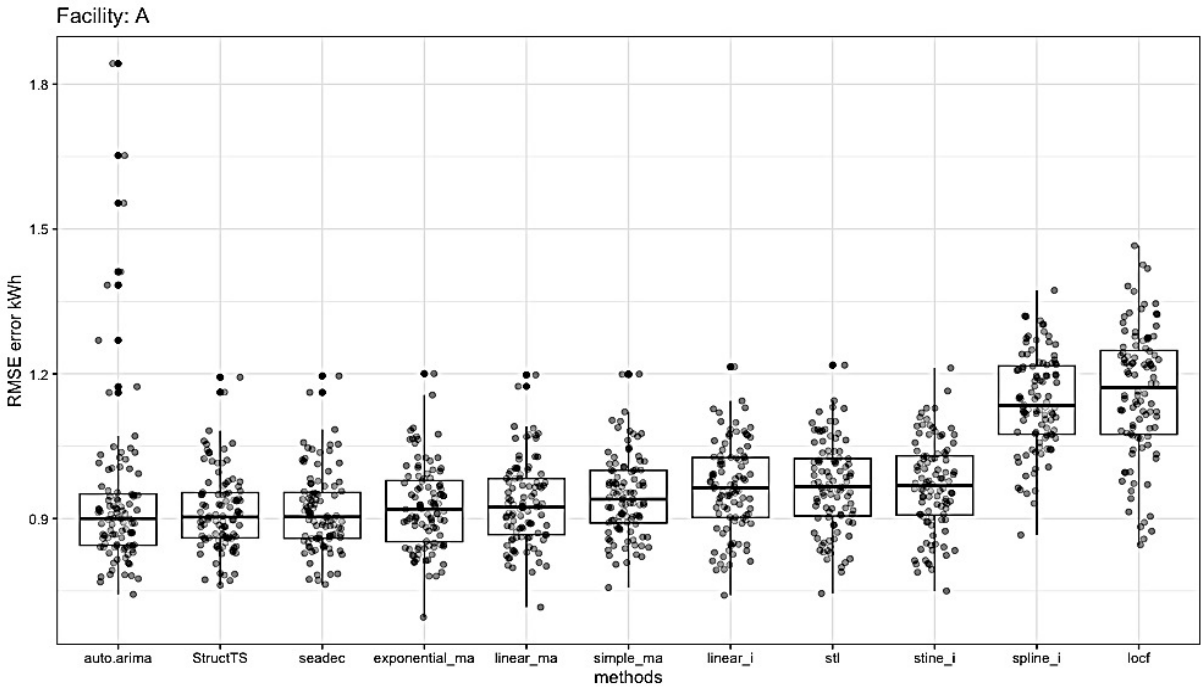

Figure 2. Distributions of RMSE error values for different imputation methods for Facility A.
Source: own study.

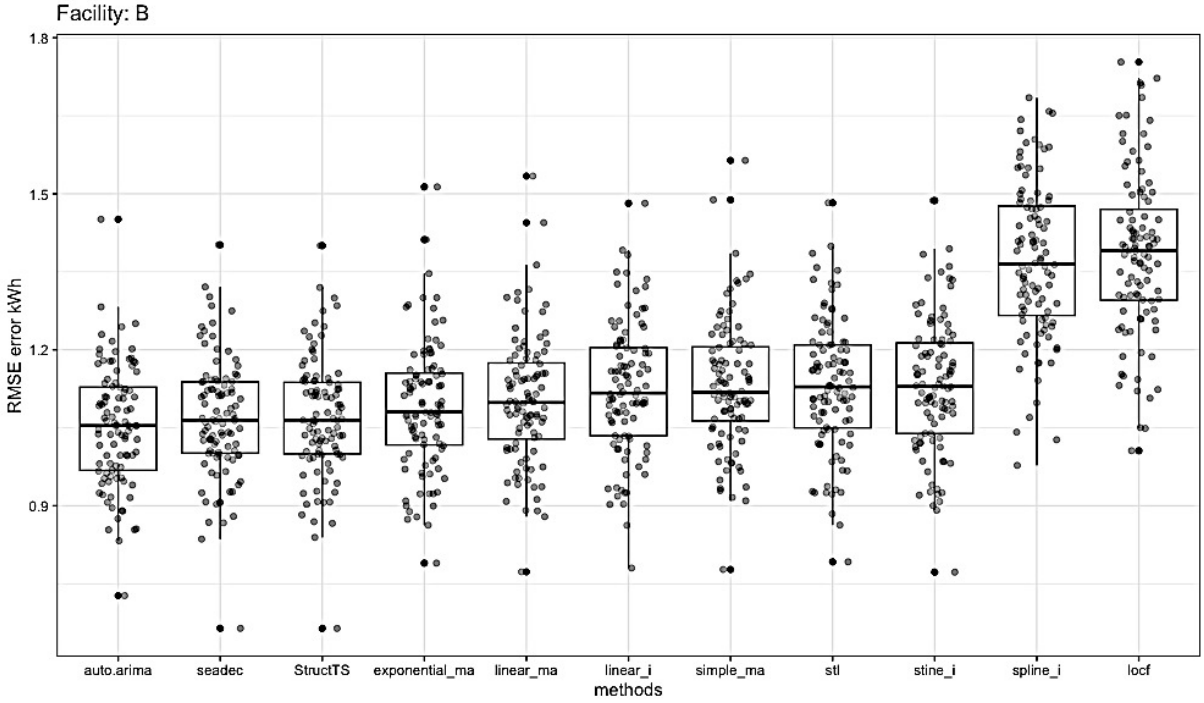

Figure 3. Distributions of RMSE error values for different imputation methods for Facility B.

Source: own research.

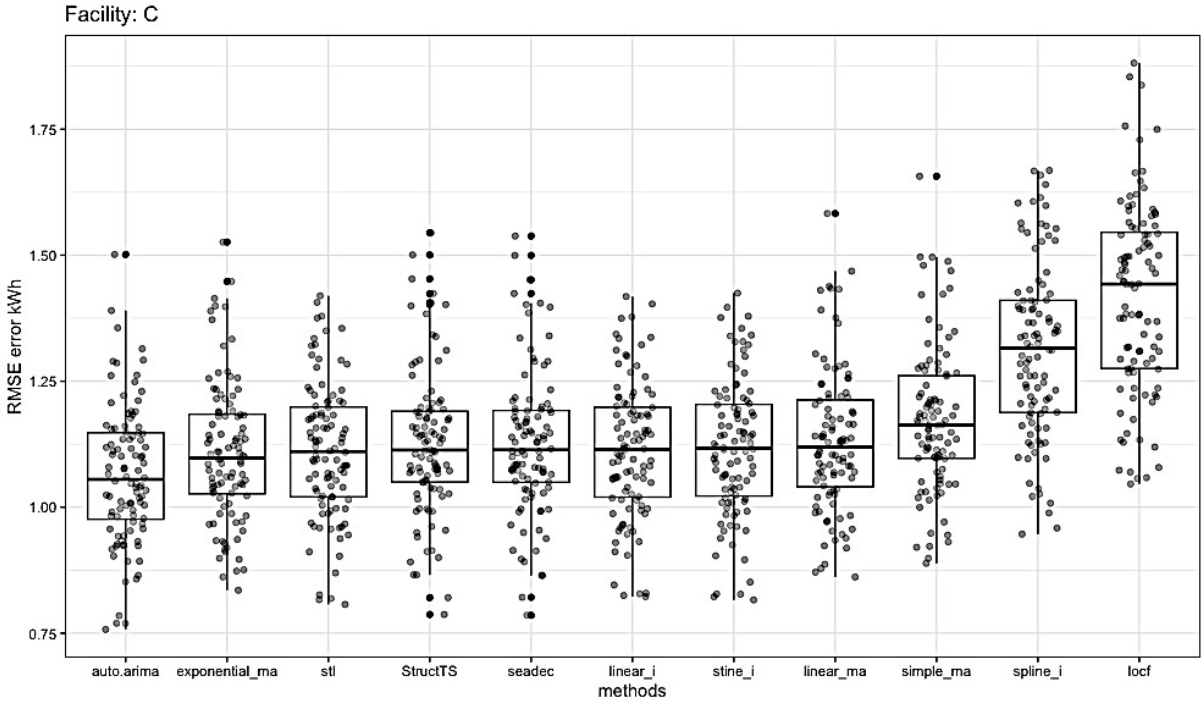

Figure 4. Distributions of RMSE error values for different imputation methods for Facility C.

Source: own research.

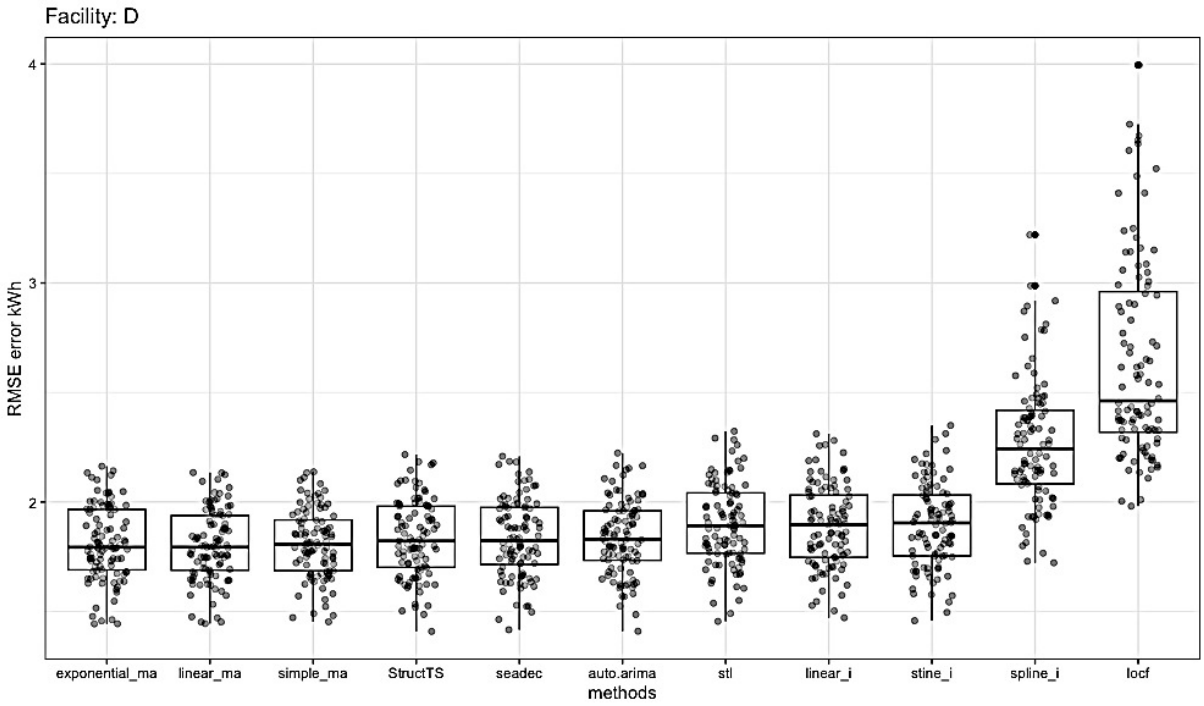

Figure 5. Distributions of RMSE error values for different imputation methods for Facility D.
Source: own research.

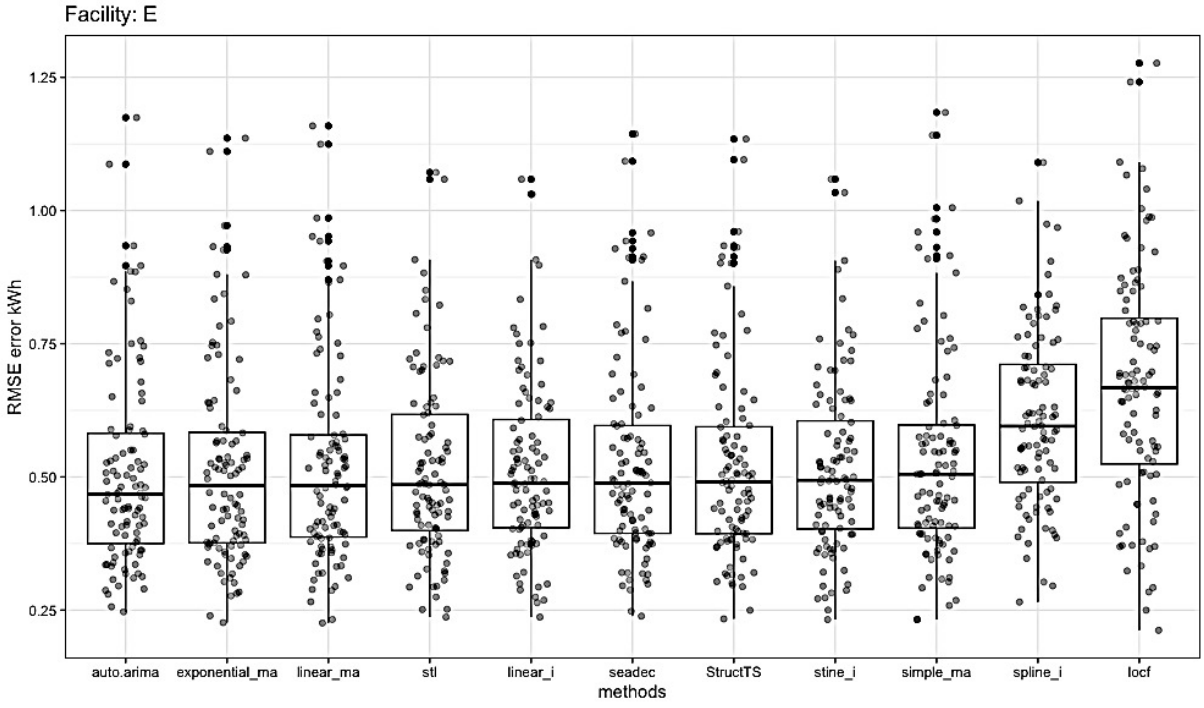

Figure 6. Distributions of RMSE error values for different imputation methods for Facility E.
Source: own research.

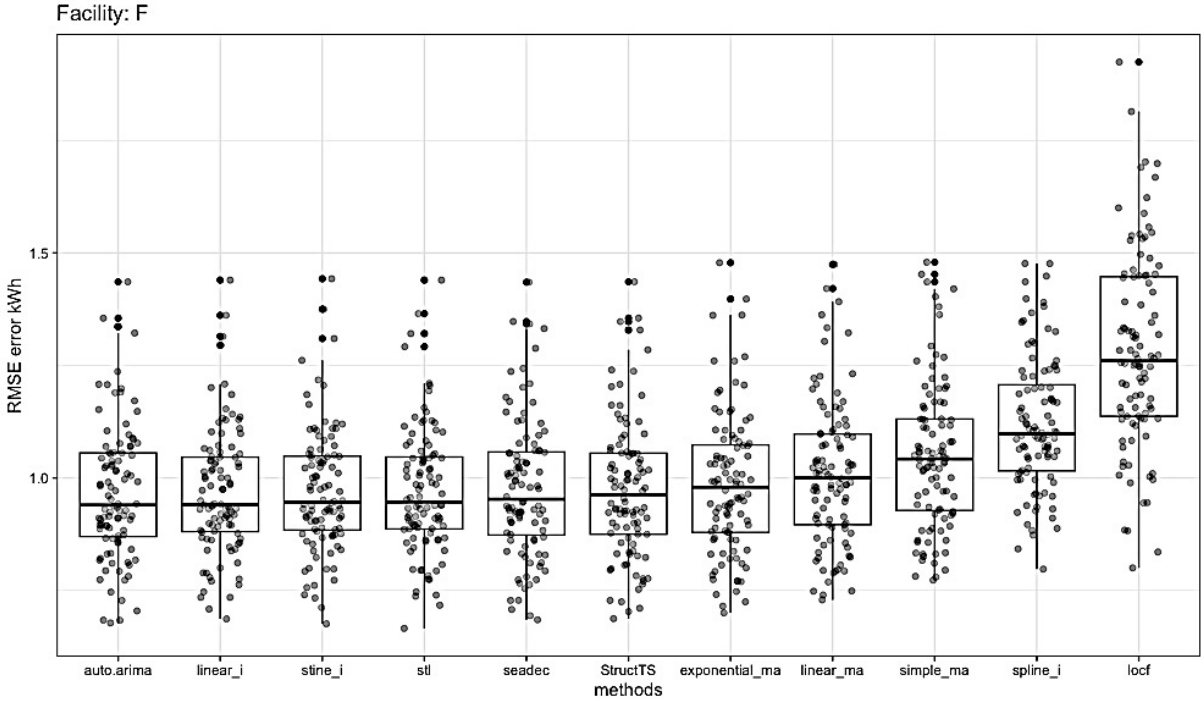

Figure 7. Distributions of RMSE error values for different imputation methods for Facility F.
Source: own research.

As can be seen from Figures 2-7, in most cases the RMSE error is smallest for the ARIMA method (auto_arima).

In order to select the best imputation method, ranks were used. As shown in Table 3, the lowest imputation error (RMSE) is generated by the 'auto.arima' method for 5 out of 6 facilities. Only for Facility D, the best imputation method was found to be 'exponential_ma'. As indicated in Table 1, in this case, the percentage of missing values was the highest (around 19%), which is approximately 4 times higher than in the other cases.

Table 3.
Ranks for facilities due to RMSE

method	facility						facility rank						SUM
	A	B	C	D	E	F	A	B	C	D	E	F	
auto.arima	0.90	1.05	1.06	1.83	0.47	0.94	1	1	1	6	1	1	11
exponential_ma	0.92	1.08	1.10	1.79	0.48	0.98	4	4	2	1	2	7	20
seadec	0.90	1.06	1.11	1.82	0.49	0.95	3	2	5	5	6	5	26
StructTS	0.90	1.06	1.11	1.82	0.49	0.96	2	3	4	4	7	6	26
linear_ma	0.92	1.10	1.12	1.79	0.48	1.00	5	5	8	2	3	8	31
linear_i	0.96	1.12	1.11	1.90	0.49	0.94	7	6	6	8	5	2	34
stl	0.97	1.13	1.11	1.89	0.49	0.95	8	8	3	7	4	4	34
simple_ma	0.94	1.12	1.16	1.81	0.51	1.04	6	7	9	3	9	9	43
stine_i	0.97	1.13	1.12	1.90	0.49	0.95	9	9	7	9	8	3	45
spline_i	1.13	1.37	1.32	2.24	0.60	1.10	10	10	10	10	10	10	60
locf	1.17	1.39	1.44	2.46	0.67	1.26	11	11	11	11	11	11	66

We are looking for a universal method of the imputation of missing values that can be used for the series of energy consumption from individual consumers. As pointed out by Moritz et al. (2015), one-dimensional time series is a particular challenge in the field of imputation research.

One-dimensional series of energy consumption in the context of missing data were previously analyzed for business customers data (Kowalska-Styczeń et al., 2022). The analysis of the structure of this data prompted the authors to choose three methods of the imputation of missing data: the calendar method, the imputation method by separating the phases of seasonal cycles and the imputation method using seasonality decomposition. In this article, also methods from "ImputeTS" package in R were used, such as "Seasonal decomposition with Kalman smoothing" (seadec), "Seasonally Splitted Missing Value Imputation" (na_seasplit), "Simple moving average" (simple_ma), "Linear moving average" (linear_ma) and "Exponential moving average" (exponential_ma).

The data analyzed in this article concerns individual customers and their structure is different than in the case of business customers (especially the distribution of missing data was very diverse). Therefore, a procedure based on the KSSA algorithm, which allows for simultaneous testing of many imputation methods for one-dimensional series, has been proposed. This may be interesting from the point of view of practitioners (e.g. energy trading companies). The proposed automated method of dealing with missing values may contribute to the improvement of electricity consumption forecasts.

5. Conclusion

The increasing demand for electricity necessitates the need for energy conservation, which includes the implementation of improved energy management systems, even for households. In this context, the key aspect is the application of methods that enhance the accuracy of individual consumption forecasts at specific points of energy consumption. Missing values in historical data pose a barrier to improving forecasting accuracy for individual consumption points. In this case, an estimate of the deficiencies in the historical time series has to be made and then the missing values should be replaced with these estimates, which is called missing data imputation or gap filling. As shown earlier, there are many methods and approaches for the imputation issue. However, it should be noted that univariate time series require an individual approach to data imputation problems as they do not contain additional attributes. Therefore, we propose utilizing a method based on the KSSA algorithm, which allows for testing multiple methods of missing values imputation. This can be a great convenience for practitioners interested in improving the quality of data and, consequently, improving electricity consumption forecasts.

For our analysis, we selected objects characterized by varying lengths of energy consumption series and different statistics regarding missing values and energy consumption. The results of our analysis demonstrate that the KSSA algorithm is a reliable tool for imputing missing values in electricity consumption series. For 5 out of 6 facilities, the 'auto.arima' method proved to be the best imputation method. In further research, we intend to analyze a larger number of objects with diverse characteristics to ultimately confirm the selection of this method as the best for imputing missing values in household electricity consumption series.

Acknowledgements

This paper was published as part of the statutory research ROZ 1: BK-274/ROZ1/2023 (13/010/BK_23/0072) at the Silesian University of Technology, Faculty of Organization and Management.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

PRACTICAL APPLICATION OF THE DELPHI METHOD TO IDENTIFY KEY FACTORS OF SOCIAL CHANGE IMPLEMENTATION

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Purpose: The aim of the paper is to demonstrate the methodology and applicability of the Delphi method for the identification of key factors of social change implementation.
Design/methodology/approach: This article represents a theoretical study, based on the literature review and the authors' own research experience.
Findings: As a general review, this paper provides knowledge on the genesis, the genesis, possible application, principles, strengths, and weaknesses of the Delphi, as well as presents research procedure of this technique.
Practical implications: The application of the Delphi method allows scientific evidence to be translated into the planning and implementation of effective public policies. An elementary requirement of rationality in public policymaking is the use of logical and fact-based justification. Nevertheless, referring to facts requires clarification, which is what they are called, i.e., finding out what results of observation or analysis of a given phenomenon will be useful. Thus, a rational basis for the actions of public authorities can be formulated. The application of the Delphi method allows scientific evidence to be translated into the planning and implementation of effective public policies.
Social implications: The use of the Delphi method to support decision-making processes during the selection of objectives or the way in which they are implemented in public policies contributes to a better spending of the cohesion policy funds. It is also important to underline the frequent use of the Delphi method for the evaluation of financial allocations within specific programming periods in the European Union and the importance of this process for the effective management of public funds.
Originality/value: The main contribution of this article is a detailed description of the research procedure using the Delphi method. The article is addressed to researchers in the field of public management sciences who are looking for original research methods as well as to policymakers seeking a rational and evidence-based basis for decision-making.

Keywords: methodology, Delphi method, public management, public policy.

Category of the paper: General review.

1. Introduction

Social change is any significant change in social structures, norms and customs, social institutions, social roles, and the values that determine people's actions, life plans, and worldviews. Social change can be considered a revolution, evolution, or modernization. It may follow a gradual emergence of changes in society (in the social system), taking place in stages. In the study of social phenomena, including change associated with the functioning of social systems related to the provision of public services, the contextual determinants of social processes should be sought. Defining reliable findings on the context in which the phenomenon of social change takes place is a major challenge for the researcher, as in social systems both the problem and the corresponding solution emerge gradually. Hence, the need to search for a new, or rather, dust off and restore the old research technique, because inductive approaches and qualitative methods contributed significantly to the construction of organisation and management theory a century ago (Czakon, 2009). Also, the combination of approaches typical for different disciplines is no longer regarded as reprehensible and subject to environmental ostracism but is gaining a growing group of supporters. What is even more obvious is that the more we give our approval to the statement ‘people build their worlds, construct their institutions (society), and knowledge is socially constructed’, the greater our tendency to strive for cognition to be close to the ideal, thus we make it by multiple methods (Czarniawska, 2010, p. 14). Czarniawska (2010) strongly valorises the notion of 'constructing' and encourages to consider the usefulness for the discipline of management science of research carried out in the regime of constructivism. We can now see constructivism as a fractious method of studying, among other things, organizations, and their lives because humans are social beings, and their creations include organisations as well. Such a statement encourages to consider it true that the cognition made by the researcher should be more social. This statement corresponds to the assumptions adopted for constructivism that an individual's knowledge is the result of his or her active action and is therefore a construction created by the learning subject; the acquisition of knowledge is a process during which the individual organises his or her world; this process takes place in constant interaction with the environment and confrontation with oneself to result in the reconstruction of one's own image of the world. This creative search for the context in which change takes place can be facilitated by, among other things, using the Delphic method, which is demanding, but at the same time offers a chance to gain a deep insight into the conditions in which a social phenomenon occurs.

The purpose of this paper is the detailed description of the research procedure using the Delphi method in the social science. It contributes both to the public management theory, as well as practice of public policy making processes, offering the evidence-based approach to the management of public organizations and the design of public policies towards social change.

2. Genesis, application, characteristics, and principles of the Delphi method

The Delphi method is a commonly accepted exploratory research approach (Kraus et al., 2017). Also known as the expert method, it is one of the intuitive heuristic methods (Sudoł, 2016) and is a special process of systematically agreeing on expert opinions (Linstone, Turoff, 2002). As a social and political research technique, it is used to generate consensus among experts dealing with complex issues (Robertson et al., 2017; Profillidis, Botzoris, 2019).

The genesis of this method is to be found in the shortcomings of traditional forecasting methods in areas where precise scientific knowledge had not yet been established. The Delphi method was developed at the beginning of the Cold War as a result of attempts to predict the impact of technology on warfare. In the 1950s, mathematicians N. Dalkey and O. Helmer, employed by the US research organisation RAND Corporation, introduced surveys of individual opinions based on multiple repetitions with feedback from the results of a previous survey. The aim was to make long-term predictions about the future. This gave rise to the Delphi method. The name ‘Delphi’ was invented by A. Kaplan, a qualified philosopher also employed by the RAND Corporation (Taghipoorreyneh, 2023).

The Delphi technique was initially used in foresight projects (Dalkey, Helmer, 1963). Nevertheless, Sudoł (2016) indicates that limiting this method to forecasting the future is an unjustified narrowing due to its universal character and important insight into the analysed problem. The scope of the Delphi method can be much wider, and it can be successfully applied to study existing reality (Delbecq, Van de Ven, Gustafson, 1975). Indeed, as Flostrand (2017, p. 230) indicates, ‘the Delphi technique has been used to poll and aggregate information from experts in a number of management disciplines’. Also, Okoli and Pwalowski (2004, p. 16) highlight that ‘researchers have applied the Delphi method to a wide variety of situations’.

In this regard, the possibility of using the Delphi method for the development of social science in the discipline of management science is increasingly being pointed out in the literature, mentioned by Sudoł (2016), Landeta (2006), Matejun (2012) and Baron et al. (2015).

The Delphi technique, based on the rationale that 'two heads are better than one' (Dalkey, Brown, Cochran, 1969), 'may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem' (Linstone, Turoff, 1975, p. 3), characterized by dependence on many factors that are difficult to quantify (Sudoł, 2016). The Delphi method is especially 'used to establish a highly qualitative solution to a specific issue where no exact knowledge currently exists' (Kraus et al., 2017). Consequently, 'this allowed new ideas to emerge, founded on the knowledge pooled from panelists' expertise, and ensured that all views were actively engaged' (Toumbourou, 2020, p. 2).

The Delphi method is a series of questionnaires, where subsequent questionnaire is built upon responses to the preceding questionnaire (dell'Olio et al., 2018). Therefore, experts can consider and revise their views after analysing the feedback reports summarising the views of other panellists. The aim is to obtain the most reliable consensus of the expert panel (Naisola-Ruiter, 2022)

The Delphi method must meet the following four criteria (Borodako, 2009; Landeta, 2006; Landeta, Barrutia, 2011):

- **Anonymity**. The experts remain anonymous. The members of the expert panel are known by the study moderator, but they do not know each other, and the individual responses of participants are known directly only to the research coordinator.
- **Repetitive of the process**. The experts must be consulted at least twice on the same question, so that they can revise their views, aided by the information they receive from the rest of the panellists. The data from the previous round are used to create the subsequent round.
- **Controlled feedback**. The exchange of information between the experts is carried out by means of a study moderator, controlling the quantity and quality of the feedback, so that all irrelevant information is eliminated.
- **Statistical analysis.** The questions are formulated so that the answers can be processed quantitatively and statistically. It is done by appropriately quantifying the qualitative responses given by experts to the questionnaire questions. The responses are then analysed statistically using measures of central tendency – median, quartiles, arithmetic mean, dominant, and measures of dispersion – primarily standard deviation. Respondents are informed after each round about the statistics of each questionnaire item, so that they have the opportunity to compare their own position with the group and to change their own view.

The literature points to several advantages as well as disadvantages of the Delphi method (Table 1).

Table 1.
Advantages and disadvantages of the Delphi method

Advantages	Disadvantages
• Flexible methodology and simple execution. • Anonymity eliminates disadvantageous group phenomena – prevents domination by certain individuals, removes the sense of danger associated with confronting one's own position with the opinion of others, guarantees full honesty of respondents and eliminates the influence of the social group on opinions. • Reduction in the influence of undesirable psychological effects among the participants. • Independence of expert opinion. • Fosters a climate of exploration, creativity and self-development among participants. • Selective feedback of the relevant information. • Extensive consideration thanks to the repetition. • Possibility of reaching a consensus in a specific area of uncertainty or in the absence of empirical evidence. • Possibility of remote communication – the ability to participate regardless of the space separating individual respondents from each other or from the moderator. • Reconciliation and aggregation the opinions of competent persons. • Creating multidisciplinary synergies. • Exploit of the creative synergies resulting the combination of effort and knowledge of experts in the area where no exact knowledge currently exists. • Use of an iterative mechanism for collective learning and drawing conclusions. • Multi-stage approach eliminates elements of participants' preconceptions that may distort the reality of the issue described – gives more and more objective results with each round. • Statistical processing and presentation of results.	• Ease inherent in the methodology of interested manipulation by the person running the study. • Significant dependence of the results on the selection of experts and on the quality and design of the questionnaire. • Time required to carry it out – relatively long period for obtaining results. • High organisational requirements. • Effort required on the part of the participants. • Difficulty in selecting experts. • Lack of clear rules for the inclusion of persons in the expert panel and its optimal size. • Difficulty of actually assessing the expertise of the panel participants. • Little involvement of experts if they are not introduced to the details of the study. • Limitation of the interaction involved in written and controlled feedback – lack of opportunity for a direct exchange of views between participants. • Restriction to the possibility of social compensation for individual contribution to the group (the reinforcement and motivation normally provided by the support and social approval of the other expert group members are removed). • Impunity conferred by the anonymity with respect to irresponsible actions on the part of the experts. • Use of consensus as a way to approach the truth, while consensus is defined by study's moderato • Difficulty to normalise, objectify and standardise it, given the qualitative features. • Lack of validation. • Difficulty of checking the method's accuracy and reliability. • Sensitivity of results to ambiguity.

Source: Delbecq, Van de Ven, Gustafson (1975); Flostrand (2017); Górski, Skorupka (2011); Landeta (2006); Matejun (2012); Pritchard (2002); Taghipoorreyneh (2023).

In despite of these weaknesses, results for the application of the Delphi method are mostly positive (cf. Cleemput et al., 2015; Landeta, 2006; Wiewiora et al., 2016). 'On the other hand, we have observed that, when this method is used without the required knowledge, the characteristics inherent in the methodology usually result, on occasion, in a certain „disappointment" with the technique, both among researchers running a Delphi exercise for the first time as well as in those who take part as experts in this research' (Landeta, 2006, p. 469). Thus, the use of this method requires good understanding and conscientious preparation, followed by a lot of work and effort involved in its execution.

3. The Delphi method research procedure

In the Delphi approach 2 to 4 rounds are considered optimal, while expert groups typically reach broad consensus after 3 rounds (Flostrand, 2007; Sudoł, 2016). The experience of other researchers shows that in the third and subsequent rounds, the results of the survey do not change substantially from round two (Kowalewska, Głuszyński, 2009). In the described research, three rounds were conducted.

To ensure the relevance and accuracy of the results, a rigorous selection of experts is necessary in the Delphi method (Landeta, 2006; Toumbourou, 2020). In a typical procedure the emphasis is on expertise rather than on statistical representation, thus a convenience sample of experts is used (Flostrand, 2017). The definition of expert in the Delphi approach has been constantly expanded. There is a growing trend in the application of the Delphi method to involve a wide variety of stakeholders (in terms of education, occupations, and experience) in the belief that a multiplicity of perspectives is a valuable asset. Individuals who have knowledge of the subject of the study are invited to participate, although this does not necessarily have to be documented by formal education or achievements in this field (UNIDO, 2005). Delphi generally targets experts with diverse backgrounds, rather than using a homogeneous panel of experts (Linstone, Turoff, 2002; Wiewiora et al., 2016).

The size of the respondent panel is variable, but usually varies between 20 and 30 experts (Sekayi, Kennedy, 2017). Accroding to Pawłowski (2010), a minimum of 25 experts must participate in each survey round.

Then, as Delbecq, Van de Ven and Gustafson (1975) argued, alongside with the selection of experts, development of the Delphi questionnaire is the key. The Delphi questions might focus upon problems, objectives, solutions, or forecasts. If respondents do not understand the purpose or particular questions, they may answer inappropriately or become frustrated with the questionnaire and lose interest. In the questionnaire applied to identify factors of social change implementation, Likert scale may be adapted (Elliott, Woodward, 2007). The questionnaire included then statements on the proposed factors and experts are asked to assess the importance of each factor. The 5-point rating scale is used: 1 – very low importance, 2 – low importance, 3 – medium importance, 4 – high importance, 5 – very high importance.

Since the Delphi method is a series of consecutive questionnaires and entire research procedure remains anonymous (Kraus et al., 2017), the distribution of questionnaires is necessary. In the classic version, the questionnaires were transmitted through the mails (Linstone, Turoff, 1975). Nowadays, traditional mail has been replaced by e-mail or online instruments (Cleemput et al., 2015; Grant, Armstrong, Khodyakov, 2021; Kraus et al., 2017; Northcote et al., 2008).

It is generally accepted (see Delbecq, Van de Ven, Gustafson, 1975; Hill, Fowles, 1975; Matejun, 2012) that the three-rounds Delphi method consists of ten stages:

1) Conceptual phase – development of the questionnaire.
2) Selection and contact with potential experts, determining the conditions for participation in the study and compiling the final list of experts.
3) Selection of the sample size.
4) Distribution of Questionnaire #1, forming preliminary positions by the experts and returning the questionnaire.
5) Analysis of Questionnaire #1 with the use of statistical tools and developement of the subsequent questionnaire.
6) Distribution of Questionnaire #2. The experts tak *getting acquainted with* the combined results, reflect on these and can alter their judgements. Respondents returning the questionnaire.
7) Analysis of Questionnaire #2 with the use of statistical tools and developement of the last questionnaire.
8) Distribution of Questionnaire #3. The experts *getting acquainted with* the combined results, reflect on these and can alter their judgements. Respondents returning the questionnaire.
9) Analysis of Questionnaire #3 with the use of statistical tools and formulation of conclusions.
10) Preparation of final report.

In order to determine whether the consensus between expert opinions have been reached, the interquartile range (IQR) can be applied. The aim of the Delphi method is to narrow down it during subsequent rounds of study. In addition, the median (M) is calculated (Mullen 2003; Pawłowski, 2010). IQR comprise 50% of all measured values of a variable and is located between quartile 1 (Q1) and quartile 3 (Q3). The interquartile range tells the spread of the middle half of distribution The median is the value in the middle of a data set (Ross, 2010).

When the scale from 1 to 5 is adopted, the consensus can be defined as IQR between 3.5 (Q1) and 5 (Q3). This means that the factors whose importance ratings are agreed by the experts between 3.5 and 5, are considered key factors in of social change implementation.

4. Application of the Delphi method in the identification of key factors of social change implementation

The Delphi method is especially useful in the identification of key factors of social change implementation for several reasons. First, because of its anonymity reduces the influence of disadvantageous and undesirable psychological effects among the participants (Landeta, 2006).

The anonymity prevents domination by certain individuals (Kraus et al., 2017), allows to avoid the negative influence that could be exercised by factors in the individual answers in terms of the personality and status of the participating experts (Landeta, 2006), removes the sense of fear of authority and danger associated with confronting one's own position with the opinion of others, guarantees full honesty of respondents and eliminates the influence of the social group on opinions (including group think syndrome). In an atmosphere of anonymity, respondents can become authentic and engaged participants in the discussion. They have the chance to feel equal to the other members of the expert panel, free from the influence of the group, and are therefore willing to address topics relevant to themselves. Furthermore, they have the confidence that by changing their own answers in the next Delphi round they will 'not lose face' (cf. Mullen, 2003).

Second, given that Delphi does not require face-to-face contact, it is useful for involving experts who cannot come together physically (personally), or it would be difficult (Sekayi, Kennedy, 2017). In the carried out study, it would be particularly difficult to bring together such a large and diverse group of experts, and to bring the discussion under control. Moreover, because participants receive the questionnaire, they have longer timeframe to answer and freedom/ discretion as to when exactly they do it (Okoli, Pawlowski, 2004).

Third, the Delphi method enable the exploit of the creative synergies resulting from the combination of effort and knowledge of experts in the area where no exact knowledge currently exists. The application of this method allows the use of an iterative mechanism for collective learning and drawing conclusions (Matejun, 2012). The Delphi makes use of consensus instead of focusing on differences between opinions. Participants are able to alter their opinion and adapt their views by having more time to overview their prior answers and reflect on these. Moreover, the Delphi technique obtains a high degree of effectiveness in regard to the accuracy of results because it allows for successive rounds of judgments to be sought and then clarifies (Dalkey, Helmer, 1963; dell'Olio, 2018).

Similarly, Kraus et al. (2017) indicate that Delphi technique has advantages over other qualitative methods which seek to gather expert opinion in issues concerning social change and public policies. The cited authors point to three advantages of this method. First, the approach is based on anonymity. Second, the participants do not have a fixed timetable regarding when the discussion will take place, but they have a longer timeframe to answer its respective questions. Third, the Delphi method obtains a high degree of effectiveness regarding the accuracy of judgments. The participants can alter their opinion and may adapt their views by having more time to review their previous answers and reflect on these.

In turn, Wiewiora et al. (2016, p. 492) in the study of the public services provision process, selected the Delphi method *as an appropriate technique to gain a better understanding of infrastructure-based public service delivery concerning the involvement of key actors in that process*. They argue that using this technique allowed capture the opposing views of experts across various management organizational, disciplinary and sectoral arenas to eventually obtain an agreement on important public policy issues (Wiewiora et al., 2016)

The applications of the Delphi method in social science, as Landeta (2006, p. 472) emphasizes, *highlight how this technique may be adapted to different social realities and requirements, making a positive contribution to social progress, provided it is applied with the necessary methodological rigour and with a good knowledge of the social medium in which it is being applied*. Therefore, this approach can be successfully used to support decision-making processes during the selection of objectives or the way in which they are implemented in public policies.

5. Summary

In conclusion, the value of the Delphi method for identifying the conditions for implementing new solutions in planned changes to public policies should be emphasized. Public policies are activities aimed at solving the problems of a community related to the provision of public goods, where the ultimate aim should be rational decision-making. The stages of this process are (1) recognition of conditions (facts), (2) selection of objectives (in the context of the recognised facts and in the light of the values of the decision-maker), (3) adjustment of measures to the objectives, (4) implementation, and (5) evaluation of the results obtained. An elementary requirement of rationality in public policymaking is the use of logical and fact-based justification. Nevertheless, referring to facts requires clarification, which is what they are called, i.e., finding out what results of observation or analysis of a given phenomenon will be useful. Thus, a rational basis for the actions of public authorities can be formulated. The application of the Delphi method allows scientific evidence to be translated into the planning and implementation of effective public policies. However, this depends on to the simultaneous fulfilment of several conditions. First, the problem has a clear scientific explanation. Second, its causes are reliably identified. Third, the selection of experts for the expert panels is correct so they have the knowledge and experience necessary to generalize the observed phenomena. Finally, it should be stressed that although it is currently a fashionable method used especially for the evaluation of the disbursement of aid available under the cohesion policy, it is a method that requires reliable research skills and considerable professional knowledge.

While this paper offers some directions and strategies for public managers and policymakers seeking a rational and evidence-based basis for decision-making, there are also several limitations. Firstly, the article constitutes a general overview and represents a theoretical study based on the literature review and the authors' own research experience, which may interfere with scientific objectivity. Secondly, the traditional literature review, which is not systematic, has been conducted. Therefore, not all key publications may have been cited.

Acknowledgements

This work was supported by the National Science Centre, Poland under Grant 2020/37/N/NS4/01600 entitled "Co-production ecosystem – the factors favouring the co-production of social services".

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

NEGOTIATIONS UNDER PANDEMIC

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Purpose: to present the concept of describing the determinants of socio-economic negotiation processes resulting from the Covid-19 pandemic.
Design/methodology/approach: the paper is based on the author's own concept of negotiations description supported by the comparative analysis of selected works by other authors.
Findings: comprehensive explanation of the specific determinants and features of negotiations in pandemic, including both positive and negative impact of Covid-19 on negotiations; such explanation reflects their real nature (essence) and allows us to conduct them effectively as well as facilitate the research on them.
Practical implications: the presented concept can constitute useful basis for the analysis of unusual negotiation situations, deviating from the routine, as well as the ones conditioned by the pandemic.
Social implications: that concept helps to be aware of specific features of such negotiations and to develop proper attitudes to them, substantially reflecting those features.
Originality/value: the paper contains original author's concept which contributes to the performance of managers and other people responsible for conducting negotiations under pandemic. The clarification of specific features of such negotiations facilitates searching for effective tools of conducting those negations in practice.

Keywords: socio-economic negotiations, pandemic Covid-19, the impact of pandemic on negotiation processes.

Category of the paper: viewpoint.

1. Introduction

There has been a Covid-19 pandemic in the world for more than three years. Its impact significantly and quickly changes the nature and course of many different types of projects. It has a significant impact on our professional and personal lives. It also concerns the processes of socio-economic negotiations, which are therefore becoming more and more difficult and even unpredictable. Therefore, it becomes necessary to identify and analyze the nature and scope of the impact of the pandemic on these processes.

The aim of the article is therefore to present the author's concept of describing the determinants of socio-economic negotiation processes resulting from the occurrence of the Covid-19 pandemic. These determinants can be of two types.

1. Negative, i.e. defects, weaknesses, difficulties, etc., which constitute significant limitations to the negotiation processes, hindering their implementation.
2. Positive, i.e. advantages, strengths, facilitations, etc., which create new opportunities, facilitating negotiations.

It can be assumed that the conditions of the first type prevail, because the pandemic mainly has a negative impact on all spheres of our lives. The latter ones have a much lesser impact on the conduct of negotiations.

2. Literature review

As far as the state of research on the impact of the pandemic on the processes of socio-economic negotiations, a number of publications on this subject have been published in the last three years. After their careful analysis, the most representative bibliographic works were selected. Many of them are of a general nature, i.e. they refer to the entire negotiation process, e.g. (Majchráková, Kremeňová, 2022; Najam, 2020; Shonk, 2020). Some of them concern selected types of negotiations, e.g. international (Sarnet, 2021; Yu 2021), in the field of mergers and acquisitions (Subramanian, Petrucci, 2021), or collective ones (Fay, Ghadimi, 2020). Some works deal with negotiated agreements (Anisimovic, 2020; Johnston, Meakin, 2021; Mulligan et al., 2022; Subramanian, Petrucci, 2021). Others focus on detailed negotiation tools, e.g. making proposals (Kowalewski, 2021) or selection of effective negotiation techniques (Nandkeolyar, 2021).

3. Research methods

The paper is of theoretical character, i.e. contains author’s original concept. In order to describe the determinants of negotiations under pandemic in the main parts of the paper, the author's original approach to the key aspects of the interpretation of negotiations was adopted as a methodological scheme (Kozina, 2018, pp. 13-17), i.e. as a process, method of conflict management and reaching agreement, mutual dependence of the parties and processes of: decision making, communicating, mutual exchange and value creation. These aspects were distinguished based on the analysis of the extensive literature on the subject, e.g. (Jung, Krebst, 2019; Lewicki et al., 2018; Rockman et al., 2020; Thompson, 2013). The author's own approach

to the considered determinants was supplemented with selected findings by other authors based on a comparative and critical analysis of the literature on the subject.

The next parts of the paper present the results of the analysis of the determinants of negotiation processes resulting from the impact of the pandemic. These results were compiled in accordance with the aspects of the interpretation of the negotiations distinguished above. In some cases, recommendations are also included that may counteract this impact. Based on the description of these conditions, the summary lists the essential features of negotiation processes in the era of a pandemic and indicates the directions of research enriching the proposed concept.

4. Negotiation process under the pandemic

Negotiations are a comprehensive action extended over time, including a number of sub-processes (stages, phases), and within them specific actions, carried out sequentially, in parallel and/or cyclically, as well as a number of events and interactions between the parties. An important feature of negotiations is their changeability, which makes modelling them difficult. They are auxiliary in relation to the processes and basic projects implemented in the organization.

Due to their complexity and volatility, negotiation processes in general, and those discussed here in particular, are not easily structured. They are difficult to program into procedures. They can have a disorderly, unpredictable and even random course. Many activities are carried out intuitively.

One should agree with the opinion that the pandemic not only multiplied the number of negotiation processes and changed their form, but also caused a change in the perception of the process by the parties. Today, negotiations often take place at a much higher level of emotion. This is because people often transfer to the negotiation process a sense of person-al threat, uncertainty about the business future and the stability of the conditions in which they operate in the process (Kowalewski, 2021).

On the other hand, the occurrence of a pandemic, and in particular the virtualization of contacts, makes the implementation of negotiation processes faster, as it is necessary to consider fewer issues and requires simplified coordination of activities carried out as part of a smaller number of interactions. Negotiation processes are simplified and spontaneous, somewhat reflexive, located in areas where a problem arises that requires their use. In addition, it is difficult to undertake multilateral negotiations due to the limited possibilities of analyzing their context, arranging talks and conducting them.

5. Negotiations during the pandemic as a method of conflict management

This is their competitive dimension, as their parties strive to achieve their own goals and obtain the best possible results. Negotiators have divergent intentions and differing views on the contentious issues under consideration. It is therefore necessary to consistently seek solutions to these issues. Contradictions also concern values, principles, expectations, imaginations, etc., which create the emotional context of negotiations, significantly affecting substantive issues, and in the case under consideration, having a great importance (as mentioned above).

On the one hand, due to the limited exchange of information and the narrow scope of interaction in the conditions of a pandemic, the number of potential conflicts between the parties to the negotiations is relatively small, although there may be very violent and sharp disputes regarding fundamental issues, mainly material ones. There may also be unnecessary conflicts of data and values, sometimes difficult to recognize, resulting from a lack of information and of understanding. As a result, the parties to the negotiations are then unable to properly identify and assess the causes, effects and the course of such conflicts, as well as the negotiation situation. The available data may be unreliable, erroneous, selective, incorrectly compiled, etc. or interpreted differently by the negotiators. These unnecessary disputes can stimulate real conflicts of interest. Therefore, it becomes necessary to provide a reliable and comprehensive explanation of the situation by confronting the avail-able information, which will prevent the escalation of conflicts.

On the other hand, the relative speed of action as well as the limited and virtualization of relations, and sometimes the anonymity of partners, mean that possible conflicts are mostly short-lived, imperceptible, and cannot fully reveal themselves, let alone develop. In addition, it is easier to use competitive negotiation techniques, take advantage of the effect of surprise or asymmetry of information, strengthen bargaining power, threaten and promise, bluff, etc., because the parties to negotiations can often be "poorly informed".

6. Negotiations under the pandemic as a method of reaching an agreement

This aspect concerns their intended result, beneficial for all participants, i.e. meeting their needs. They also have common goals, so they are interested in the effects of negotiations, which are important for them (tangible and intangible). The cooperation of the parties is therefore necessary to achieve the desired level of effectiveness. This, in turn, requires the conclusion of a series of contracts (open and secret) specifying the terms of the agreement between them.

In the conditions of a pandemic, the choice of partners for cooperation is difficult, be-cause the recognition of the negotiation environment, which is limited by necessity, in-creases the likelihood of interacting with random partners, which may be risky for the course and effects of negotiations. Therefore, there are cases of incorrect decisions regarding the selection of partners and/or disloyalty on their part, related to abuse of trust. The possibilities of identifying new, potential participants are also limited, in the absence of data on their credibility, reliability, etc.

In addition, in the era of a pandemic, limited, short-term or even virtual contracts are often concluded, which on the one hand frees us from permanent obligations, but on the other hand increases the risk of losses due to the partners' failure to meet contractual arrangements or the conclusion of incomplete contracts. Carefully review all your contracts to ensure that you have the right to suspend performance of the obligations involved or otherwise withdraw from contracts that are impossible to perform (Mulligan et al., 2022). In the event of difficulties in meeting the provisions of the contract concluded as a result of negotiations in the conditions of a pandemic, the possibility of invoking the so-called force majeure or an extraordinary change in relations, i.e. an event which, by its impact, destroyed the original calculations of the parties and which could not be predicted (Anisimowicz, 2020). However, care should be taken before invoking a force majeure clause as this may lead the contractor to believe that you have rejected the contract (Mulligan et al., 2022).

On the other hand, the pandemic is conducive to relying on proven partners, especially those whom you trust. Therefore, the scope of cooperation with them should be extended. In addition, contracts concluded during the pandemic are less extensive, simpler in their form and cover shorter periods of time, which reduces the risk of failure by negotiation partners to fulfil their obligations.

7. Negotiations as the mutual dependence of the parties determined by the pandemic

The interaction of the dimensions of cooperation (cooperation) and competition (rivalry), i.e. the coexistence of contradictory and convergent goals of the participants in the negotiations. It expresses the desire of the parties to achieve a result favorable to them, conditioned by the need to resolve the conflict between them. None of the parties can achieve its goals alone, and at the same time each of them can help others to achieve their goals.

In the era of a pandemic, the parties are often "doomed to each other", negotiating out of compulsion, not choice. There is much less interaction between them. Mutual relations are usually weaker, asymmetric, short-term or temporary. It is more difficult to build lasting positive relations, and even more so partnership. The negotiation process is seen as more brutal

and people have less trust in the other party (Kowalewski, 2021). In the conditions of a pandemic, there is therefore a much lower than usual probability of establishing and maintaining positive and beneficial relations with negotiation participants based on mutual trust. Of course, efforts are made to shape and maintain them to ensure effective cooperation beneficial to all, but this is not always possible and/or necessary. With limited access to data and virtualization of contacts, signals about disloyal or unreliable partners are difficult to access in the negotiation environment. What's more, generally "poorly in-formed" negotiating parties are less likely to establish and maintain positive relations and are less likely to use cooperation-oriented negotiation techniques. Cooperation and competition coexist in the form of coopetition strategies.

The positive side of the limited mutual dependence of the parties to negotiations in the era of a pandemic is that the relations between them are relatively easy to identify, and even more so to shape. In addition, you do not have to get too involved in their development, which is usually laborious and generally costly, and sometimes unprofitable or risky. Anonymous functioning in a negotiating environment may turn out to be more beneficial and even safer.

8. Negotiations during the pandemic as a decision-making process

Their most important interpretation focused on directly finding solutions to the negotiated issues by the parties involved. In the preparatory phase, this process is carried out by them independently of each other, i.e. each analyses the negotiation situation from the point of view of its goals and interests. On this basis, they determine initial solutions to the negotiated problems based on their own criteria for selecting solutions. Then, they iteratively make the necessary arrangements of variants, determining the area of negotiations, i.e. a set of acceptable solutions to the negotiated problems, based on the analysis of commonality and divergence of interests. By adopting common criteria and selection rules, they find a solution accepted by all.

In the conditions of a pandemic, all typical activities in the process of interactive decision-making by negotiators are difficult and unreliable, i.e. identifying problems, collecting and analyzing information, generating variants of solutions, selecting criteria for their assessment, making choices and necessary implementation work. This is the result of the lack of data and the limited relationship between the parties. The information needs of negotiators as decision makers are not fully met, and their decisions may be hasty, inaccurate, late, risky, etc. This increases the uncertainty of their actions.

The advantages of the decision-making process in negotiations during a pandemic include forcing the parties to decide, limiting the excess of information and no need to carefully select it, simplifying sometimes too extensive analyses and making choices faster and more precisely. As a result, decision-making processes are less time-consuming, although they are riskier.

It should be emphasized that it is not always appreciated how many decisions in times of crisis are made through negotiations. The speed and severity of the Covid-19 threat, uncertainty about information patterns, and above all, the novelty of the crisis, amplify the need and necessity of negotiations. On the other hand, the same factors make us more prone to panic (Najam, 2020). Moreover, in many situations it may be helpful to move from last resort (e.g. ultimatums, threats) to conditional measures and from a negotiating mindset to joint decision-making (Najam, 2020).

9. Negotiations under the pandemic as a communication process

That aspect concerns the mutual exchange of information, "permeating" all activities of the parties in the negotiation process, from the initial presentation of positions, through: shaping relationships, formulating and exchanging offers, persuading each other, asking questions and answering, listening, clarification of doubts, etc., until final arrangements and drafting of the contract.

As a result of the impact of the pandemic, the exchange of information in negotiations is significantly impoverished. Contact restrictions caused by the COVID crisis accelerated digitization as a large part of communication had to be moved to the virtual space (Majchráková, Kremeňová, 2022). Certainly, negotiators are not favored by a kind of artificiality of communication during online meetings. For hundreds of years, one of the elements supporting interpersonal communication, including negotiation, has been the ability to give and read signals, build relational capital resulting from direct interaction. The most important thing was meeting face to face (Kowalewski, 2021). The negotiating parties have limited access to all necessary information in real time. Not all data necessary for operation is public, presented to everyone on the forum. The lack of access to information and transparency of communication prevents negotiators from properly determining how to better achieve goals. It reduces the efficiency of analytical and diagnostic activities. It noticeably impoverishes the negotiation tools, i.e. reduces the number and quality of offers and the accuracy of arguments, reduces the effectiveness of questions, makes it difficult to clarify doubts and effectively select negotiation techniques. In addition, it is much more difficult to interpret and analyze the non-verbal messages of other negotiation participants and their emotional behavior. In general, it is impossible to fully meet the information needs of the negotiation participants, the throughput of communication channels deteriorates and the usefulness of information in terms of its detailed parameters, i.e. credibility, authenticity, appropriate form, appropriate detail, etc., decreases.

In turn, it is difficult to indicate the significant positive aspects of the impact of the pandemic on communication in negotiations. A noticeable advantage is undoubtedly the lack of the need to disclose certain data, which is sometimes a prerequisite for cooperation with negotiation partners. It's just easier to hide some inconvenient facts. You can also feel greater care for data protection and security, and sensitivity to potential threats in this area. It is easier to mask your own non-verbal signals and emotional reflexes and make it difficult for other parties to the negotiations to read their meanings.

10.Negotiations during the pandemic as a process of mutual exchange

That exchange takes place on terms jointly agreed by the parties, through mutual agreements and concessions. It is favored by the differences in the hierarchy of negotiators' goals, i.e. they strive to obtain significant resources and values, giving less important, but important for other parties, in return. It concerns not only measurable resources, but also intangible ones, i.e. ideas, concepts, solutions.

The adverse impact of the pandemic on the negotiation processes in this aspect is mainly expressed through difficulties in determining the scope and conditions of a possible exchange due to the limited scope of interaction and cooperation between the parties to the negotiations and the selective scope of communication between them. It is difficult to define and confront the preferences of the participants of the negotiations, their expectations can be and often are not disclosed or unclear. Potential exchange offers are temporary and focused mainly on material values. They can be unexpected and ill-considered. The creativity of the parties in the search for the exchange of irrational assets is limited and even undesirable. It is difficult for negotiators to find wider possibilities to meet their mutual needs. They reveal a tendency to formulate non-equivalent exchange proposals in order to achieve quick and short-term benefits, especially measurable ones. Positional negotiations, i.e. simple haggling, dominate. Possibilities in the selection of potential exchange partners and their offers are significantly limited. It is difficult to obtain and communicate complete and reliable information on the needs of the parties, as it is usually unavailable. Therefore, realistic proposals should be made, and not start with a "high C" (Kowalewski, 2021). It is particularly important to effectively listen to the partner and strive to meet their needs (Nandkeolyar, 2021). In addition, in efforts to negotiate solutions to the pandemic, three principles of negotiation are particularly useful: focusing on interests, anticipating and eliminating sources of prejudice, reaching agreement among yourself and with other parties (Shonk, 2020). Two pitfalls should also be avoided: focusing on immediate needs at the expense of long-term effects and being defensive about avoiding the worst alternatives (Najam, 2020).

The advantages of the impact of the pandemic on the considered aspect of the interpretation of the negotiations are less noticeable. Undoubtedly, greater precision is required when formulating exchange offers. They are faster and simpler and generally have a lower 'weight', so they carry less potential risk. In addition, there may be opportunities to surprise other negotiators when they are not prepared to accept certain proposals.

11. Negotiations under the influence of the pandemic as a value creation process

The interdependence of the parties and the process of mutual exchange in negotiations allow the parties to seek mutual benefits by creating additional values, which would not be possible without negotiations. These common values are the synergistic effect of the parties' cooperation. Their creation is also possible when one side has something to offer that is of little value to itself but is of great value to other participants in the negotiations - and vice versa. By exchanging these values, each side loses little, but gains a lot.

Negotiations conducted in the conditions of a pandemic are undoubtedly characterized by considerable difficulty for the parties to agree on common values that are to be the subject and effect of cooperation. Orientation on immediate effects of negotiations, their virtualization, short-term and limited relationships, and even their antagonistic nature, lack of trust, poor exchange of information about the values themselves make their co-creation extremely difficult, and sometimes impossible. At most, the prospect of quick and measurable benefits as a result of ad hoc cooperation between the parties may encourage them to try to obtain these benefits. Of course, there may be a danger of unjustified appropriation of resources, as a result of which proven partners should be relied on in search of common values. In addition, cases of this type of unethical activity are exposed on the web and widely stigmatized.

Searching for the positive sides of the impact of the pandemic on the considered aspect of the interpretation of the negotiations, it can be seen that the differences in the assessment of the values represented by their participants, i.e. the differences in their priorities, create the possibility of reaching an agreement through the exchange of values that are beneficial to them. On the other hand, if they focus on intangible assets, paradoxically, the chances of joint search for opportunities to increase intangible assets, in the form of innovative concepts and ideas, also in the virtual space, increase. In the short-term, these values may be of little importance to the parties to the negotiations, but they may bring benefits deferred in time. In addition, potential conflicts of values can and should be resolved by explaining their causes and convincing each other about the positive impact of different values on the negotiation process.

12.Conclusions

Summing up, it can be said that the occurrence of a pandemic in the conduct of socio-economic negotiation processes entails the need to apply different methods of conduct in the implementation of these processes. Considering the mainly disturbing and, to a lesser extent, supporting impact of the pandemic on these processes, the following features may be indicated, which must be considered due to this impact:

- significant acceleration and, at the same time, simplification of the implementation of these processes, often excessive, especially the pre-negotiation analysis,
- substantial impoverishment of the scope of such analysis in a narrow negotiation environment, and limiting the spectrum of potential parties to negotiations and their activities,
- difficult to find trusted negotiation partners and less opportunities to develop and maintain positive relations with them,
- extreme caution when establishing relationships, i.e. applying the principle of "hyper-limited" trust,
- adopting a narrow perspective when looking for possible solutions, often adopting satisfactory rather than optimal solutions,
- generally limiting the creativity of action and preferring routine,
- less operational flexibility, especially when generating variants of solutions,
- increased risk and even uncertainty of negotiations,
- difficult use of negotiation strategies and techniques aimed at finding a balance between cooperation and competition,
- advantage of competitive attitudes and negotiation tools over integrative ones,
- limiting the possibility of conducting multilateral negotiations, which are dominant in contemporary socio-economic life,
- the need to pay much more attention to information security,
- an urgent need for a wider use of negotiation support systems via the Internet.

As it is easy to notice, the above characteristics of the discussed negotiations also include their positive aspects, albeit to a small extent, such as the need to be careful when conducting them, careful risk analysis when making choices or care for information security.

The concept of describing negotiations in the conditions of a pandemic presented in the article is an initial, largely hypothetical approach to the considered issues, due to the fact that they are relatively new, not fully recognized both in theory and research, as well as in socio-economic practice. Therefore, the author will strive to enrich and broaden his concept, mainly by searching for more precise characteristics of the considered dependencies between the pandemic phenomenon and the course of negotiation processes. It is also planned to carry out empirical comparative research in order to verify the usefulness of this concept.

In addition, it is planned to broaden the context of considerations, i.e. to create a broader concept of negotiations conditions in the current socio-economic realities, and thus to create a specific model of negotiations in the expected crisis. As can be seen, some of the statements contained in the article are more general in nature, going beyond the is-sue of the impact of the pandemic on the negotiations. The second, promising direction of research will be to consider the more general issue of managing relations with partners in the conditions of a pandemic or crisis, and not just negotiations with them.

Acknowledgements

The publication was financed from the funds granted to the College of Economy and Public Administration of the Cracow University of Economics, as part of a subsidy for the maintenance of research potential - the project entitled “Political Economy of Budget Processes in Poland - Structural, Institutional and Relational Aspects”.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

THE IMPORTANCE OF HUMAN CAPITAL FOR ORGANIZATIONAL RESILIENCE

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Purpose: The study draws attention to the determinants of the growing role of organizational resilience and human capital, which, thanks to its capabilities, skills and flexibility, is an important determinant supporting the resilience of the entities. Thus, the purpose of the study is to identify human capital and its characteristics as determinants of organizational resilience.

Design/methodology/approach: The study was based on critical analysis of literature and internet sources. The subject includes the issues related to organizational resilience and human capital, as a determinant of this resilience that increases the level of acceptance of changes, i.e., the level of adaptability.

Findings: The considerations presented in this study show that resilience is currently a desirable feature of every organization. It is also a feature of human capital and the appropriate use of individual resilience through human capital management can help create organizational resilience.

Practical implications: Theoretical considerations are supported by the results of global research in the field of human capital management. Consequently, it was confirmed that considering a human aspect when making decisions provides companies with better protection against rapid changes. Improving managers' awareness of this situation should help them prepare their companies for difficult operating conditions, and thus enable them to survive and continue to function effectively, despite crises and other threats.

Social implications: Recognizing the determinants of organizational resilience and highlighting the role of human capital in this sphere as well as raising awareness of the importance of effective human capital management may have multi-faceted beneficial socio-economic consequences.

Originality/value: This study shows a specific approach to human capital, which, through its capabilities and individual resilience, shapes the organizational resilience and determines the effective company management in the situation of rapid and unpredictable changes in the environment.

Keywords: resilience, organizational resilience, human capital, flexibility.

Category of the paper: Viewpoint, General review.

1. Introduction

The conditions of the modern economy as well as the transformations and changes observed in the environment mean that the functioning and development of modern enterprises are determined by the synergistic influence of many processes and factors that are responsible for shaping the attitude that will allow for resisting the negative impact of changes in the environment and enable effective operation even in very unfavorable conditions. Experts often refer to the fact that we live in an increasingly complex and changing world. Considering this, companies facing this new scenario need to be agile to adapt to this volatile scenario and not lag behind. This means that companies should work to improve their adaptability, which over time has started to be called organizational resilience.

In such circumstances, resilience is a commonly perceived need and a desirable feature or ability of modern enterprises. Adaptation to unfavorable conditions of functioning of both individuals and organizations is therefore of interest to researchers.

In the light of such considerations, the study presents the basic issues relevant in the context of organizational resilience and the role of human capital in its shaping.

The purpose of this study is to identify human capital and its characteristics as determinants of organizational resilience. Through the study, attention is drawn to the determinants of the growing role of people as factors supporting organizational resilience.

The study was created on the basis of a critical analysis of the literature and Internet sources due to the topicality of the discussed subject matter. The literature review was conducted in a theoretical context, as theoretical approaches interpreting the discussed issues were sought. Polish and English literature was selected based on the key word. The latest publications, i.e., those published in the last decade were chosen. Only in a few cases, slightly older publications related to the analyzed issues were used.

2. The essence of resilience

There is no consensus in the scientific circles on the use of the concept of resilience, as well as on its definition. The English word "resilience" has several equivalents in Polish. In the studies, such notions as resilience, elasticity, agility, flexibility or durability can be found.

The same applies to the definition of the concept of resilience, which is interdisciplinary (e.g., it is used in biological sciences, engineering as well as technical or social sciences) (Soliwoda, 2020).

According to the Dictionary of the Polish Language edited by M. Szymczak (1979), resilience refers to chemical, physical or biological properties. Doroszewski (1969) relates resilience to endurance. In the old definitions there is no reference to socio-economic issues, which is clearly demonstrated by the emergence of a new semantic context today. It is necessary to structure the concept of resilience, and for this purpose, the concept of resilience should be specified, and the following questions answered: "what resilience?", "what is the resilience about?" or "resilience to what?".

Resilience is a concept that has been increasingly used in the last two decades (National Audit Office, 2013; 2014) as the ability to respond to crises, either as return to the initial condition (passive resilience) or as the ability to anticipate and cope with unexpected events through developing new capabilities and creating new opportunities (active resilience).

On the basis of the literature review Martin Linnenluecke (2017) pointed out that resilience functions ambiguously within various fields. It takes on the meaning and definition depending on the area it refers to, and the similarities and differences in the concepts within the areas have not been clearly defined so far, which contributes to the lack of a common, explicit definition of resilience.

Organizational resilience is the basis for discussion in this paper. Resilience as such is a multidimensional phenomenon, occurring on many different levels. Organizational resilience is therefore one of the types of resilience that is typical of the entity that is the organization (Ingram, 2023).

The starting point for defining it may be the approach in Resilience Alliance (2019), according to which resilience is the ability of a system to absorb disturbances and reorganize. This definition is universal and therefore it can be adapted to an organization.

What exactly is organizational resilience?

According to ISO 22316, resilience is not a specific action or state, nor is there a measure of resilience as such. Organizational resilience is an organization's capability to react and adapt to changes. Resilience enables organizations to anticipate and respond to threats and opportunities arising from sudden or gradual changes in their internal and external context. Increasing resilience should be a strategic organizational goal.

According to the representatives of the BSI Polska - British Standard for Organizational Resilience group, the resilience of an organization means its durability (Kerr, 2016). The concepts of resilience and durability are closely related. Organizational resilience is an organization's capability to anticipate, prepare, respond, and adapt to continuous changes and unexpected disruptions in order to survive and grow. Resilience constitutes protection against danger. The proper organizational resilience to a turbulent environment creates its durability (Krzemiński, 2016). In other words, a sustainable organization is one that has improved (adequate) resilience. Acquiring organizational resilience consists in gradual “learning” by the organization even from small everyday matters. Organizational resilience is a relative and dynamic concept, not a specific action or fixed condition. Factors that increase

organizational resilience are unique to each organization. Organizations can be more or less resilient, and there is no absolute measure or ultimate goal in creating resilience.

Organizational resilience is also an organization's capability to face complex and adverse scenarios and adapt to the changes that these situations require. At the organizational level, it is an emergent property residing in the units, systems, structures, infrastructure, procedures and parameters of the organization (Burnard, Bhamra, 2011). It also represents the organization's ability to return to balance after a period of disruptions.

R. Bharma (2015) is the author of one of comprehensive definitions of resilience. He claims that organizational resilience should not be perceived as only the organization's ability to return to a state of equilibrium from before the disruption. Organizational resilience is an overarching concept that not only allows enterprises to continue their business activity, but also to grow, learn and progress regardless of their environment. Resilience can be a constructive mechanism for building competitiveness of an organization.

Despite being present in numerous studies, the concept of organizational resilience is still defined ambiguously, which is confirmed by many authors (Annareli, Nonino, 2016; Ribeiro, Barbosa-Povoa, 2018). The definitions of resilience contained in this study do not reflect all that are found in the literature, but they are those that, in the author's opinion, illustrate this concept well.

However, in order to illustrate the diversity of definitions presented in the literature, the paper presents the study of F. Odważny (2022) who analyzed the definition of resilience on the basis of literature review. He distinguished 3 features that consider the definitions contained in the analyzed literature:

- organizational resilience focuses on showing the strength of the organization before the disruption occurred; it refers to the organization's predictive capabilities and conscious behavior towards possible disruptions;
- organizational resilience refers to the context of enterprise management during in the period of disruption, in the face of a crisis situation; it emphasizes the organization's capability to function after disruption of system homeostasis;
- organizational resilience in terms of the functioning of the enterprise after returning to balance; it considers the company's capability to learn from disruptions, implement recovery programs and prevent disruptions occurring again;
- R. Bharma's definition that was mentioned before includes all three elements.

Based on the analysis of different approaches to resilience, an attempt can be made to define the characteristics of a resilient organization. A resilient organization should be characterized by special capabilities (Mitchell, 2013, p. 7; Odważny, 2022, p. 31):

- the organization's capability to anticipate disruptions inside and outside the enterprise;
- the ability to absorb shocks - it allows for maintaining the stability and structure of the system, it is often referred to as "resilience" in "traditional" risk management, limited to the risk of natural disasters;

- adaptability, otherwise known as "durability" – it introduces flexibility into the system, leading to gradual changes;
- the ability to transform - implementing significant changes that lead to the transformation of the existing system. This involves technological innovations, institutional reforms as well as changes in the behavior of actors and cultural processes. This capability is often used to develop post-conflict public policy;
- the organization's capability to survive a crisis and thrive in its period;
- the capability of the organization to return to the state of equilibrium thanks to the actions defined previously in the framework of planning business operation continuity;
- the organization's ability to return to the state of equilibrium thanks to spontaneous actions, based on the experience and intuition of the team forming the organization;
- the ability to use available tangible and intangible resources to improve the financial result in the face of potential, ongoing and past disruptions;
- ability to learn from a disruption and willingness to implement remedial actions to prevent a recurrence of the negative impact of a disruption on the organization.
- high flexibility, characterizing the company before and during the disruption, corresponding to the turbulent environment in which the organization operates.

Various combinations of these partial capabilities compose the resilience of a particular organization.

3. Determinants of resilience

Any disruptions, both in the organization (including crisis) and in the environment, affect the quality of the functioning of an organization, the results of its activity and adaptive capacity, which at the same time determines the way in which the organization copes with unfavorable conditions. Establishing what determines the ability of an organization (and an individual) to adapt to unfavorable conditions is the issue to be resolved. What are its determinants?

According to BSI representatives, 3 main features determine the resilience of an organization (Kerr, 2016):

- Product excellence, which represents meeting all market requirements by the products offered by a given company. Truly resilient organizations innovate, not just take advantage of the boom, create new products and new markets, always being one step ahead of the competition.
- Integrity of processes, which means that practicing the habit of excellence in the process of creating products and services and introducing them to the market is a key element for success.

- Employee behavior. Resilient organizations aim to achieve a balance between customer expectations and employee engagement. Modern organizations are opinion-makers, they not only set the rules to be followed, but also encourage employees to make their proper behavior in the workplace an integral part of their work and organizational culture. It is the challenge for leaders to understand the values of the organization, talk about them and demonstrate them so that all employees share these values – however, not because they are told to, but because they understand that "this is how this organization works".

Apart from the determinants identified by the BSI, other combinations of resilience determinants can be found in the literature. They include:

- networks of relations defining the enterprise; (Farrar, 2017; Klockner, 2017),
- organizational and management culture, which largely results from staff commitment and leadership skills; (Spiegler, 2012; Hills, 2015),
- change management, closely related to the proactive attitude of the staff (Ates, Bittici, 2011).

When summarizing the above overview, it can be noted that human capital can be seen among these determinants in various approaches. The employees' behavior, their knowledge, skills and competences will affect the perfection of products, reliability of processes, organizational culture and the effectiveness of change management. Thus, it can be indicated that human resources are an important determinant of resilience.

The assumption about the dominant role of human resources in shaping resilience is confirmed by the comparison made by T. Ingram (2023) on the basis of a systematic review of the literature. It indicates that some researchers see the sources of resilience in the organization's resources (Wieczorek-Kosmala, 2022), while paying attention to the role of financial resources in this matter (Undoubtedly, financial resources significantly facilitate adaptation to new conditions through the possibility of introducing new solutions responding to new market conditions). However, the main interests of researchers relate primarily to the management of human resources, i.e., employees, as a resource of the company. Finally, modern information technologies as enterprise resources are the third group focusing the researchers' attention. The results of the conducted analyzes indicate that on the resource side, human resources are most important for the resilience of the organization, followed by financial and information (technological) resources, as indicated by the number of key words (Ingram, 2023).

It can be concluded that resilience increases with the growth of our resources and strengths, which shape the specific capabilities of the company. Therefore, it should be clear that resilience will be determined by various factors. Achieving resilience requires the commitment of the entire organization. Resilience is built on the values, behaviors, culture and ethos of the organization, but human capital will undoubtedly be one of the basic determinants of resilience. Strengthening all factors is the task of the leaders of the organization. However, involvement of employees at all levels is the key to success (Kerr, 2016).

4. Human capital as a determinant of resilience

The considerations above show that organizational resilience is a strategic necessity for organizations if they want to thrive in a dynamic and ever-changing world. An organization's resilience capability can and should be developed through appropriate actions aimed at the development of resources essential for shaping resilience. They include human capital, i.e., qualified, committed and well motivated employees who are increasingly perceived as an important source of growth and development of the company. Well-managed human capital is seen as a source of success, building resilience, and potential benefits for both sides: both employers and employees (Kapitał ludzki..., 2015).

Resilience (in a way) is a natural human trait. It is one of the psychological resources (Załuski, 2020). Other categories of resources that can be distinguished in humans are: cognitive, social and physical. Resources in each of the above-mentioned areas provide their holders with the opportunity to influence their environment adequately and effectively. In a resource-based approach, ways of "coping" with threatening, adverse situations are explored. The concept of coping coincides with the active aspect of resilience.

Resilience in humans is manifested by the fact that when facing a threat, they usually tend to accept and cope with difficulties. According to Coutu (2002), resilient people have three features in common: they accept reality; have a strong belief that life is important and have the ability to improvise. Referring mental resilience to the work environment, it can be defined as a positive psychological ability to bounce back, recover after failures, experience uncertainty, conflict, failure, and even positive change, progress and increased responsibility (Luthans, Avolio, Avey, Norman, 2007).

Human capital enables organizations to gain resilience by considering the relationship between individual and organizational resilience (Lengnick-Halli et al., 2011). Organizational capability is derived from a combination of knowledge, skills, capabilities, and other attributes at the individual level that are part of a organization's human capital management strategy focused on the capabilities, motivation, and performance of employees. Supporting individual resilience and developing specialist competencies in individuals will increase collective group and organizational resilience (Coutu, 2002).

Reference can be made here to the concept of intellectual capital management (Edvisson, Malone, 2000), in which the authors emphasize that the purpose of intellectual capital management is to transform human capital (assigned to an individual) into structural capital, which is the property of an organization and does not depend on employee fluctuation. This means that individual, personal skills, experience, education of individual employees are transformed and saved in the programs used in the company, tools and concepts that have been developed by this company in order to conduct effective operations.

The situation regarding the transformation of individual resilience into organizational resilience seems to be similar to the transformation of human capital into structural capital. Human capital management (HCM) strategies that develop employee resilience contribute to organizational resilience. Resilience is dynamic and represents both the adaptive capacity of the individual and the organization to absorb uncertainty, develop responses, and engage in transformations to exploit disruptions (Denyer, 2017).

To support the process of building resilience through a human capital management strategy, the following recommendations have been defined: (Douglas, 2021):

1. Emphasis on building capacity first, and then skills. In organizational environments where capabilities are developed and cultivated, employees retrain faster and more sustainably.
2. Employee development should move from the specific needs of employees, focusing on short-term strategies, to cultivating passions to help solve unnoticed and future problems. This means supporting employee motivation to make an impact, seek challenges to improve performance, and promote collaborative environments that build relationships and gain knowledge. This contributes to the sustainable productivity of the organization.
3. Shifting from formal training to learning by experience. Employee development and training should integrate learning into the workflow.
4. Creating incentives that motivate people to constantly learn, adapt and improve.

For the purpose of strengthening resilience, Sutcliffe and Vogus (2003; after Mills et al., 2013) propose to support the competence and efficiency of employees through greater access to and use of resources (tangible and intangible), promoting lifelong learning, as well as supporting autonomous decision-making.

The above implications that refer to changing human capital management strategies to build employee and organizational resilience focus on developing human capital competencies and capabilities, and then on job or task related skills. It is necessary to constantly learn and improve the skills of employees; however, in human capital management strategies of an organization, it is essential to provide employees with the tools enabling adaptation to a range of uncertainties in addition to skills development.

There is one more very important feature of human capital, i.e., flexibility. It is essential in the context of resilience. Human capital is the most flexible element of the organization, hence the development of the concept of managing this resource is currently so dynamic and perceived as a pillar supporting the resilience of enterprises.

Flexibility is one of the determinants of the success of a modern organization. It enables proper performance of functions assigned to management and skillful adaptation to the dynamically changing situation (conditions in the environment) and the company's expectations depending on the existing market situation. Flexibility means the ability to change quickly, i.e., the capability to adapt and react to external impulses that disrupt its current stability.

This means that it is closely related to resilience. The difference between flexible and inflexible enterprises is that the change, i.e., the reaction to the impact of external or internal factors, can take place during the performance of operational activities, without the need to suspend them (Czerska, Szpitter, 2010), i.e., it does not disturb the efficiency. Flexibility is one of the most important features that a company needs in volatile times.

Flexibility should always be part of business management. It is an attribute of an organization reflecting the position of a given entity on the stability-chaos continuum (April 2021). However, nowadays, in the conditions of progressive market deregulation and the effects of the crisis caused by the global pandemic, the importance of flexibility as such and the importance of people who are characterized by this flexibility are increasing.

The study does not include a thorough analysis of the notion of flexibility. This is because the concept is widely interpreted in numerous studies (e.g., Krupski, 2005; 2008; Czerska, Szpitter, 2010; Bridges, 2008; Kwiecień, 2018). The author's intention was only to draw attention to flexibility as a feature of human capital and its role in the context of shaping the organization's resilience, necessary for effective operation in a turbulent environment.

The results of the research: Human Capital Study (Report 2019-2020) can be a summary of the considerations on the role of human capital for shaping resilience, and at the same time a confirmation of the role of human capital and its management strategies in strengthening the resilience of the organization. The analyzes presented in the research report allow to conclude that there is a certain configuration of norms, values and tools used for long-term planning, which to some extent makes companies resilient to the crisis and allows them to remain innovative. Companies with a long-term plan of action and personnel development, and those in which the management board focuses on efficient organization and control of the implementation of procedures are particularly resilient in this respect.

Similarly, the Global Human Capital Trends research (GHCT Report, 2020; 2021) conducted by Delloitte in 2020 and 2021 in the area of human capital management confirmed that despite the crisis, people and organizations are able to set and achieve new, often surprising goals by adopting the right attitude. The results from 2021 showed that people-driven decision making provides companies with better protection against rapid changes, i.e., it improves the resilience of the organization.

The results from 2021 showed that people-driven decision making provides companies with better protection against rapid changes, i.e., it improves the resilience of the organization.

If the organization's environment changes faster than its interior, the company may not survive it. Human capital is the factor that can enable enterprises to adapt the pace of internal changes to the pace of changes in the environment.

5. Summary

The conditions for adaptation to the unfavorable conditions of functioning of both individuals and organizations are the subject of interest to researchers in the field of organizational effectiveness. They look for features and factors responsible for the organization's capability to adapt to changes in a turbulent environment.

Resilience is the feature that determines the ability of the organization to accept changes, and its determinants include human capital, along with its abilities, skills, individual resilience and flexibility.

These theoretical considerations are not a comprehensive analysis of resilience development. However, thanks to the literature review, it has been shown that organizational resilience is not a ready-made system that can be bought and applied. Resilience proves to be not just something you is possessed or not possessed. This is a kind of philosophy of action that must be systematically and consistently developed and applied in practice. It can therefore be shaped, individually and organizationally. Resilience is built through everyday work, small events and appropriate actions that consider defined determinants (Krzemiński, 2020). At the organizational level, it is manifested as a mix of behaviors, perspectives and interactions that can be developed, measured and managed (Somers, 2009). Resilience is an organization's capability to respond and adapt to change, allowing it to recover quickly, learn from experiences, and grow.

The key is knowledge of the factors that strengthen resilience and the implementation of programs to build it, verified in terms of effectiveness. The conducted literature review allowed for concluding that human capital is a factor that appears in many areas of creating resilience. Today's extremely dynamically changing environment requires a certain amount of courage, a sober perspective and flexibility, i.e., purely human features (April 2022). This means that human capital is becoming an increasingly important source of enterprise advantage, its value and a determinant of resilience (Kapital ludzki..., 2015).

Considering various perspectives of the role of human capital for the functioning of modern enterprises, the thesis can be confirmed that human capital is a key resource of the enterprise, and this resource should be taken care of in order to develop it and strengthen its comprehensive positive impact on the functioning of enterprises in today's dynamic market. Any studies on human capital will help to present and understand its key role for resilience and to clarify the idea of research on human capital in the context of shaping organizational resilience. The review of sources on the analyzed issue was selective, however, the considerations in this study allowed to achieve its goal, i.e., identify human capital and its characteristics as determinants of organizational resilience. The subject area related to shaping organizational resilience is extremely vast and can still be explored in a variety of contexts and approaches. Deliberations on the role of human capital in shaping resilience are one of the elements of planned, broader

research in the area of organizational resilience. We are now preparing research on the role of resources in creating resilience, which will be conducted on the basis of a systematic literature review. The considerations presented in this study already allow for showing how important the role of human capital in shaping resilience is and which of its features should be given special attention. The purpose of further research will be specifying the set of determinants of resilience, i.e., identifying internal resources and their role in generating organizational resilience.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

STRENGTHENING THE SOCIAL CAPITAL OF ENTERPRISES IN THE LIGHT OF DEMOGRAPHIC CRISIS

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Purpose: The purpose of the article is to present the social capital of the enterprise as a resource in response to the demographic crisis existing in Poland and to present possible instruments for its strengthening on the ground of enterprise management.
Design/methodology/approach: Analyzing data from secondary sources (Central Statistical Office, Eurostat), the main symptoms of the demographic crisis in Poland were identified. Particular attention was focused on those that determine the operation of Polish enterprises causing changes in the age structure on the labor supply side. Then social capital was presented in the role of a strategic resource of an enterprise, which allows it to adapt to the dynamically changing conditions of doing business. In addition, the main instruments and ways of strengthening social capital in enterprises are indicated based on the analysis of available research studies. The article is a continuation of the author's work on the management of social capital of enterprises and, at the same time, an introduction to the planned subsequent empirical research in this area.
Findings: Statistical data clearly indicate that Poland is facing a deepening demographic crisis. The effect of the transformations discussed is the growth of the population from the so-called "pre-old age", and thus the aging of labor resources. As a result, the need to better utilize the potential of older people in companies is recommended. However, this requires a commitment primarily on the part of trust, which is the main resource of social capital. This can take the form of improving training policies for the creation of new knowledge and its transfer among project team members, organizing workplaces that coincide with the concept of age diversity management, intergenerational cooperation and also respect for the knowledge and competence of organizational members.
Research limitations/implications: The main difficulty concerning the study of social capital in the enterprise is its non-material dimension. The available literature indicates that there is a gap regarding its operationalization. Thus, the assessments made of its impact on various aspects of enterprise performance are so far uncertain.
Practical implications: This article can provide valuable information on how to invest in corporate social capital. Due to its existence in the structure of relationships, it can cause enterprises to be more flexible, which is important in a period of turbulent economic conditions.
Originality/value: It is worth pointing out here that this article is a valuable source of knowledge on social capital management in the enterprise and can be used in the activities of entities of various industries.

Keywords: social capital, demographic crisis, trust.

Category of the paper: research paper.

1. Introduction

An enterprise is a collection of diverse resources. The way in which they are used is unique to each organization. Of particular importance are the key resources that contribute most to building and maintaining competitive advantage. Wanting to achieve market success, it is necessary to subject these resources to such transformations that represent higher and higher strategic value. According to M. Bratnicki, at the top of the strategic hierarchy are competencies (2000, p. 112). They are the result of the fusion of lower-level components, i.e. resources, processes and capabilities, with increasing difficulty in their creation and use. According to the author, having core competencies is a necessary, but not sufficient, condition for an organization to achieve and maintain a competitive advantage. It is also important to have a specific strategic intention, which can be expressed in the form of "ambitious goals" that challenge and generate creative tension for the development of the company's competencies and the activation of organizational learning at the appropriate level" (Bratnicki, 2000, p. 116). A major difficulty in achieving goals and creating core competencies for enterprises is the dynamically changing conditions of their operation. The intensification of economic processes observed in the last decade, further strengthened by global effects related to the COVID-19 pandemic and the armed conflict in Ukraine, causes enterprises to be forced to constantly modify their activities. The previous methods of thinking and principles that guide modern enterprises are becoming outdated. An additional circumstance unfavorable for the management processes of a modern enterprise is the coexistence of negative trends of a demographic nature, observed in Poland over the past decade. The purpose of the article is to present the social capital of the enterprise as a resource in response to the demographic crisis existing in Poland and to present possible instruments for its strengthening on the ground of enterprise management.

2. Symptoms of demographic crisis

Over the past several years, the demographic phenomena occurring in Poland are collectively referred to by economists as a demographic crisis causing changes in the occupational structure of the population. Its rationale is to be found in at least several trends that determine the conduct of business and pose challenges to modern managers.

First, with the development of civilization, changes in lifestyles, advances in the medical field, as well as a growing awareness of dietetics or body hygiene, life expectancy is increasing. In 1950, the median age in Poland was 56.1 for men and 61.7 for women (CSO data). This means that exactly half of Poles have not yet reached that age, and the other half have already passed it. Statistics for 2021 indicate that this age will increase to 71.8 for men and 79.7 for women (CSO data).

Secondly, over the past several years, Poland has seen a gradual increase in the post-working age population, from 6.46 million in 2010, to about 8.53 million in 2021 (CSO data), with the total population, as well as the pre-working and working age populations, falling over this period, as shown in Figure 1.

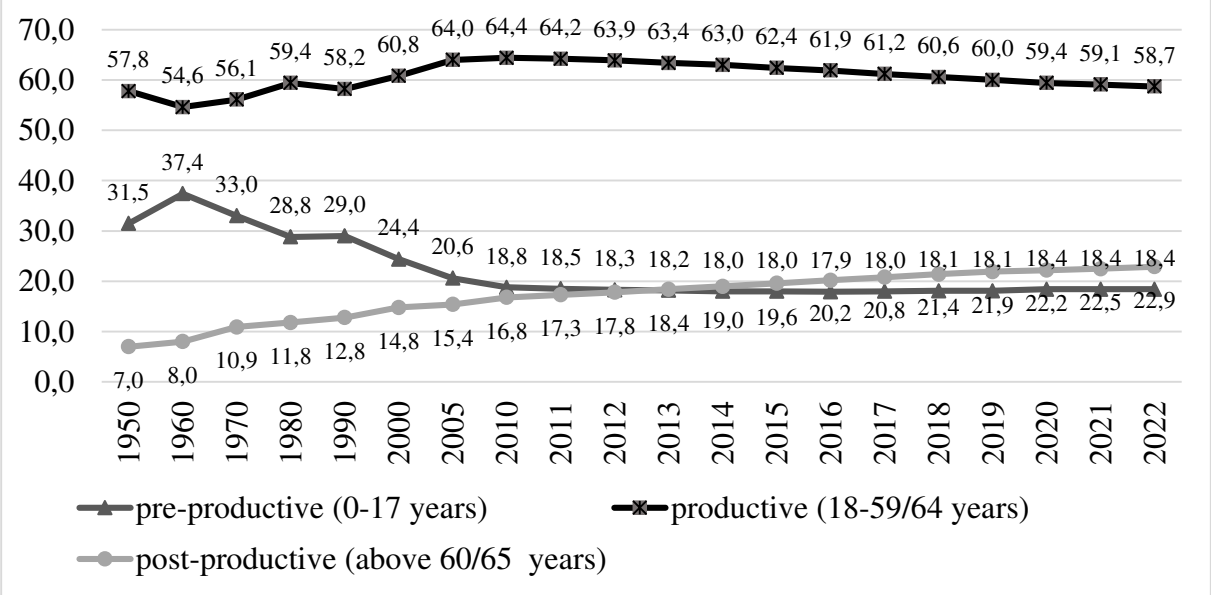

Figure 1. Share of population by economic occupational groups in the total population in Poland in 1950-2022 (in %).

Source: CSO data by LFS.

More than a decade ago (in 2010), the post-working-age population accounted for 16.8% of the total population, increasing this share to 22.9% in 2022. In addition, since 2012, a deepening negative natural growth rate has been observed in Poland, reaching -143.3 thousand in 2022, with the benchmark value of this phenomenon in 2010 at +34.8 thousand. The increase in the old-age rate is related to the enlargement of the elderly group by the increasing number of people born in the 1950s (during the period of the compensatory boom) (CSO data). At the same time, the percentage of people aged 15-64 is falling. This causes worrying shifts in the age structure, as well as on the dependency ratio. In 2022, for every 10 people of working age, there will be as many as 3.9 people of post-working age, and only 3.1 of pre-working age (CSO data). This means that the labor resources that will enter the labor market in the future are fewer than those who have already left it.

Third, the migration balance for Poland has been growing significantly in recent years. Eurostat data shows that in 2021 the number of immigrants in Poland was 241.1 thousand, which was fifth on the list of European countries, behind Germany (874.4 thousand), Spain (528.9 thousand), France (336.4 thousand) and Italy (318.4 thousand). In the same year, the number of emigrants in Poland was 201.6 thousand, which in turn placed us at the bottom of the ranking among European countries, behind Romania and Spain (Eurostat, 2023b). In light of the above, it can be concluded that Poland has achieved a positive migration balance. However, it should be noted at the same time that this result was significantly influenced by the inflow trend of migrants from Ukraine, which has been observed in Poland for several years. In addition, this movement has been dramatically increased since February 2022, after the outbreak of war across our eastern border. Wanting to address the labor market situation in Poland, we cannot ignore the huge migration wave from our eastern neighbors in 2022. Here we can talk about two migrant populations, who ended up in Poland for completely different reasons. The first population consisted of migrants who crossed the Polish border for work purposes, even before the outbreak of full-scale war. They represented a significant part of the labor supply in the Polish market already before 2022, gradually adapting to the prevailing conditions. Here we can speak of some favorable incentives for the difficult labor market situation in Poland. The second group is fed by refugees who arrived in Poland at a rapid pace within a few months of the outbreak of the war. Despite the influx of this wave of war migrants, the problems of labor supply in Poland cannot be said to have been solved. In the case of the first group, we can see that since 2015, the population of foreigners taking up work in Poland has steadily increased, eventually shaping up to be nearly six times higher in 2022 (fig. 2). They gradually became accustomed to our domestic labor market, learned the Polish language, had time to change jobs several times in search of the most satisfying one, which eventually verified their plans to stay in the labor market. On the other hand, in the case of the second group, the situation is much more complicated. The mentioned processes were very abrupt in nature. The reason for migration for these people was not for salary reasons, but only to seek refuge. It should be emphasized here that, despite the declared high willingness to work on the part of war migrants, the other processes, which in the case of the first group occurred naturally (including knowledge of the Polish language, previous experience of staying in Poland), could not be accelerated. As indicated by a study commissioned by the NBP, despite the fact that most refugees looking for work quickly found it, the percentage of unemployed is still relatively high among them and their average economic situation is relatively worse than that of previous labor migrants (NBP, 2023, p. 13).

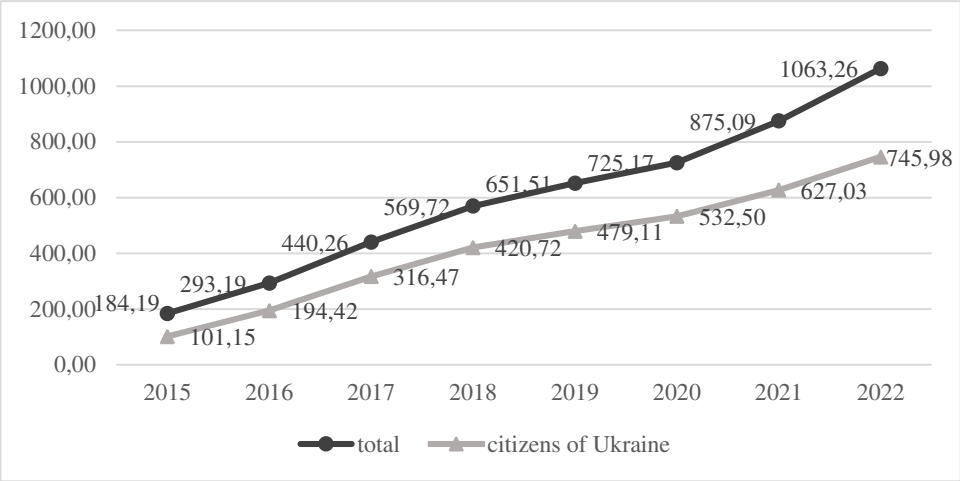

Figure 2. Number of foreigners insured in the Social Insurance Institution in Poland in 2015-2022 (in thousands).

Source: own study based on (ZUS, 2023, p. 9).

Those who have migrated to Poland are characterized by high labor force participation. Among them, about 65% are working, about 24% are looking for work, and only 11% are economically inactive (NBP, 2023, p. 13). In Poland, in the same period, according to the Labour Force Survey, the share of working women aged 15-64 was at 65%, the unemployed were 2%, and the economically inactive were 33% (NBP, 2023, p. 13).

The dynamics of changes in the labor market in Poland is a challenge for determining the labor force participation of the population. Moreover, according to statistics, only one in five refugees plans to stay in Poland permanently (19%), among pre-war migrants, the percentage is 55% (NBP, 2023, p.22). In addition, 56% of 2022 refugees plan to return to Ukraine as early as 3 months after the end of the war (NBP, 2023, p. 22).

Fourth, the situation of mothers in the labor market is becoming more complicated every year. Figure 3 presents the values of the employment rate among women with the youngest child under 5 in Poland in 2015 and 2020.

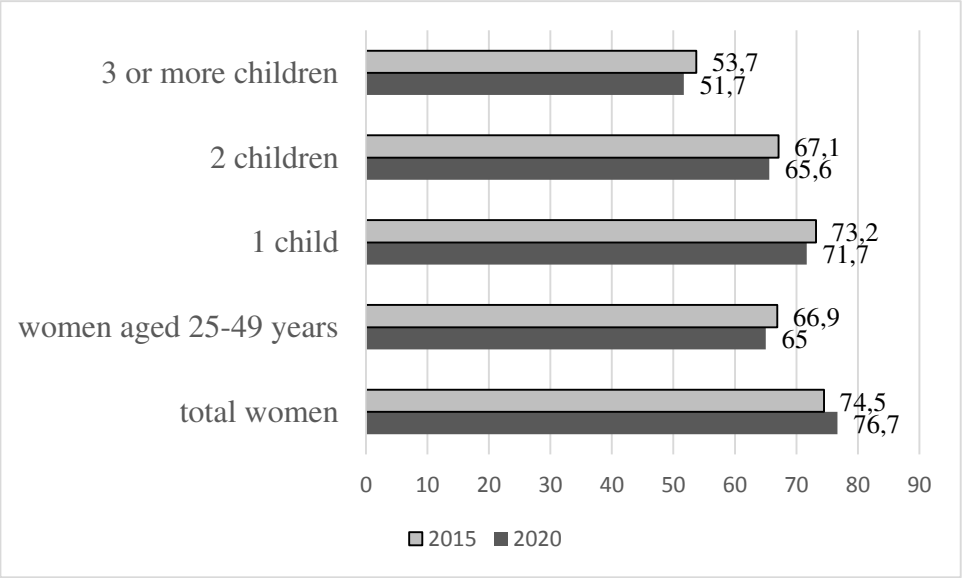

Figure 3. Employment rate of women (aged 25-49) with youngest child under 5 (in %) by LFS.
Source: CSO data.

The value of this indicator is significantly affected by the number of children one has. As can be seen from the data in Figure 2, during the 2015-2020 period, employment rates for women with young children decreased. This decline applies to all women, regardless of the number of children they have. At the same time, it is worth mentioning that the labor force participation rates for those without children in 2021 were similar for both genders, at 90% for women and 92% for men (CSO data). Moreover, these rates change significantly with the arrival of children, with the directions of these changes being opposite for both genders. This means that men's labor force participation increases (employment rates, too) with each additional child, while for women it declines sharply.

Similar directions of change are evident among men and women with children under the age of 18. According to the Central Statistical Office, in 2022, the employment rate for women will be 83%, for women with one child, 78.6%, - with two children and 58.2% - with three. For men, regardless of the number of children, the rate fluctuated around 94%.

Thus, the above data confirm the declining labor force participation of women accompanying the increase in the number of offspring. At the same time, it is worth noting that employment rates after childbirth for women never return to the level of the childless period. In addition, it should be noted that the difficult situation of mothers in the labor market is reflected, among other things, in the decline in the fertility rate of women in Poland over the past few years (from a level of 1.45 in 2017 a value of 1.26 in 2022) (CSO data).

Taking the above into account, it is necessary to talk about new challenges for companies that operate in the current economic reality. Taking adaptation measures not only for survival in the market but also for building a sustainable competitive advantage requires commitment not only from modern managers, but also from employees and customers. Effectiveness in these activities will only be possible with a strong from within organization. The answer to the

indicated challenges may turn out to be social capital, which will be the resource responsible for mitigating negative external phenomena, including the discussed demographic changes. Support from trust, which is the main component of social capital, should therefore be considered complementary to the management of the company during the crisis. In the face of aging resources and the need to take measures for their activation, it is possible to point to the beneficial effect of social capital by conquering subjectivity and integration within the collective, which improves the quality of life (not only in the professional sense), and also provides a sense of informal support and assistance (Trafiałek, Klimczuk, 2017, pp. 105-108).

3. Social capital in the enterprise

The concept of social capital appeared in the literature more than a century ago, but it is relatively recently that its importance has begun to be recognized in the field of business management. In traditional terms, social capital is understood as "the set of actual and potential resources that are associated with the possession of an enduring network of more or less institutionalized relationships supported by mutual familiarity and recognition, or in other words with membership in a group - which provides each of its members with the support of the capital possessed by the collective (...)" (Bourdieu, 1986, p. 51). The inclusion of social capital in the corporate management space is primarily due to its basic component, which is trust. In the period of the formation of economies with a key resource of knowledge and the processes associated with its transfer between companies in the framework of mutual cooperation and its networking (conditioned by relationships of both professional and social nature), the importance of trust is growing (Grudzewski et al., 2010, p. 78). There are changes in paradigms of business management. Competing based only on material resources has become insufficient (Libertowska, 2020, p. 6). In a globally organized market, achieving and maintaining a competitive advantage can only be done with access to unique resources and transforming them in ways that cannot be imitated. It is pointed out that these resources must be knowledge, skills, experience and creativity (Kazibudzki, 2010, p. 127), and social capital, headed by trust, is the ticket to the efficient use of these resources. As M. Stelmaszyk points out, social capital accompanies each stage of external as well as internal learning processes through which knowledge is created (2012, p. 217). In addition, Poland is still implementing activities that are the result of systemic transformation and the passage of convergence stages. During these transformations of a globalizing and integrating nature, the directions of change in the economy are being set. On the grounds of these transformations, the significant role of social capital in shaping institutional factors is recognized (Przybysz, Sauś, 2004, p. 32). It is seen here as providing special support for the reconstruction and reestablishment of order in the economy by leveling the negative phenomena associated with sudden social uncertainty and shaky security.

4. Trust as a strategic resource of the company

Trust in an enterprise is an essential element of management aimed at gaining and maintaining competitive advantage. A requirement for this is the recognition of trust as a strategic resource for the enterprise. In this context and based on the strategic checks of M. Bratnicki, the following characteristics of trust are pointed out (Bratnicki, 2000, pp. 55-57; Grudzewski et al., 2009, pp. 63-64):

- trust makes it possible to mitigate the fluctuations that occur in the company's environment, i.e., to respond to changes occurring in the dynamically changing economic space (the valuation test),
- only a few organizations are rated with a high level of trust, the demand for trust is higher than the supply of trust (rarity test),
- interpersonal trust is attributed to all employees of an enterprise, making it inextricably linked to it (ownership test),
- trust is a resource that is very difficult to automatically copy and reproduce in another organization; the processes involved in its accumulation are lengthy and often unclear as to its essence and creation (test of susceptibility to imitation),
- trust grows over time (durability test),
- trust cannot be replaced by another value (substitutability test),
- trust can provide the foundation for building a highly competitive operating strategy (test of competitive superiority),
- trust cannot be created through formal procedures and regulations in force in the organization (codification test),
- trust is related to virtually all aspects of an enterprise's activities (organization test),
- trust interacts with the ability to shape activities in an enterprise (embodiment test),
- trust is relevant to the current as well as future efficiency of the enterprise (validity test).

According to the above, trust determines the success of the implementation of the formulated strategy of the organization. It represents a latent variable for the organizational success of the enterprise.

5. Instruments for strengthening social capital in the enterprise

According to M. Bratnicki, social capital is one of the main components of the intellectual capital model, along with human and organizational capital (Bratnicki, 2000, p. 101). This concept has a large capacity for meaning and can provide a basis for structuring the processes of business development and competitiveness. The distinguishing feature for this

model of intellectual capital is the emphasis on the properties of relationships that make them transform the organization into a living structure due to the potential based on the resources involved (Dziwulski, Skowron, 2020, p. 41).

Strengthening social capital should be done by investing in the potential accumulated in the company in the form of trust, company structure, and values and norms (Table 1). In addition to the mentioned components of this capital, a number of attributes are pointed out through which managers can take action.

Table 1.
Basic components and attributes of social capital in the enterprise

Dimension of social capital	Component	Attributes
relational	trust	Willingness to share knowledge; openness; exchange of information; willingness to help; reciprocity, evaluation of the atmosphere of cooperation
structural	company structure	Work organization conducive to knowledge of each other's competencies; social ties with co-workers; social ties with stakeholders; customer databases
cognitive	values and norms	Consistency of employee and organizational norms and principles; common language; Unforced activity for the benefit of the company; common terminology; consistency of goals; sense of responsibility

Source: Own compilation based on (Nahapiet, Ghoshal, 1998; Dyduch, 2004, p. 57; Gagacka, 2007, p. 316).

The special role of social capital, representing the dimension of social behavior in an enterprise, is seen in knowledge management processes. In organizations considered intelligent, the ability to cooperate in a team, as well as the desire for continuous learning and development, have been accepted as key competencies that foster their development (Kordel et al., 2010, p. 140). Particularly in the ability to cooperate, supported by trust, one finds the clear hallmarks of social capital. In this context, it seems important to efficiently identify knowledge gaps and fill them with specialized training. Among the factors that are conducive to improving training policies can be mentioned (Kordel et al., 2010, p. 67):

- promoting the improvement of employees' competencies and the replenishment of their knowledge as a key factor in building quality,
- adopting a routine for efficiently identifying current knowledge gaps and filling them,
- convergence of training policies with the company's development strategy,
- promoting attitudes of open knowledge exchange when organizing work within project teams, which allows knowledge to remain within the organization in the event of the departure of any of the experts,
- creation and updating of databases of external sources of knowledge,
- ongoing evaluation of the training policy and individual training courses included in it.

The indicated factors can be successfully adapted, as strengthening social capital in the enterprise. The rationale for such empowerment is the benefits achieved by enterprises through the implementation of good training practice. As the authors of the study emphasize:

"the simultaneous involvement and mutual understanding of management, engineering and lower-level employees is essential" (i.e., the basic hallmarks of social capital). These benefits were identified as (Kordel et al., 2010, p. 68):

- process improvements for the strategic development of the enterprise, primarily through the growth of intellectual capital and enhancement of employee competence,
- streamlining strategic decision-making by gaining full awareness of one's knowledge and competence potential,
- reduction of time and costs through the creation of databases on available knowledge sources,
- reducing costs associated with identifying and filling knowledge gaps by precisely tailoring the training program to project needs and the time spent by the company preparing for a given project.

It is worth noting that the benefits mentioned coincide with those attributed to the operation of social capital in the enterprise (cf. Serageldin, Grootaert, 2000; Beugelsdijk, van Schaik, 2005; Bratnicki et al., 2002, p. 29; Sztompka, 2016, p. 288; Dyduch, 2001, p. 2; McElroy, 2002, p. 3).

Following the stated goal of this article, it should be stated that in the face of the demographic phenomena presented, managers should make training efforts aimed at acquiring and maintaining the intellectual capital represented by seniors. The rationale for these efforts should be the shrinking labor force and the decline in the mobility of people from the so-called "pre-old age"". This generates the risk of disruption in maintaining the current economic growth. It therefore becomes necessary to extend the labor force participation of seniors and changes in the planning and organization of workplaces. Successive adaptation of age management assumptions may become the answer to these challenges. As M. Chmielecki and Ł. Sułkowski point out, "Through high valuation and management of a diverse workforce, it is possible to promote creativity, flexibility and accelerated response to change. Managers wishing to exploit the full potential of a heterogeneous workforce must link the issue of diversity to each function or business strategy" (2017, p. 52).

At the same time, it is worth noting that the "by-product" from the implementation of the assumptions of the cited concept will undoubtedly turn out to be the appreciation of the company's social capital due to the reinforcements made to its social structures. After all, social capital is a set of variables that shape people's awareness and activities (Radziszewski, 2019, p. 16). The concepts of age diversity management and social capital should be understood complementarily. In the context of age management and the activation of aging labor resources, attention should be paid to the beneficial effect of social capital through empowerment, integration into the broader community which positively affects the quality of life (not only professional) and provides a sense of informal support and assistance (Trafiałek, Klimczuk, 2017, pp. 105-108).

On the ground of age management and support for the development of social capital, an empirically proven necessity is recognized (Gajowiak, Libertowska, 2022, p. 35):

- strengthen the mutual exchange of knowledge between the younger and older generations,
- streamlining the process of retiring and filling the competency gap,
- systematically surveying employees' competence assessments in order to diagnose the knowledge gap and smoothly close it,
- organization of training courses for employees in the area of their perceived competence gap,
- organization of training courses to promote among managers ways to implement the concept of diversity management and its benefits (the lack of knowledge in this area confirmed in the survey).

Following the indicated instruments, it is worth noting that the building of social capital in the enterprise, along with trust and commitment, takes place through feeling and experiencing justice in the workplace. It is indicated that the performance of an employee's professional duties with commitment translates into an increase in motivation and productivity, which further contributes to the development of the entire organization (Plachciak, Rogala, 2021, p. 8). Achieving positive results in the form of an increase in trust in the enterprise requires changes at the management level, and therefore commitment on the part of the organization's managers. Trust requires strong leadership, sincere behavior, an open attitude based on a strong ethical foundation and is a key factor in the success of the organization (Rudzewicz, 2016, p. 267). In this regard, it is recommended that managers increase their awareness of the need to constantly monitor the needs of their employees. Identifying the needs of individual employees and adjusting the management style is done through conversations with them. A side effect of having conversations with employees is also to build a sense of trust. It is created by listening and taking into account the needs raised during the conversation (Huculak, 2015, p. 424). Conversation is an essential management tool (Adamiec, 2011, p. 162). During it, there is an empowerment of the employee, who is left with a sense of being an important member of the organization, as a result of which a sense of belonging to the group is created, which further generates a sense of caring for the common good, thus the appreciation of social capital.

6. Summary

In conclusion, it should be stated that the desk research shows that Poland is currently facing a demographic crisis, which will further increase in the next few decades. The rationale for this statement is based on the data presented in the article on the increasing life expectancy of Poles, the increase in the post-working age population relative to other occupational groups, the rapid

wave of war migrants, the lack of replacement of generations, the declining female fertility rate and the low activity of mothers in Poland. The effect of these transformations is the growth of the population from the so-called "pre-old age", and thus the aging of the labor force. In view of this, it is inevitable to look for opportunities to better utilize the potential of older people in companies. However, this requires a commitment primarily on the part of trust, which is the main resource of social capital. It is therefore recommended that managers adopt an attitude that promotes the need to invest in the basic designations of social capital, particularly trust, but also others such as cooperation or norms and values. This can take the form of improving training policies for the creation of new knowledge and its transfer between members of project teams, organizing workplaces that coincide with the concept of age diversity management, intergenerational cooperation, and the need to build respect for the knowledge and competence of all members of the organization.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

EMPLOYER BRANDING IN SMALL AND MEDIUM ENTERPRISES – LOCAL ENTREPRENEURS' PERSPECTIVE

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Purpose: The paper aims to research if and to which extent small enterprises from the region of Czestochowa introduce practices that can be described as employer branding in their performance.
Design/methodology/approach: The research for the study was conducted based on critical analyses of the secondary sources of information (research results, reports on employer branding, scientific papers), as well as on the primary data – quantitative (online survey and interviews) and qualitative research (in-depth interviews) conducted among owners of SMEs from the Czestochowa region
Findings: Most of the owners of SMEs from the region of Czestochowa introduce employer branding practices intuitively. The scale of their business determines the way they integrate their work teams and the ways they seek potential employees. Their main concerns are related to increasing costs of the workforce and maintaining qualified staff. Most of their efforts are intuitive and not the full potential of EB tools is used, in the employee advocacy area for example.
Research limitations/implications: The limitations can be identified in the number of research businesses and the sampling method. Due to the lack of statistical data regarding the exact number of SMEs in the region, including the number of self-employed, it is difficult to calculate the sample size. The random sampling method could not be used because of the lack of the sampling frame – available lists do not include all the businesses and do not divide them depending on their legal status.
Practical implications: The diagnosis conducted in the paper may be used for further research in employer branding in groups of small enterprises. It can also help different types of organizations providing training for SMEs or consultancies to identify areas that need support.
Originality/value: The research on employer branding is mainly conducted among the largest employees. SMEs are not usually researched, especially regionally.

Keywords: employer branding, internal branding, SME, marketing.

Category of the paper: Research paper.

1. Introduction

The concept of employer branding is strongly related to the concept of internal marketing introduced within the overall approach described as relationship marketing in the late 80s last century. Internal marketing was discussed as an integral element of the approach, introducing the idea to treat employees as the first customers the organization offers. Later, that perception of employees was also introduced in HR practices (Strokes, 2015; Adler, Ghiselli, 2015; Loyd 2018; Deepa, Baral, 2019), and its influence on the recruitment process for example employee retention was analyzed (Gilani, Cunningham, 2017; Rizwan et al., 2022). It is also identified as a factor of strategic importance especially in turbulent environments (Rose et al., 2010; Sikyr et al., 2023). The concept of employer branding should support and be an integral part of corporate brand initiatives and the concepts of internal branding, employer branding, and corporate branding should be synergic (Foster et al., 2010).

The concepts of employer branding, internal employer branding, and external one are used in the literature to distinguish different approaches towards the concepts (Table 1).

Table 1.
Different approaches towards the concept of employer branding

	Models of Employer Branding		
	Outside-in (external EB)	**Inside-out (internal EB)**	**Corporation brand (EB internal+external)**
Models	Model by K.Backhaus, S.Tikoo; model by G.Martin; Model by R.Moosley;	Model by R.Wilden, S.Gudergan, I.Lings; Model by S.J.Miles, G.Mangold;	Vision-Culture-Image Model; Model by M.J.Hatch, M.Schultz; Model by H.K.Aggerholm, S.E.Andersen, C.Thomasen;
Main goals of the approach and characteristic	Brand recognition, positive perception of a brand, brand loyalty. In the situation when organizations must court employees/talents, employers are perceived through their brand perception.	The brand of an employer is perceived as a result of service quality, organizational culture, social acceptance, level of wages, benefits offered, prestige, recruitment procedures, etc. – so all the internal procedures influence the perception of a business as an employer. Employees are internal consumers of the company.	Combination of internal and external branding.

Source: Łazorko, 2019, p. 19.

Generally, the efforts related to employer branding, as the ones that are aimed at the creation of the organization's image as an employer, can be discussed as the ones aimed at external audiences (potential employees, clients, cooperators, and other groups of stakeholders), as well as internal one, aimed at current employees. Due to many publications regarding employer branding and different approaches (Table 1), defining the concepts and indicating the areas of interpretation, it may be assumed that "the external employer brand can then be mapped to

an organization's employer image (i.e., an outsider's mental representations of attributes related to an organization as an employer), whereas the internal employer brand (i.e., an insider's mental representations of attributes related to an organization as an employer) corresponds to an organization's identity. External employer branding is then considered to be a synonym for employer image management" (Lievens, Slaughter, 2016, p. 410).

Effective employer branding determines the decisions of potential employees and helps in talent acquisition (Sommer et al., 2016; Ciscio, Graham, 2016; Zojceska, 2018; Pilurzu, 2019) and attracting shareholders (Gordon, 2022). It also impacts employee satisfaction (Schlager et al., 2011), supports onboarding procedures, and affects many aspects of work life (Adler, Ghiselli, 2015; Sokro, 2012; Sakka, 2020) by building an identifiable and unique employer identity to differentiate from competitors (Backhaus, Tikoo, 2004). Research results confirm that people who work for employers with a recognizable and positive image are more effective (Berthon et al., 2005, Kunerth, Mosley, 2011; Yalim, Mizrak, 2017; Staniec, Kalińska-Kula, 2021), and employers who consider and care about the well-being and happiness of employees are perceived as more attractive for job seekers (Patnaik, 2021). Employer branding enables employees to transform brand values into reality during the delivery of the brand promise (King, Grace 2008; Foster et al., 2010), and it is also discussed in the context of internal communication (Chong, 2007; Dryl, 2017; Hoppe, 2018; Itam et al., 2020; Tkalac Verčič, 2021; Pološki Vokić et al., 2023).

In the opinion of practitioners, employer branding "is an uphill climb since there are a lot of things to cover. This includes managing employee advocacy, marketing your business on social media channels and job boards, and identifying areas that require full attention to achieve this objective" (Gordon, 2022). When the introduction of employer branding programs is considered, most employer branding leaders indicated that the most effective are: the creation and sharing of engaging content, mapping out employer branding strategies, managing social media presence, building advocacy programs, and tracking employer brand's performance (Downing-West, 2023).

The changes within employer branding in Poland may be observed based on the research conducted by the HRM Institute, one of the biggest Polish consulting agencies. It specializes in HR aspects, with particular attention put on different aspects of employer branding. The research conducted annually enables comparison of results, as well as an indication of changes that can be observed within the area of employment and recruitment. The reports by HRM Institute inspired the research conducted within the study. As the HRM study focused on larger employers (HRM Institute, 2023), as well as research papers by different Polish scientists (Bilińska-Reformat, Stańczyk, 2018; Stuss, Herdan, 2018; Buchelt et al., 202, Sulich 2021) the research conducted within this study focused mainly on small and medium enterprises from the region of Częstochowa to investigate how employer branding is interpreted by local entrepreneurs and how important it is in overcoming consequences of crises, especially the ones organizations face at the moment, related to the Covid-19 pandemic, the war in Ukraine, high inflation, and rising labor costs.

2. Methods

As mentioned, the research was inspired by the results of research conducted by the HRM Institute, although the local aspect of performance and employment in the researched businesses determined the sampling and construction of the research tool.

The research was conducted in the Częstochowa region to investigate how smaller entrepreneurs, operating in the local environment, perceive some elements of employer branding and compare the results with information from the HRM Institute report and other available sources. The reason to choose smaller enterprises for the study was mainly determined by the fact, that according to PARP, the sector of SME is dominant in Poland (99,8%), with 97% of the microenterprise (PARP, 2022), while in the structure of the sample in the HRM Institute that aspect was not reflected, what is although understandable due to the fact, that larger businesses have larger budgets and higher awareness of some elements related to HR, including employer branding.

In the Częstochowa region, most of the companies operate in the area of Czestochowa (73% of all businesses registered in the district of Czestochowa). Among the new businesses, the most frequent are the ones offering construction services and building materials (17%), B2B services (17%), and operators in the area of logistics and transport (9%) (ALEO, 2023).

The qualitative part of the research was conducted among 60 entrepreneurs from Czestochowa, 20 with the CAWI method using a questionnaire prepared in the Google Forms tool and 40 during face-to-face interviews with the same questionnaire, consisting of 19 questions (2 metric ones), in May and June 2023. The respondents represented mainly micro-entrepreneurs, employing 1 to 9 people (42 companies) and 11-20 people (16 companies). 2 companies employ more than 21 people. Most businesses offer services (58), mainly: IT, construction, production support, events organization, marketing, medical, catering, wedding planning, language courses, and health and beauty. 2 businesses are production sites.

To possess qualitative data, the interviews on employer branding were conducted with 5 entrepreneurs. They represented: 2 health and beauty salons, 1 wedding planner, 1 conferencing service, and 1 machine tools service. They all employ up to 10 employees and operate at local (2) as well as at national (2) and international markets (1). The discussion during the in-depth interviews (that took about 30 minutes) covered the following matters: employer branding strategies introduced, perception of a company as an employer and its importance, main problems regarding employees, including present problems and foreseen ones, ways to manage talents, the role of internal employer branding in the process. The interviews were conducted after the quantitative data was collected to analyze closer the key points, and to enrich the process of analysis.

In both pieces of research, convenience sampling was used.

3. Discussion on the results

Following the HRM Institute methodology, the opening question was related to the factors that entrepreneurs perceive as the ones that will affect their business performance in the incoming years in the most significant way (Table 2).

Table 2.
Factors influencing businesses in the opinion of respondents in national and local studies

	HRM Institute research	Local businesses research
Economic crisis/inflation/	72%	35%
Technology/automation/AI	47%	5%
The mental health of employees	34%	0
Fast adaptation to changes	32%	-
Lack of talents	29%	50%
Ecology/Sustainability	20%	-
Employees competences	15%	
Integration of the State into businesses	8%	5%
War in Ukraine	8%	0
Social matter	7%	-
Increased unemployment rates and higher accessibility of candidates	4%	0
Rising costs of running the business	-	80%

- the factor was not mentioned in the questionnaire.

For local entrepreneurs, the most demanding is the problem with rising costs related to business. The in-depth interviews, as well as the survey results, indicate that aspect as the one that has definitely made running the business more demanding recently. During the interviews, the entrepreneurs declared that a minimum wage increase as well as an increase in the prices of materials were the factors that cause their most concern.

One of their main concerns, apart from the rising costs, is related to problems with candidates' availability in the market. They all agreed that recruitment would be more demanding in the incoming years, mostly because of the higher financial expectations of candidates (63%). The same opinion was shared by representatives of larger companies participating in the HRM research. They also have problems with possessing new candidates due to their expectations (62%) followed by a smaller tendency to change jobs in the market (20% - quite significantly 41% in 2022). During the interviews, that aspect was also discussed. Most businesses have already suffered from a lack of qualified employees, and if, at the moment, they have a group of qualified employees, they are afraid that there will be problems to fulfill the vacates as they get retired in the future. Their concerns are also related to the employees entering the job market, including Gen Z representatives whose expectations towards employers and work deviate from what employers are used to, which has been already observed worldwide (Schroth, 2019; Chillakuri, 2022; Janssed, Carrdini, 2021; Racolta-Paina, Irini, 2021).

It is quite significant that none of the local employers indicated that the mental state of their employers could be the factor influencing their performance, while bigger companies recognize the problem. The reasons behind that situation may be found in the fact that smaller groups of employees (the researched companies are usually the ones with up to 10 employees) can see and react earlier to any troubling situations in the workplace. That assumption was also confirmed during in-depth interviews. The respondents declared that because the teams were smaller, they could react more elastically in case of any problems in that area.

In the questionnaire, as well as during the interviews, the respondents were asked to indicate the forms of employer branding they introduce. Most of them know the concept of employer branding (70%), while the vast majority (30) do not introduce it within their businesses, because they do not find it applicable. The in-depth interviews revealed that entrepreneurs find the concept attractive but they believe it requires lots of funds to be introduced and never got into details of it. 65% of respondents declare that they agree that employees are the first customers of a company, while 35% claim that external customers are the most important. Those statistics are quite significant because they indicate that there is a group of local entrepreneurs who believe that they can achieve success in the market without treating their employees as the first customers of their services. As observed that opinion was not shared by younger employers, but due to the small sample size, that element cannot be interpreted as a tendency and should be confirmed by further research.

The respondents were also asked if, in their opinion, they are perceived by employees as good employers. Most of them declared they were (75%) while the remaining group replied they did not know and they were not interested in the opinion of employees in that matter.

Most businesses organize teambuilding meetings for their employees (65%), but they are rare, mainly before Christmas and the company's anniversaries. During interviews employers admitted that this is a result of the COVID-19 pandemic, as well as financial aspects – they are more cautious in spending money and as employers usually meet every day and know each other privately, there is no point in further integration. That aspect is worth further research at the local level as the concept of employee teambuilding effectiveness depending on the size of the team was discussed only for larger companies so far (Salas et al.,1999; Svantek et al., 1999; Abbas, 2021).

Half of the owners researched declare that they know the idea of organizational culture and try to implement it within the organization, while 30% know the idea but they react only in case of problems. That aspect of work-life balance, culture support, and job satisfaction is proven to increase the effectiveness of employees (Naqvi et al., 2013, Abdirahman et al., 2020, Rini et al., 2020).

During the research, also communication with external audiences was analyzed. The respondents were asked whether their employees posted in social media any content regarding their place of work. 30% of employers declared that their employees showed in the social media or business social media results of their work (e.g. visualizations of services,

photographs of services, etc.), while 60% did not publish any content regarding the place of work or do not encourage employees to do so. 10% of entrepreneurs prepare and post that type of content by themselves. The results indicate that still there is a space for further education in the area of communication with audiences, and that aspect of employer branding. As 65% of respondents declare that they agree that employees are the first customers of a company it can be stated that they understand the role of employees in marketing, but they seem not to be aware of the role of employee advocacy and its importance in marketing efforts. Moreover, most of them (55%) do not know whether employees recommend their company to others (family, friends, etc.). This aspect should be looked into by employers in more detail because it is proven that employee advocacy affects many different aspects of an organization's marketing performance (Yilmaz, Sanli, 2017; Tsarenko et al., 2018; Lee, 2021).

In most of the researched companies (70%) employees help to search for new candidates which can also be indicated as a specific characteristic of local businesses. At the same time, employers declare that when they seek candidates, they usually use job boards (55%), go through received applications (45%), and meet with candidates recommended by friends (25%). None of the respondents declared that they used the recommendation of employees. Whilst, during the reviews conducted with the employers, it was revealed that information about potential recruitment is quite often distributed by employees and the candidates who are recommended by the employees are often recruited. Additionally, most employers do not check opinions about themselves as employers on the job boards (70%), while 18 entrepreneurs (30%) do it regularly.

The tendency to recruit young people observed by the HRM Institute can be also observed in the local business. If they recruit, they usually search for young candidates with no experience (45%) or specialists with 1-6 years of experience (40%). The results are also confirmed by the research on the national level – as declared, young professionals with 1-6 years of experience are the most sought in the market (HRM Institute, 2023).

The aim of the study was also related to the crisis and EB as the way to overcome its effects. The respondents were asked whether they perceive the engagement of employees as the factor that may influence the resistance of organizations during the crisis. In that case, the opinions were divided almost evenly, with 55% of respondents claiming that in case of crisis, even the engagement of employees is not enough to overcome its consequences.

4. Summary

Employer branding has been researched in Polish literature for the last few years, analyzing different perspectives on its implications regarding recruitment, as well as the perspective of different types of organizations, for example medical (Buchelt et al., 2021), energy (Stuss,

Herdan, 2018) or retails (Bilińska-Reformat, Stańczyk, 2018). Polish researchers have also analyzed communication channels (Grzesiuk, Wawer, 2018) and content (Łazorko, 2019; Sulich, 2021). There is also a survey conducted annually by the HRM Institute regarding the state of employer branding in Poland. However, still there is a lack of publications regarding the topic of employer branding from the perspective of smaller enterprises.

Most local employers deal with different problems related to present and potential employees. They build the feeling of integration in their teams and try to make employees engaged. They invest in training them and later have to face the situation that the qualified employees leave. As the qualitative research revealed, the problem of employee fluctuation, although curbed by the COVID-19 pandemic (that tendency is also reported by HRM Institute), is one of the main challenges employers have to face, accompanied by growing costs of business performance.

It can be assumed that in SMEs internal employer branding is used intuitively based on the solutions developed and tested by employers and their experience. Moreover, external employer branding's potential is not fully used, as most of the local organizations do not see the need to create their image as employers as the range and the scale of their performance are smaller and mainly based on interpersonal relations. Owners and their employees are mostly not anonymous for clients and their relations are different from large-scale companies. Moreover, bigger enterprises have larger budgets that can be spent on issues related to employer branding, and their actions are planned and introduced consequently (HRM Institute, 2023). Nevertheless, in the case of SMEs "despite the limited sources, things can always be done, especially since employer branding is not an outcome but an experience we can create" (Baluchova, 2023). Hence, although the situation of smaller enterprises is different, the actions they undertake to recruit and maintain the most valuable employees, increase the engagement of employees as well as promote their offers through employee advocacy mainly intuitive at the moment, should be planned and intensified.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

PUBLIC TRANSPORTATION APPS USERS IN SILESIAN METROPOLIS

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Purpose: The purpose of this paper is to assess the subjective preferences of mobile app transportation users who commute in the Silesian Metropolis area.
Design/methodology/approach: The article uses the following methods to achieve the set goal: literature analysis, descriptive and statistical analysis of data obtained in primary research carried out by the authors using the CAWI method.
Findings: Silesian Metropolis has smart transportation potential, according to research. Several apps allow city travel. Local governments and transit coordinators write apps. Passenger-friendly apps need a little adjustment. The software allows quick ticket purchases. Decentralization harms the system. They manage transportation managers or organizational units. Passengers feel the study region should consolidate apps and systems. They would gladly provide market research or application experience data.
Practical implications: The conclusions indicate that passengers are looking for a centralized mobile application to travel around the Silesian Metropolis and they are willing to contribute to its development, according to the findings. This may be the beginning of cooperation between all managers of currently existing applications and their clients.
Research limitations/implications: The CAWI approach has various disadvantages, including the fact that it is dependent on internet access; the target audience may be large but not universal, and it is associated with the risk of losing the respondent's attention.
Originality/value: The article provides insight into the thoughts of users of mobile applications in the Silesian Metropolis.

Keywords: smart mobility, public transportation, apps, GZM.

Category of the paper: research paper.

1. Introduction

Smart solutions are prevalent in each of our daily lives. Using modern information technology, people aspire to improve the quality of life. The rapid development of technology is most obvious in densely populated areas like cities. According to World Bank statistics, cities

host 56% of the world's population (4.4 billion people). This trend is expected to continue, with the urban population more than doubling by 2050, when roughly seven out of ten people will live in cities (World Bank, 2023). With cities accounting for more than 80% of global GDP, urbanization can contribute to long-term growth through greater productivity and innovation if properly managed.

The innovative use of the smart city concept, which is based on the use of contemporary information and communication technologies (ICT), can contribute to the improvement of city inhabitants' life. As a result, most of the Polish cities are attempting to become smart cities. A significant component of a smart city is smart mobility, which is defined as an integrated transport and logistics systems that utilize sustainable energy. The need for smart mobility solutions in Polish cities is primarily a result of the high levels of air pollution caused by automobile emissions, the long wait times in traffic jams, and the high frequency of car accidents, all of which have a detrimental impact on the residents' sense of safety.

These days, a single mobile transportation app can fulfil a wide range of needs in the transportation industry, from ridesharing to GPS location to route planning to navigation to data collecting and analysis on traffic conditions to advice on when to travel. The convenience of having so much data at your fingertips via a smartphone has also accelerated the widespread adoption of this technology.

Several studies have already examined the implementation of mobile technology in the Polish public transportation system. Bojda (2011) reviewed information technologies supporting traveling by public transport operating in Poland and Germany. He outlined the primary features and functions of the systems operating at that time and signaled the emergence of the new Passenger 2.0. Few studies examined the introduction of passenger information system in different Polish cities such as Radom (Grad, Ferensztajn-Galardos, Krajweska, 2013), Krakow (Kędzior, Bryniarska, 2015; Bryniarska Gacek, 2018), Upper Silesian Industrial District (Kos, 2016) and Lublin (Berlińska, Choma, 2018) Three of those studies examined the passenger perspective on the implementation of this system in their cities. Kędzior, Bryniarska (2015) presented the results of a study conducted at public transport stops in Krakow. The aim of the study was to assess the level of passenger information in Krakow based on the opinions of public transport users. Passengers assessed the quality of information available at the journey planning stage, at stops and in vehicles. Later study (Bryniarska, Gacek, 2018) also conducted in Krakow area was aimed at characterizing and evaluating travel planners in terms of their usefulness for passengers of public transport in Krakow. As a result, it was shown to what extent the Internet and mobile applications are used and which information contained therein is the most important, valuable and helpful. Researchers (Berlińska, Choma, 2018) also covered the degree of use of mobile applications to move around the city of Lublin. Especially whether there are significant differences in the degree of use of application data and how the degree of their use relates to the usability of the application and the implementation of the assumptions of the concept of sustainable transport development and the Smart City concept, especially among young people who shape their communication choices.

Other study conducted in 2017 (Kos, Urbanek) focused on another aspect of passenger perspective, namely their attitude to mobile payments on the public transport. The aim of the study was to characterize the electronic payment systems for public transport services functioning in Polish cities, as well as to examine the level of use of modern technologies (Internet and mobile applications) to purchase tickets for public collective transport in cities.

None of these studies focused on Silesian Metropolis passengers' preferences for mobile transportation apps, key existing and potential features, ticket purchases, and app supervision, resulting in a research gap. Therefore, the purpose of this article is to assess the subjective preferences of mobile app transportation users who commute in the Silesian Metropolis area. To achieve its objective, the study employs the following methods: literature analysis, descriptive and statistical analysis of data acquired from primary research conducted by the authors utilizing the CAWI method.

2. Literature review

2.1. Smart city

The smart city concept is currently one of the liveliest discussed topics on the forums of politicians, economists, architects, urban planners, lawyers as well as IT and web specialists. Despite the immense interest and recognition in the scientific community, the main definition of a smart city concept has not yet been established. According to numerous academics, the concept of a smart city began to gain popularity in the early 1990s. (i.a Caragliu, Del E Nijkamp, 2011; Albino, Berardi, Dangelico, 2015; Mora, Bolici, Deakin, 2017; Mora, Deakin, Reid, 2017; Komninos, Mora, 2018; Yigitcanlar et al., 2018; Krysiński, 2020; Ochojski 2022) and evolved on the premise that there should be integration of systems connected to services that help people live in cities, integrating human and technology capital, and researching ways to improve the city's relationship with its people (Pinochet et al., 2019).

The Smart City concept involves the use of IT and digital data transfer to rationalize the management of urban resources, improve the efficiency of urban logistics, and achieve sustainable development, as well as other positive aspects - social, ecological and economic (Szewc, 2020, p. 89). Moreover, these areas can be integrated to obtain a holistic approach and development of the city (Appio et al., 2019; Höjer, Wangel, 2015; Jonek-Kowalska, Wolniak, 2019; Kaźmierczak, 2019; Kuzior, Sobotka, 2019) and reduce its operating costs (Anttiroiko et al., 2014)

This concept allows integrated operations of digitally connected city infrastructure and service systems by deploying different communication technologies, real-time data collection infrastructure and data analytics and intelligence platforms to improve the efficiency of city

services and improve quality of life (Dey, Fries, Ahmed, 2018, p. 267). The goal of smart city implementation is to minimize the issues of continuing urbanization development and the effects of climate change in urban areas (Zhihua Zhang, Jianping Li, 2020). However, thanks to the technology used in smart cities they are also thought to be hubs of innovation and economic development (Manoharan et al., 2023, p. 71).

Depending on the deployment cost, funding availability and maturity of technologies, any combination of various Smart City infrastructure systems and service systems can be implemented (Silva et al., 2023). The success of Smart City implementations is primarily dependent on an emphasis on the adoption of new technology-based infrastructure and service systems, broader community participation in the development–deployment–operations of such systems, strong leadership, and effective resource management (Mbonu et al., 2022; He et al., 2021). Depending on available resources, different cities throughout the world can implement Smart City ideas on varying scales.

Authors of Smart Cities - Ranking of European Medium-Sized Cities (Giffinger et al., 2007) introduced six characteristics and their assigned factors (Figure 1), that characterize the most important functional and organizational areas of the city as well as its human, tangible and intangible resources.

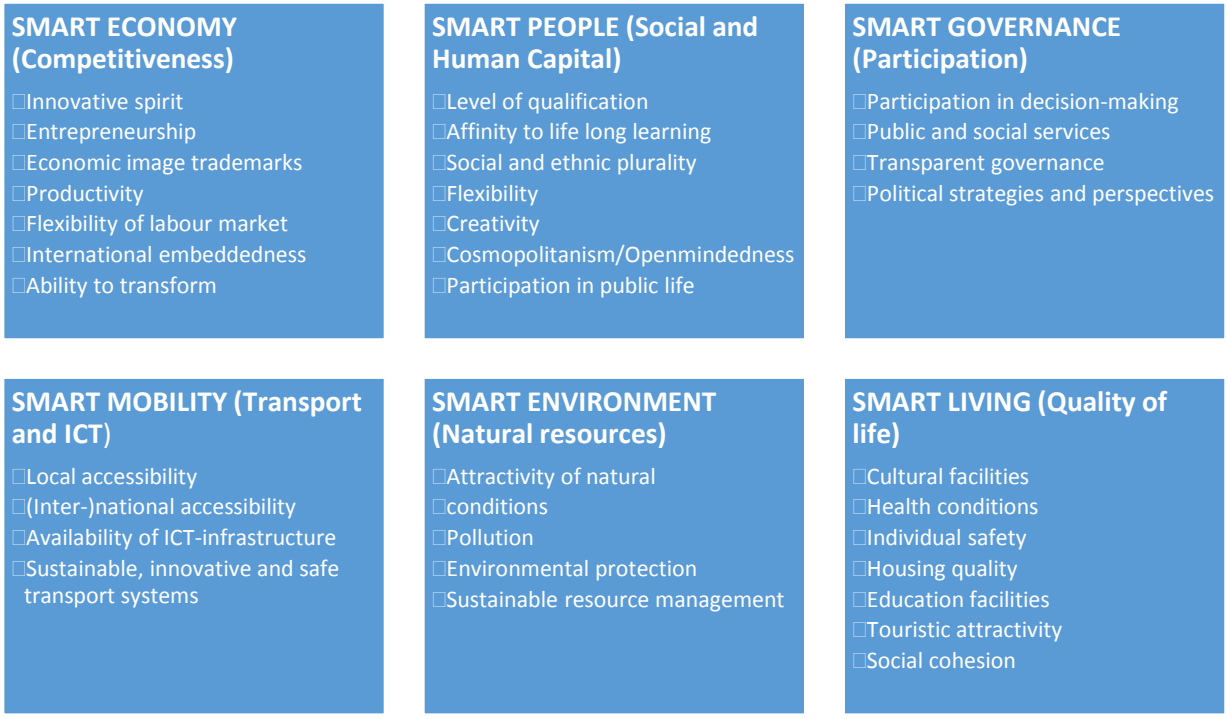


Figure1. Characteristics and factors of a smart city.

Source: Giffinger et al. 2007.

The smart economy (competitiveness) is frequently regarded as the most essential dimension. In the modern world, it is founded on the creation of new jobs, the encouragement of entrepreneurship with a focus on small and medium-sized businesses, the systematic development of competitiveness through the development of innovative products and services,

and the increase in productivity through the use of new techniques and technologies supported by disciplined management. It is also the ability to notice emerging trends and adjust or transform accordingly (Muraszkiewicz, 2016)

Smart people's value (human and social capital) is an organic product developed by successive generations of city residents, with whom new, highly skilled, and creative specialists eventually blend. This approach requires a constant strategy of openness and social and, in some cases, ethnic heterogeneity. Many smart city theorists and practitioners, particularly those who are sceptical of technocratic solutions, regard human capital and its more advanced form, social capital, as the beginning of everything important in a smart city, as the quintessence and necessary condition but sadly, not sufficient to constitute such a city (Muraszkiewicz, 2016).

Smart governance (participation) refers to the democratisation of decision-making processes, including access to the data required for these processes. In the case of cities, it is about inhabitants', producers', and service providers' engagement not only in making decisions on specific issues concerning the city's operation but also in the task of developing a plan for its development. Transparency in management systems has become unquestionably the rule in modern, prosperous cities (Muraszkiewicz, 2016).

Smart mobility (transportation and ICT) focuses on physical mobility, which is supported by both “hard” communication infrastructure (roads, streets, bridges, viaducts, parking lots, etc.) and the “soft” communication layer in cyberspace. This involves issues such as universality and accessibility to this infrastructure and layer, as well as simplicity of usage, such as access to local offices, services, and municipal resources (Muraszkiewicz, 2016).

Smart environment (natural resources), which refers to the city's natural environment, cleanliness, and attractiveness for living, working, and active enjoyment, has become one of the most essential aspects of attracting investors, new inhabitants, and tourists. In the face of the city's usually expanding growth needs, sustainable management of natural urban resources is now a constant component of its strategy, clearly distinguishing successful cities from troubled ones (Muraszkiewicz, 2016).

Until recently, smart living (quality of life) was applied to rich communities; today, this topic is permanently on the agenda of nearly all major cities throughout the world. Improving the quality of life is at the heart of presidents', and city mayors' initiatives in India, China, South America, and Africa. The safety of people and commercial entities operating within an urban agglomeration has become a fundamental and universal requirement for its development. Efforts to enhance living conditions, education level and accessibility, decent health conditions, appealing amenities and cultural events have become regular elements of the activities carried out by local officials. All of this is designed to form the social cohesion of the population and foster a sense of affiliation with the city, its history, identity, and fate (Muraszkiewicz, 2016).

2.2. The concept of smart mobility

Some researchers suggest that smart mobility is a cornerstone of the smart city concept, mostly because its deployment has the potential to reduce road congestion, commute times, and road accidents while allowing passengers to personalise their travels (Bıyık et al., 2021).

To this day, researchers around the world have not agreed upon a definition of smart mobility. Some define it simply as one of the elements of a smart city plan (Yigitcanlar, Kamruzzaman, 2019). Others consider this concept to be the apex of a smart city, which is tied to municipal decisions and strategies based on communication, data, and technology tools (Tomaszewska, Florea, 2018). Others see it as a group of numerous actions that enhance users' mobility by foot, public or private transportation, or any other means of transport and eventually allow for the reduction in economic costs that are incurred by the environment and time (Aletà, Alonso, Ruiz, 2017). Some suggest that smart mobility is more than just incorporating technology into urban infrastructure; it also requires inhabitants to explore and interact with their urban environment thoughtfully and reasonably (Allam, Newman, 2018). Others focus on its broad meaning in connection to city improvement, where smart mobility is a broad method to reduce the toxic gases sent into the atmosphere by automobiles and human congestion and contributes to improving transportation quality while being ecologically friendly (Gabryś, 2014). The true essence of smart mobility includes but is not limited to, the use of intelligent transportation systems, open-data and open-source transport applications, applications for big data analytics, citizen engagement, and crowd-sourcing strategies from the ground up (Bıyık et al., 2021).

Smart mobility is portrayed as both a major challenge and a potential source of inspiration for transforming city operations. What is becoming apparent is the need to improve infrastructure to fulfil long-term needs of 50 years or more, rather than just immediate or short-term demands, and the need to treat smart mobility as a tool for improving economic, social, and environmental well-being (El-Sheruf, 2021). Key benefits of smart urban mobility were outlined in detail by The Climate Group (2019), and they include:

- Quality of life: improving the efficiency and accessibility of public transportation enhances the inhabitants' quality of life, saves money, and makes a city more appealing to tourists.
- Reduced pollution: smart systems encourage the usage of public transportation by providing access to different modes of transportation as well as real-time schedules and delays. This reduces the use of private cars while encouraging eco-friendly habits such as bike sharing and carpooling.
- Public transport safety and security: improved public transportation monitoring can aid in the detection and response to emergencies, accidents, and terrorist attacks. It can also lower the number of accidents in a city at an advanced stage of implementation.

- Mobility marketplace: the availability of open data regarding transportation and movement in the city generates a market for mobile apps that can assist consumers in travelling and consuming transportation services throughout the city.
- Smart parking solutions: cities can alleviate the problem of parking in congested urban areas by providing the necessary infrastructure, sensors, security cameras, and internet access. Cities can share data about available parking, and consumers can access this data through mobile apps and web interfaces.

According to El-Sheruf (2021, p. 101), smart mobility goods cannot fulfil their full potential to manage operational efficiency and user demand if any of their components are missing. Numerous infrastructure components are required for the smart mobility system, such as physical infrastructure, operational technology, and information and communication technologies (ICT). Coordinating and integrating across organizational levels boosts operational efficiency and paves the way for innovative demand management products.

The physical infrastructure of urban mobility, which includes roads, railroads, bike lanes, walkways, and other physical assets that allow transportation to operate, underpins the whole system. Data and information that assist smart mobility are continually created from dynamic patterns of human activity as individuals move the city using existing infrastructure (El-Sheruf, 2021).

Operational technologies generate data for smart solutions. They enable real-time capture and sharing of raw data from physical infrastructure and services and quick infrastructure management adjustments to provide capacity where needed. Many cities use such technology to guide travellers and maintain traffic flows, improving network efficiency (El-Sheruf, 2021; The Climate Group, 2019) Intelligent transport systems (ITS) are promoting sustainable and sensible urban mobility. This strategy includes electronic tickets and payments, traffic management, trip information, access control, demand management, and smart cards for urban transit in airports, railway stations, and bus terminals. These new technologies will allow citizens to access new services, enhance real-time traffic and capacity management, and track and monitor transport flows for environmental and safety concerns (Herrero, 2011). ITS equipment generates fresh transport network data and helps transport operators immediately control traffic and travel (El-Sheruf, 2021).

ICT is an umbrella term for any communication device or application, including radio, television, mobile phones, computer and network hardware and software, satellite systems, and so on, as well as the various services and applications that go with them, such as videoconferencing and distance learning (Huth, Vishik, Masucci, 2017).

With many new businesses presenting creative ideas to affect trip management, the software response to urban mobility is currently the most dynamic sector of growth in the urban mobility field. Channels such as Wi-Fi, 3G, 4G, 5G, and Bluetooth are crucial for real-time location-based data transfer from machine to machine, as well as between human operators, data processors, and information consumers (El-Sheruf, 2021). According to Statista (2023), the current global smartphone user population is 6.92 billion, which means that 86.29% of the

world's population possesses a smartphone. According to the Founding Research of the National Media Institute, 75.8% of Poles use a smartphone (Krajowa Rada Radiofonii i Telewizji, 2022). Users of smartphones are also Internet users - among the users of mobile phones with a touch screen, 90.7% have used the Internet in the last 12 months Krajowa Rada Radiofonii i Telewizji, 2022). In ITC systems data is acquired and aggregated by public and private actors. These data handlers create user-friendly applications and interfaces by combining city data and operational technology data. Communications networks deliver different apps to users, providing useful data that influence network operations and demand (El-Sheruf, 2021).

While many municipal governments and transport operators are already familiar with and use operational technology, its importance in giving data for software innovation is only now being recognized. Many cities are only now realizing the possibilities of software solutions.

2.3. The state of smart mobility in the Silesian Metropolis

Silesian Metropolis (Górnolsko-Zagbiowska Metropolia, GZM) is a metropolitan union in southern Poland, in the Silesian Voivodeship, established on July 1 (Rozporządzenie Rady Ministrów z dnia 26 czerwca 2017 r.). It consists of 41 cities and communes (Figure 1) with a total area of 2.5 thousand square kilometres, inhabited by 2.3 million inhabitants and 240 thousand companies and enterprises operating in it, generating about 8% of Poland's GDP (Metropolia GZM, 2023).

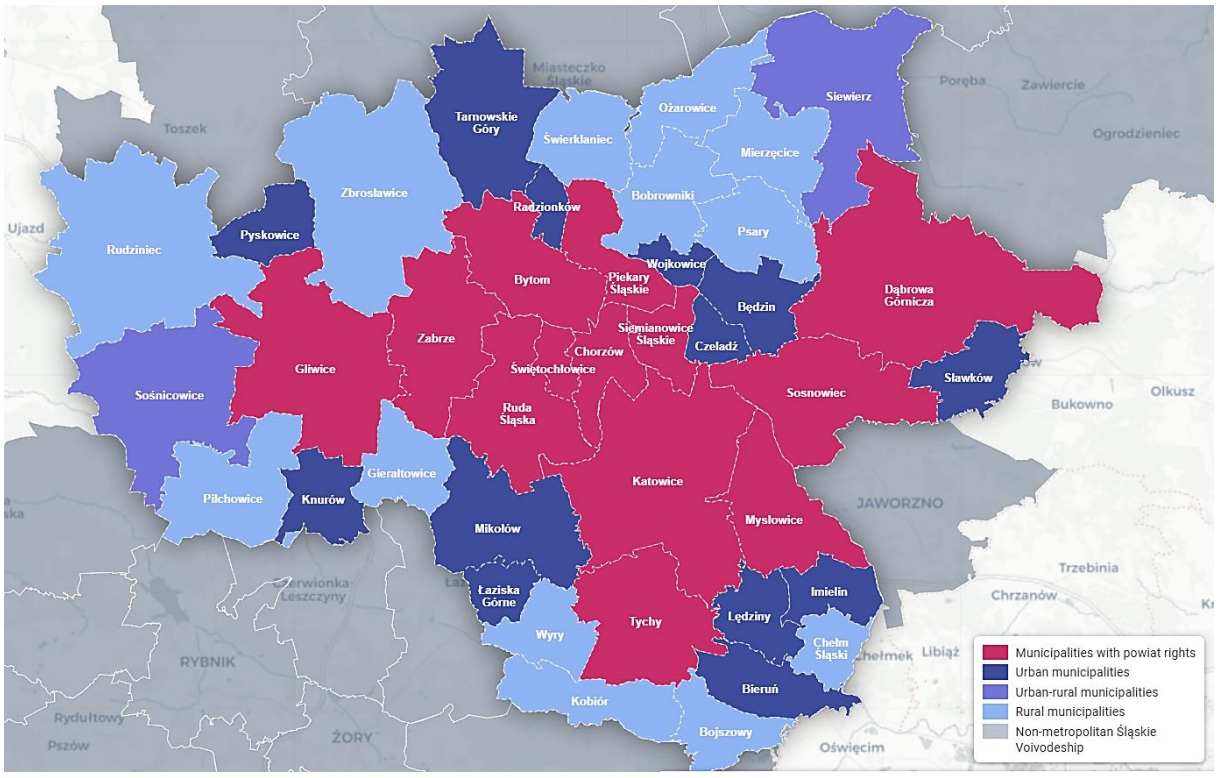


Figure 2. Map of Silesian Metropolis.

Source: https://infogzm.metropoliagzm.pl/infomapa.html.

Every day, around 1,500 public transportation vehicles with over 6,700 stops cross the Metropolis' streets. Over the last five years, metropolitan managers have undertaken numerous activities aimed at improving the urban transport strategy. One of the most important actions occurred in 2019 when the Metropolitan Transport Authority (Polish: Zarzd Transportu Metropolitalnego, ZTM) merged three existing transport organisers (KZK GOP, MZK Tychy, and MZKP Tarnowskie Góry) into one. As a result, the three organizers carried the same ticket policy. The consolidation of ZTM enabled the creation of a cohesive and uniform service, as well as the management of public transportation throughout the Metropolis (Metropolia GZM, 2023).

By establishing and changing routes, ZTM has been consistently increasing the quality of public transportation in the Metropolis. ZTM placed a passenger counting device in every vehicle to precisely determine the number of individuals who use each bus route and stop. The inauguration of the METROTICKET in 2019—a joint offer for buses, trams, trolleybuses, and Koleje Śląskie trains—was a major step forward for public transit in the Metropolis (Metropolia GZM, 2023).

Additionally, ZTM attempts to expand the availability of public transportation tickets. The existing operational "Silesian Card of Public Services" (ŚKUP) project will be changed, and new features will be added to make it more user-friendly and convenient for travellers. In almost 150 vehicles, the ability to pay for a ride with a credit card has been introduced, and shortly all sorts of tickets will be available for purchase through the ZTM mobile application. Eventually, the system will be expanded to include ZTM cars, railroads, and the metropolitan bicycle system. Additionally, the number of ticket vending machines is growing (Metropolia GZM, 2023).

One of the major priorities included in the development strategy for Silesian Metroplly focuses on the planning, coordination, integration, and development of public transport, including road and railroad transportation, as well as sustainable urban mobility (GZM, 2022) (Table 1).

Table1.
Strategic arrangements for mobility and accessibility in Silesian Metropolis

Goal	Direction activities
Developing sustainable urban mobility and popularizing public transport as the primary choice for everyday commuting	– Creating and implementing solutions to reduce individual transportation and improve pedestrian safety. – Integrating mobility and transportation communities.
Developing infrastructural and organizational conditions for the improvement of public and road transport	– Optimizing the operation of public transportation with the integration of operators and the tariff-ticketing system as well as the development of the ticketing network. – Expanding infrastructure related to public transportation and traffic management, including smart solutions. – Developing an information system on public transportation system solutions and implemented changes. – Supporting the development of priority metropolitan transport routes.

Cont. table 1.

Developing railway transport	– Developing rail infrastructure and fleet, taking into account the connection with the Katowice Airport in Pyrzowice. – Cooperation with institutions of the legislative and executive branch on changes in the mechanisms of financing railroad passenger transport and statutory discounts. – Promoting micromobility, including cycling and the principle of sharing – Building a coherent system of cycling connectivity and existing, and planned infrastructure. – Popularization of individual and shared micromobility for "last mile" travel.

Source: GZM (2023) Development Strategy of the GZM Metropolis for 2022-2027, with an outlook to 2035 Executive Summary.

GZM defines "smart mobility" as modern, remotely operated, and digitally operated mobility services consisting of making a trip from point A to point B using one or more means of transport, most often using a mobile application by the user. GZM is aware of the role of intelligent mobility in the Metropolis; it notes examples of single implementations of modern mobility services around the world, including in Gothenburg, Vienna, Dundee, London, and Warsaw. The goal of GZM is to create a diverse offer of smart mobility services and favourable conditions for the development of services on a competitive and free market basis, ensuring that a local monopoly (and preferences) for a selected service do not arise at the expense of others (Jędrzejewski, 2018).

3. Research methodology

For the purposes of this paper, a survey of Silesian Metropolis passengers was conducted. The computer-assisted web interviewing method was used to conduct the research, and the tool was a survey questionnaire, which consisted of 14 basic questions and 4 sociodemographic questions. The survey was conducted at the turn of April and May 2023, using Google Forms. The survey was conducted completely anonymously. The selection criteria were the usage of mobile applications to navigate the Metropolis and the willingness to participate in the study, which required the employment of a systematic sampling technique. 200 properly filled-out questionnaires were received (Table 2).

Table 2.
Characteristics of respondents (N = 200) in %

Sex				
Men		Women		
29.0		71.0		
Age Group				
15-18 yo	19-25 yo	26-40 yo	41-60 yo	above 60 yo
8.5	36.5	42.5	11.5	1

Cont. table 2.

Status			
Students	Employed	Unemployed	Pensioners
29.5	65.0	4.0	3.0
Education			
Primary education	Vocational Qualification	Secondary education	Higher education
7.0	3.5	43.5	46.0

Source: Own calculations based on data from the survey.

4. Results

The first four questions were intended to extract generic information on Silesian Metropolis public transit users. The very first question revealed how often the group surveyed uses public transit (Figure 3).

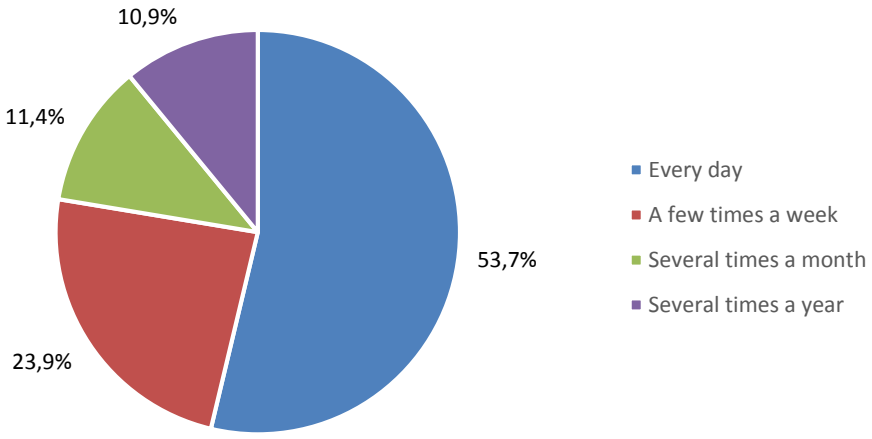


Figure 3. Frequency of travelling by public transport.

Source: Own calculations based on data from the survey.

More than half of the respondents use public transit daily (53.73 %). Almost a quarter (23.88%) do so multiple times per week. One-fifth (11.4%) do it multiple times each month, and slightly less (10.9%) do it multiple times every year. Men are more likely than women to utilize public transportation on a daily basis. People aged 15 to 18 make up the largest segment of daily travellers (82.1 %). Pensioners (54,3 %), working individuals (54,3 %), and students (44,2 %) travel more frequently than unemployed individuals.

The respondents were then asked about the most popular place reached by public transport (Figure 4). The majority of participants utilize public transportation to get to work (65.8 %). Social gatherings with family or friends (45,4 %) and errand-running (41,5 %) were also frequently cited reasons for travel. Shopping (31.6 %) and commuting to college or university were among the less popular answers (29.9 %).

It comes as no surprise that school or university is a top destination for young people aged 15 to 18. (45.6%). Equally, people of working age usually travel to work. Elderly individuals (those over the age of 60) use public transportation to run errands in the city (42.3%). People with primary education travel to school/university the most frequently (39.6 %), followed by those with vocational education (36.8 %), secondary education (28.1 %), and higher education (35.5 %).

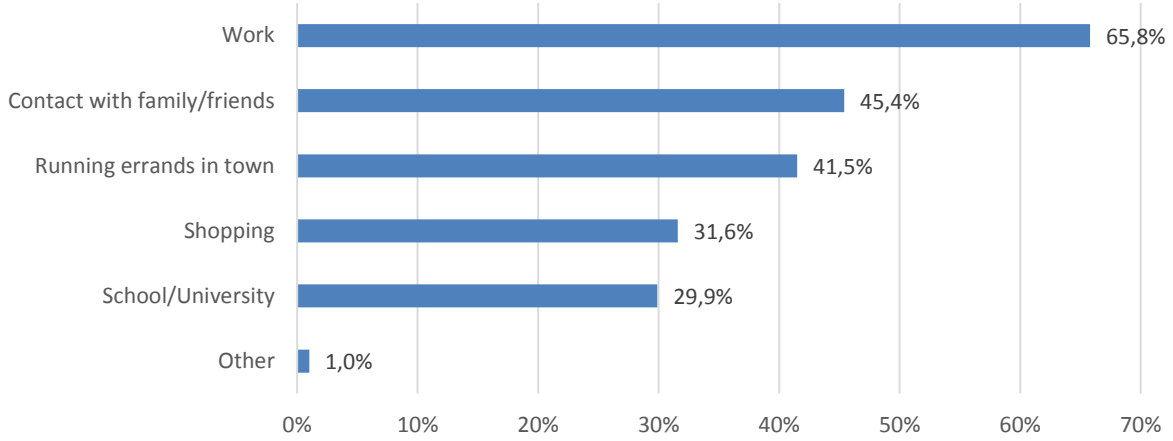


Figure 4. Most common travel destinations.

Source: Own calculations based on data from the survey.

Most frequently, respondents travel 6 to 10 kilometres by public transit (37.5%). Every third of them (29.8 %) goes between 11 and 20 kilometres, while every fifth travelers beyond 21 kilometres (20.2 %).

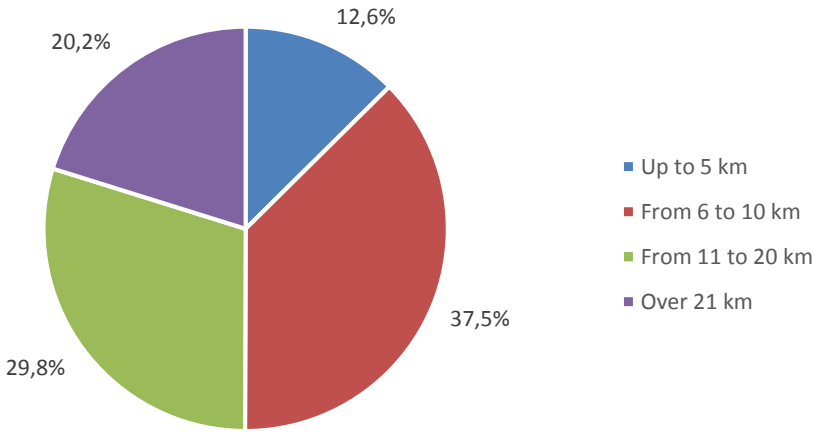


Figure 5. Distance travelled by public transportation.

Source: Own calculations based on data from the survey.

Surprisingly, the age group 41 to 60 has the highest frequency of travel above 21 km. Similar patterns can be noticed among the unemployed.

The bus was the most popular mode of transportation across all groups polled (83.2%). (Figure 6). The importance of other means of transport available in the Metropolis turned out to be marginal.

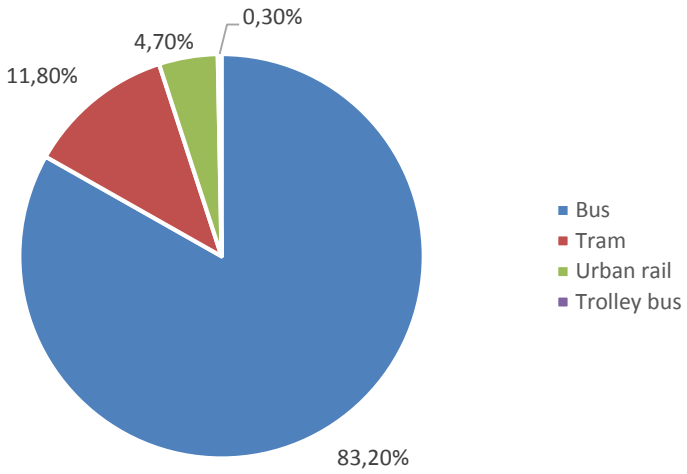


Figure 6. The most popular means of public transportation.

Source: Own calculations based on data from the survey.

The subsequent series of questions relates directly to mobile applications utilized for public transit in the region. The first question helped us to identify which mobile applications are the most popular among passengers (Figure 7).

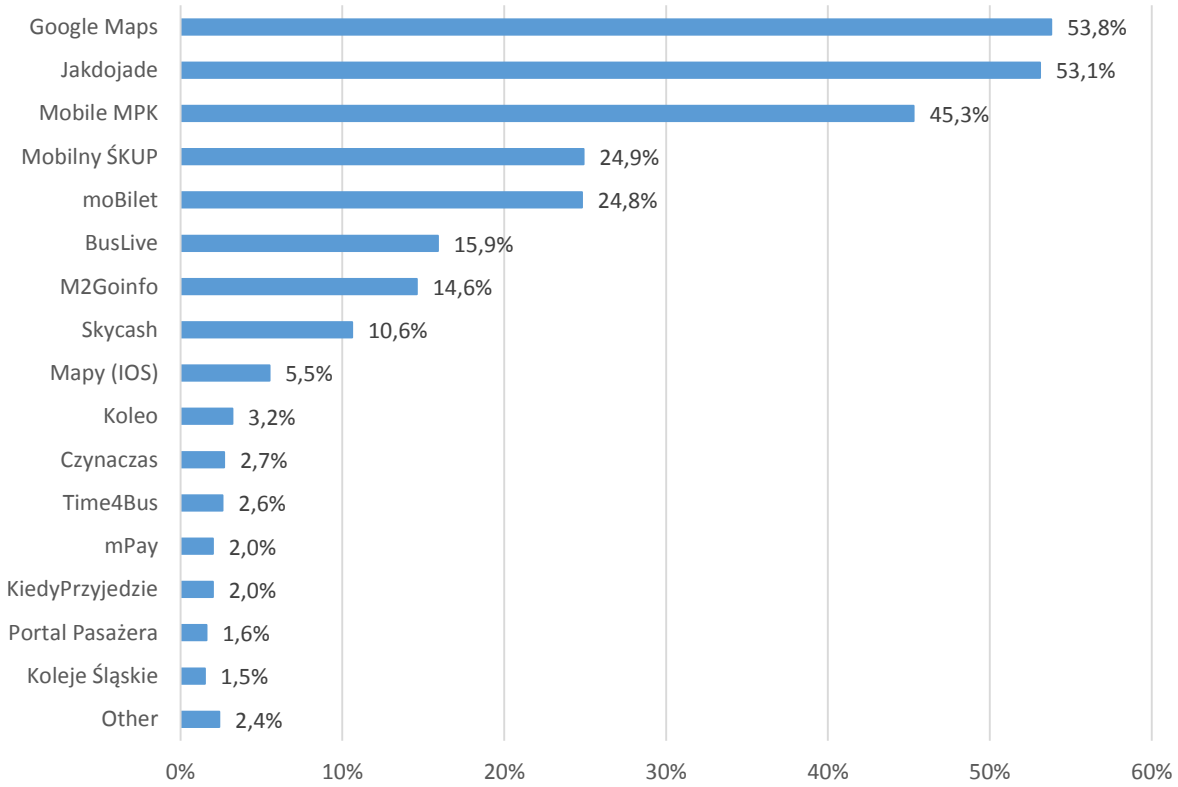


Figure 7. Most popular mobile applications among travellers.

Source: Own calculations based on data from the survey.

The study revealed that Google Maps is the most popular application for using public transportation, followed by Jakdajade. The application submitted by the body in charge of transport coordination ranks third (MPK). The specific features of each application are described below (Table 3).

Table 3.
Characteristics of apps used by respondents

App name	Manager	Features
BusLive	Private developer	– real-time transportation tracking on the map, – radar of means of public transport nearby, – timetable, – route planning, – allows adding routes to favourites, – possibility to rent vehicles from the rental company, – indicates bike-sharing stations, – indicates the amount of traffic on the streets on the map.
Czynaczas	Private developer	– real-time transportation tracking on the map, – timetable change announcements, – allows to search for lines and stops, – blog.
Google Maps	Private developer	– various public transport options, – live trip planning from where you are to your final address, – live view orientation in the environment, – allows to include of certain vehicle features in route planning, such as choosing uncrowded routes, vehicles accessible for disabled individuals, the temperature in the vehicle, and monitoring, – traffic monitoring, – carrier information, – possibility to plan your trip in the calendar.
KiedyPrzyjedzie	Private developer	– real-time transportation tracking on the map, – timetable, – allows adding routes to favourites, – timetable change announcements.
M2Goinfo	Transport coordinating organization (ZTM)	– real-time transportation tracking on the map, – timetable, – finding and presenting information about a selected transport line and selected vehicle, – timetable change announcements, – route planning, – quick search in terms of a communication line and a stop or stand, – allows adding routes to favourites.
Maps (for IOS)	Private developer	– route planning, – timetable, – allows adding routes to favourites, – check ticket prices, – the ability to pay for tickets using Apple Pay, a public transport card.
Mobile MPK	Transport coordinating organization (MPK)	– route planning, – real-time transportation tracking on the map, – timetable, – allows checking where city bikes are stationed, – coordinate sharing, – allows for determining the conditions in the vehicle - e.g., low-floor vehicles.

Cont. table 3.

moBilet	Private developer	– parking payments, – tickets for public and long-distance transport, – prepaid account funded by: Blik, Przelewy24 and Klarna, – controlling active tickets and payment history.
Mobilny ŚKUP	Local government (GZM)	– ŚKUP (city card) card registration, – Purchase of a single/group ticket via ŚKUP or a prepaid account associated with ŚKUP, – timetable, – timetable change announcements, – allows for sending a complaint, – allows for notifying false vehicles.
Skycash	Private developer	– route planning, – allows to purchase tickets for: tickets for parking, public transport tickets, highways, Taxi, PKP intercity tickets, railways, flight tickets, coach tickets, cinema, parking, entertainment and shopping, Tatra National Park tickets, top-up GSM and bills, – purchase can be made by a prepaid account funded by bank transfer, promotional code, payment card, PayU and Przelewey24 (BLIK), – allows to save payments to favourites.
Time4Bus	Private developer	– real-time transportation tracking on the map, – route planning, – timetable, – locating stops, – filtering vehicles on the map.
Jakdojade	Private developer	– route planning – allows to purchase of tickets using a prepaid account powered by: BLIK, Google Pay, card, – timetables, – possibility to save routes to favourites, – allows to determine the conditions in the vehicle and transfers, – radar that determines access to the nearest stop.
mPay	Private developer	– allows to purchase: PKP Intercity tickets, highways, public transport, parking, – route planning, – timetables, – allows to purchase insurance for travel, vehicle insurance and accidental death and dismemberment insurance, – methods payments: transfer, loan.
Portal Pasażera	Transport coordinating organization (PKP Polskie Linie Kolejowe S.A.)	– route planning for all of the railway carriers in Poland, – timetable, – real-time transportation tracking on the map, – current messages from the infrastructure manager and carriers, – "Quick connections" section with your selected relationships, – possibility to configure favourite stations and relations, – online map with the route of your connection, – three language versions - Polish, English and Ukrainian.
Koleje Śląskie	Transport coordinating organization (Koleje Śląskie)	– allows to purchase single and season tickets for Koleje Śląskie connections and combined tickets which change, – allows to purchase of tickets using cad, quick transfer and BLIK transfer, – allows to use of map navigation while travelling.

Cont. table 3.

Koleo		– timetable, – ticket price list, – allows to purchase tickets for the following carriers: PKP Intercity (TLK, IC, EIC, EIP), POLREGIO (PR), Arriva RP (ARRIVA), Koleje Dolnośląskie (KD), Koleje Małopolskie (KMŁ), Koleje Śląskie (KŚ), Koleje Wielkopolskie (KW), Łódzka Kolej Aglomeracyjna (ŁKA), PKP SKM w Trójmieście (SKM-T), – available ways of payment: KOLEO account, card, BLIK or GPay.

Source: Own elaboration.

In the next question, respondents were asked to rank the importance (on a six-point Likert scale: unimportant, somewhat important, rather important, very important, and essential) of the most prevalent functions of the applications currently in use. (Table 4).

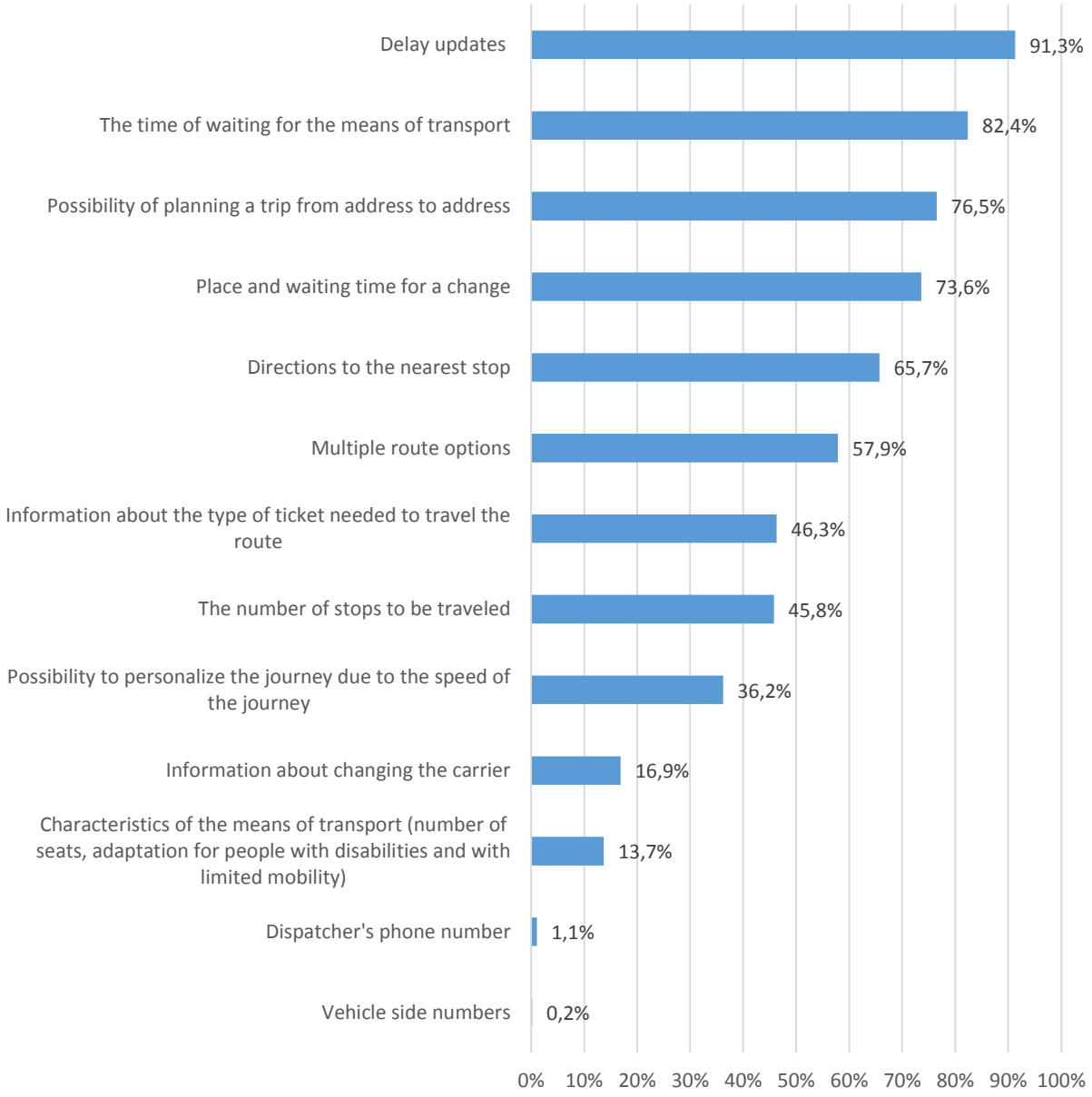
Table 4.
The importance of the features available in the application

Features	**Assessment**				
	Unimportant	**Somewhat important**	**Rather important**	**Very important**	**Essential**
Intuitive operation	2%	5%	24%	38%	31%
Current timetable	1%	3%	7%	9%	79%
Ability to work offline	10%	25%	20%	26%	19%
Automatic detection of the traveller's location	8%	18%	21%	32%	22%
Tracking means of transport in real time along with determining the delay	3%	5%	15%	21%	55%
Route planning, considering the necessary transfers and changes of means of transport	2%	4%	16%	27%	52%
Information about the type and price of the ticket necessary	9%	14%	22%	26%	29%
Possibility to buy a ticket	8%	11%	20%	24%	36%
Possibility to save the route to favourites	23%	28%	24%	12%	12%
Information about vehicles adapted for people with disabilities and reduced mobility	30%	20%	21%	20%	9%
Carrier information	35%	27%	19%	11%	9%
Ongoing information about changes in the functioning of public transport	2%	3%	21%	28%	45%
Searching for alternative connections	1%	6%	17%	31%	45%

Source: Own calculations based on data from the survey.

Respondents considered features such as real-time transportation tracking, real-time timetables, and route planning to be essential. It was also crucial to them to supply current information about changes in the operation of public transportation and to search for alternate connections. It turns out that adding routes to favourites, providing information on vehicles adapted for those with impairments and limited mobility, and providing information about the operator is not necessary for respondents.

To determine which functionalities should be included in such an essential feature as route planning, participants were asked to identify the application's major features in this area (Figure 8).



Total response %ages exceed 100% because responders were allowed to select multiple answers at once.

Figure 8. Factors relevant to route planning.

Source: Own calculations based on data from the survey.

Delay updates (91.3%) have proven to be the most important factor in route planning in the app. Information about the waiting time for a means of transport (82.4), planning a trip from one address to another (76.5%) and the waiting time for a change (73.6%) turned out to be of little less crucial. On the other hand, functions such as the side number of the vehicle (0,02%), and the dispatcher's telephone number (1.1%) are the least important.

Respondents were also asked to rate the importance of other possible app features (Table 5).

Table 5.
The importance of additional features in the application

Features	Assessment				
	Unimportant	Somewhat important	Rather important	Very important	Essential
Information on alternative means of transport available nearby, such as city bikes and scooters	27%	35%	26%	9%	3%
Possibility to rent alternative means of transport using the application	29%	31%	23%	13%	4%
Possibility to order a taxi or car transport services	37%	26%	17%	20%	0%
Possibility to pay for parking	32%	26%	14%	21%	7%
Reporting a vehicle breakdown	18%	26%	21%	20%	15%
Possibility to assess the conditions of the trip	20%	23%	24%	19%	15%
Direct contact with the carrier	30%	26%	22%	9%	12%
Possibility to share the route of travel with third parties	17%	25%	19%	23%	16%
Indication of overcrowded means of transport	11%	20%	20%	30%	21%
Information about vehicles that have charging ports and Wi-Fi	33%	24%	20%	11%	13%

Source: Own calculations based on data from the survey.

Travellers positively commented on the possibility of checking overcrowded means of transport. In the case of the possibility of reporting vehicle breakdowns, assessment of travel conditions and making the route available to third parties, opinions were divided. The rest of the features didn't turn out to be relevant enough.

The next section of questions concerned preferences in making public transport payments in the application. Almost four out of every five app users (78.6%) decide to buy tickets with its assistance. More women (85.8%) than men (59.0%) prefer this form of payment. Most age groups, except those over 60, agree. Especially people who study (87.7%) and work (74.2%), but also the unemployed (100%) take advantage of this privilege. From the standpoint of their education, individuals with primary (88.4%), secondary (73.6%), and higher education (78.6%) are generally more willing to use this option, as opposed to people with vocational education, who are less enthusiastic (58.1%).

When it comes to preferred payment methods, the vast majority of respondents favour instant payments (78.15%). Some opt for overpaid accounts (19.0%). The least liked ways include via a city card (1.49%), and banking app (1,38%).

Respondents were also asked about several issues regarding the management strategy of public transport applications. In the opinion of the respondents, local governments (70,3%) should be fully responsible for the operation of the application (Figure 9).

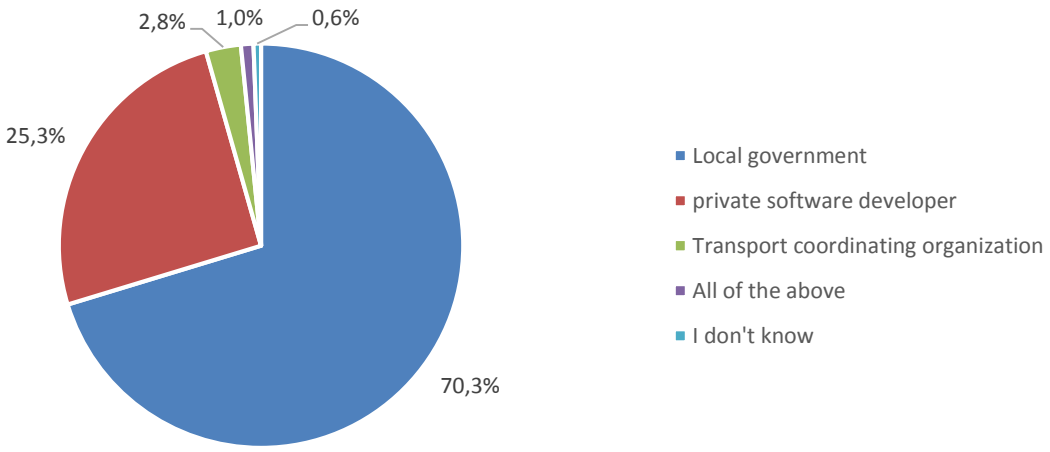
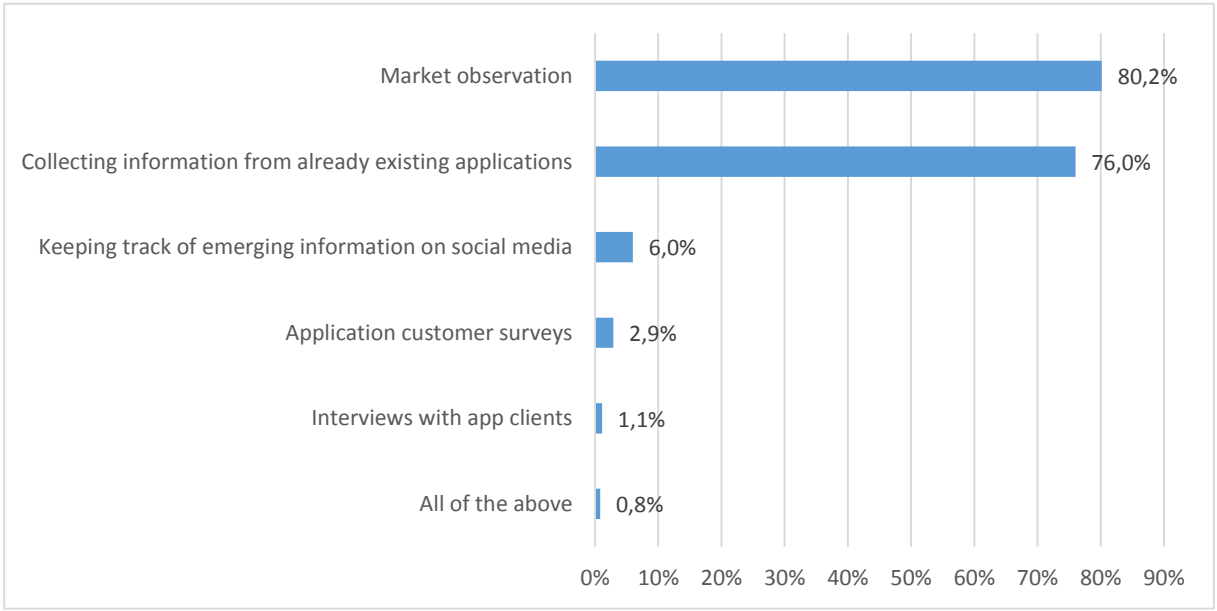


Figure 9. Entities that, in the opinion of the respondents, should supervise the operation of the local urban transport application.

Source: Own calculations based on data from the survey.

The results indicate that respondents are bothered by a wide range of functionalities in a variety of applications. As many as four out of five (81.7%) feel the need to centralize mass transit applications and systems.

They were also asked to indicate how the manager of the application should obtain information allowing it to be adapted to the needs and expectations of users (Figure 10).



Total response %ages exceed 100% because responders were allowed to select multiple answers at once.

Figure 10. Opinion of the respondents on the ways of obtaining information by the manager to adapt the application to the expectations of users.

Source: Own calculations based on data from the survey.

Users would prefer the manager to use such sources of information as market observation (80.2%) and analysis of data obtained from functioning applications (76.0%).

5. Discussion

The purpose of this study was to gain a better understanding of the subjective preferences of mobile app transportation users who commute in the Silesian Metropolis area. The results of the present study suggest that the average transportation app user is a passenger who travels frequently, usually every day, which comes to no surprise when they mainly commute to work by bus on medium distances from 6 to 20 kilometers.

The vast majority of passengers assist their travel with three major apps: Google Maps, Jakodojade and Mobile MPK. This pattern of results is consistent with the previous literature, the same set of most preferred apps have been pointed out in the study conducted in Lublin (Belińska, Choma, 2018). In Krakow (Bryniarska, Gacek, 2018) Jakdojade and Mobile MPK have been proven to be the most useful. The high proportion of replies to Google Maps could be ascribed to the app's accessibility of use and adaptability. Google Maps is one of the world's largest, if not the largest, easily accessible, and free online map services. Most respondents' confession of using the Jakdojade app is not surprising. This application has been around for a very a while, and in addition, it is continually updated, has a rich interface and a wide range of functionalities. Mobile MPK is the only application that is not handled by a private developer but rather by the Transport Coordinating Organization (MPK). The increasing popularity of local government-provided applications may signal a power shift among application developers.

Given the variety of app features and alternatives, app users consider real-time transportation tracking, real-time timetables, and route planning to be critical. They do not see the need to expand the range of features, apart from the one that indicates overcrowded means of transport. Implementing such a function will be as simple as tracking the activity of app users, as is already done in Google Maps that can detect traffic jams. Consequently, we may assume that the application user's needs are currently being addressed properly.

In our study, app users in route planning value the most the ability to detect delays, as well as time of waiting and detailed planning. This pattern of results is consistent with the previous study from Krakow, where planning from point A to B, including time of travel, change and time of waiting are the most crucial features (Bryniarska, Gacek, 2018). Route planning requirements and preferences are thus a universal and provable set of characteristics in different cities.

Our findings highlight that users of public transport applications are very enthusiastic about buying a ticket using their mobile phone. Other studies (Kos-Łabędowicz, Urbanek, 2017) indicate an entirely different approach, where both the Internet and mobile applications are not popular distribution channels for public transport tickets, even among young consumers. This gap in outcomes may be the result of a variety of factors. Undoubtedly, the recent rapid increase in the number of non-cash transactions corresponds to an increase in the number of

locations accepting non-cash payments. Based on the study "Payment habits in Poland in 2020" carried out by the National Bank of Poland, it was found that 46.4% of transactions were made with cash (NBP, 2020, p. 10). In the case of remote payments (on the Internet), the share of non-cash payments was 97.8% the number of all transactions and 97.9% their values (NBP, 2020, p.17). The results indicate that society is undergoing a noticeable transformation to reduce cash payments in favour of cashless payments, as evidenced by the payment for a ticket via a mobile application.

Finally, we learned that app users prefer that their local governments manage all aspects of their public transportation apps. This approach is part of the smart mobility doctrine, which guides the goals set by the Silesian Metropolis. What's more, application users are willing to take an active part in improving the application by sharing data from their own devices with the manager.

There are at least three potential limitations concerning the results of this study. The first limitation concerns the chosen CAWI method only reaches those who have an internet connection and a PC or mobile device. Many people are not always willing to fill out online questionnaires. According to studies, the population that answers to online questionnaire invitations is biased toward younger individuals. The second one concerns the sample size limitation. In the area of Silesian Metropolis live 2,143 million people (Metropolia GZM, 2023). The chosen sample may not represent the variety and the complexity of the considered population. The third limitation concerns the limited scope of factors considered in this study. The chosen method restricted the in-depth research and considered problem. Despite these limitations, these results suggest several implications. The results can aid in the development of improved applications, as well as encourage local governments to create and manage those applications according to user preferences. In addition, this study enables the continued investigation of smart city features within the smart mobility strategy of Silesian Metropolis. In future research, it would be beneficial to compare and contrast results using alternative survey instruments or to adopt a quantitative approach to better understand the motivation and characteristics of mobile app transportation users.

6. Conclusions

Public transport applications are a revolution, embodying the essence of the smart city idea. Applications that largely encourage people to travel by public transport are breaking the barrier of ignorance about the public transport offer and bring hope for a smart city future. Smart mobility appears to be a necessity in this period of fast economic development, rising social demands for quality of life, and increased environmental consciousness. The Silesian

Metropolis (Górnolsko-Zagbiowska Metropolis GZM) has a chance of becoming its forerunner, not only on the scale of Poland but also of a significant portion of Europe.

Research has demonstrated that the Silesian Metropolis has tremendous potential for smart transportation applications. Passengers can use several different applications with different functionalities to move around the Metropolis. Apart from commercial developers, local government entities and transportation organizers are prospering among the app's authors. Since the currently available applications already cater to the tastes of passengers, there is no desire to make fundamental improvements to how they operate. They have no issue purchasing the ticket within the app, and they often use instant payment methods.

They do, however, point out that the system's decentralization works against it. They prefer that certain bodies, such as organizational units or transportation managers, be in charge of oversight and operation. Passengers also believe that efforts should be made throughout the study region to centralize applications and systems. They would be glad to share their insights as part of market research or as part of gathering data on their experiences with existing applications.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF THE SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

MANAGEMENT IN FAMILY BUSINESSES – SUCCESSION AS A MEASURE OF BUSINESS SUCCESS

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Purpose: A properly planned and executed succession is the only way to ensure the sustainability of the company for future generations. Its incorrect implementation can cause a crisis within the company or family and can even cause its downfall. The aim of this article was to analyse how the succession process was conducted in selected family businesses - what advantages and disadvantages were indicated by both owners and successors. What does the succession process look like in the eyes of old-timers and young successors?
Design/methodology/approach: The study focuses on the analysis of how the succession process is perceived by the older and younger generation of entrepreneurs.
To achieve the study objectives an in-depth case study method, supported by a structured interview in selected family businesses operating in the local market has been used.
Findings: there are few practised inheritance patterns. Therefore, it is often unduly postponed, or conducted in a quick, poorly-planned manner. Such inappropriate steps can lead to the disintegration of the company or even bankruptcy rather than growth and success in the years to come. By analysing the succession processes already conducted, good practices can be identified in this respect.
By using them, both old-timers and successors could certainly avoid many mistakes. An important element is to make future old-timers aware that, when building a company and thinking about its development, they should think long-term, also taking into account the role of successors from the beginning. It is also very important that communication between incumbent owners and their successors is open and unambiguous from the outset. Analysing the possibilities for a smooth succession and helping each other to find suitable solutions is the key to the success of a well-run succession. It is also worth noting that the generation of owners will always look at the company's development from the perspective of the previous years of activity, while, according to the interviews conducted, the new generation looks at the company without analysing the past and thinks ahead, wanting to develop the company and implement innovations.
Practical implications: By analysing succession processes that were already conducted, it is possible to identify good practices in this area. By using them, both incumbent owners and successors could certainly avoid many mistakes.
Social implications: The research is addressed both to other researchers so they can analyse or elaborate the research presented here and to entrepreneurs in family businesses who are conducting the succession process in their companies. The analysis presented in this paper allows the succession process to be viewed through the eyes of both the younger generation

(the successors) and the older generation (the owners). This is important for the succession process to be conducted properly so that it contributes to the success and development of family businesses. The research presented here will serve to broaden knowledge on succession in family businesses.
Originality/value The research is addressed to both other researchers so they can analyse or deepen the research and to family business entrepreneurs who are conducting the succession process in their companies. The analysis allows the process to be viewed through the eyes of both the younger generation (successors) and the older generation (owners). With the information gained, entrepreneurs will be able to plan the succession process better and avoid certain mistakes.

Keywords: family businesses, succession, management.

Category of the paper: Research paper.

1. Introduction

A family business is an enterprise defined as a business entity in which ownership control or management of the entity is in the hands of family representatives and more than one family member is involved in the operation of the business entity (Family Business Survey, 2015). Family businesses are one of the cornerstones of the global economy.

The succession process is one of the characteristics of such enterprises. To ensure that the business remains a property of the family in the future, the business long-term strategy must involve the succession. The succession process is based on the intergenerational change management (Marjański, 2010, p. 88). Succession in a family business involves the handover of the latter by its founder or owner to a successor, who may be a family member or a professional manager (Surdej, Wach, 2010, p. 54). The handover of a company to successors continues to cause many contradictions and often involves personal and business issues (Hall, 2001). According to the analyzed data, approximately 79% of Polish family businesses have not yet developed a succession plan, while studies conducted in Western European countries and the USA show that only one third of family businesses successfully undergo the first generational change.

Family businesses in Poland were established predominantly in the 1990s. This means that their owners are now between 50 and 65 years old and need to face the issue of succession. The first generational change is a very important moment in any business, as it is at this stage that the departing owner and their family should define the company's vision - its system of values and formal regulations. As rightly pointed out by Krzysztof Safin, Ph.D., WSB Professor: *The succession process cannot be reduced to relatively simple notarial and judicial acts. Recognising the business model, values and ownership relationships, and integrating them with the personality of the successor, as well as with the new position of the seniors, requires many years of active involvement by all participants.* The process of handing over the company

to the next generation is very important. Properly planned and executed succession is the only way to ensure the sustainability of the company for future generations. If it is not conducted properly, it can cause a crisis in the company or the family and even lead to bankruptcy (Lee, Marshall, 2013). Research indicates that succession is among the most difficult challenges of the entire life cycle of a family business. Many family businesses fail to cope with this task. Through the close relationship between the business and the family, succession ceases to be a purely professional matter as it concerns the entrepreneur and their family. Succession raises issues in the areas of economics, law, taxation and psychology. Changing ownership and management of a company can create conflicts between generations over money or power. Emotional conflicts can be caused by the owners' and successors' conflicting perspectives on the goals and development of the company, as on the one hand, it is important to ensure the sustainability of the company and, on the other it is equally important to seek the financial security of their own family (Perz, Kaszuba-Perz, 2016; Stavrou,1999).

The aim of this paper was to find out how the succession process has been handled in selected family businesses - what advantages and disadvantages of the problems are indicated by both owners and successors. How the succession process is perceived by the older and younger generation of entrepreneurs. To achieve the objectives, a face-to-face interview method was used in selected family businesses operating on the local market.

2. The succession process in family businesses

Family businesses are economic entities that can be defined in many diverse ways in the subject literature.

Among many definitions, some literature sources state that a family business is a business in which (Family Business Definition, 2015; Mandl, 2008, p. 2; Piecuch, 2013, pp. 152-182; Sulkowski, 2004, p. 99):

- the majority of votes and also the majority of the ownership structure is in the hands of members of a (single) family;
- the majority of family members are actively involved in the functioning of the family,
- there is an intention of succession, i.e. passing the company on to the next generation.

Switzerland is an example of a country with a long tradition of family businesses. Some of Swiss companies have traditions hailing back more than a century. The oldest family businesses in Switzerland are: Hotel Interlaken in Interlaken, founded in 1239, Engel Pharmacy in Basel, founded in 1389, and Goldenen Sternen Restaurant in Basel, founded in 1412. In contrast, the oldest family business still remaining in the hands of the founding family is Fonjallaz Wein, located in Epesses and operating since 1552.

A common element in the definition of family businesses is the concept of succession. Succession is defined as 'the transfer of ownership and management of a family business to a younger generation' (Aronoff, Mc Clure, Ward, 2012, p. 15). It is a complex, long-term process, involving planning and management functions, which aim to ensure that the company operates in the market when it is run not only by founders, but also by the subsequent generations (Kowalewski, 2012; Ahmad et al., 2020) (Figure 1).

PLANNING	THE SEARCH FOR A SUCCESSOR	COMPLETION	POST-SUCCESSION

Figure 1. Stages of the succession process.

Compilation of the source based on (Lewandowska, 2013).

When discussing the succession process, it is worth mentioning that it is possible, although very rare, to come across the so-called 'reverse succession', which involves handing over the company and management competences to seniors who have previously played subordinate roles.

When juniors come to the conclusion that the company they have created is mature and stable, and they have other business ideas themselves, they can place the company under the supervision of their most trusted persons, i.e., their parents, seeing this as a certain compromise in terms of ownership and management (the company still remains within the family) (Miklaszewski, 2018).

According to J.A. Blikle (President of the Family Business Initiative Association) the concept of succession includes two aspects: legal and emotional. The way in which power is delegated in formal and legal terms within family businesses can include the following aspects: (Lewandowska, 2013)

- mere delegation of authority,
- transfer of power and assets,
- transfer of authority and bequest in a will,
- simultaneous transfer of power and assets,
- sale of the company.

The transfer of power also involves a psychological aspect. For seniors, leaving a company can mean a change of status, a change of daily routine, putting the 'work' of their lives in the hands of others. These aspects cause fear and a sense of powerlessness (Iszkowski, 2012; Ahmad et al., 2021). The emotions that arise during the succession process are difficult. Each party has its own expectations, which may be conflicted with each other. During succession, some family members, e.g., children of the owners, may feel that they have been treated unfairly by their parents. During succession, there is often a selection of the best candidate according to certain criteria, which in owners' opinion facilitate the survival of the company.

The formalisation of the succession process is a very important factor for a properly conducted succession. According to Andrzej Marjański, Ph.D., (Head of the Department of Entrepreneurship and Family Businesses, Social Academy of Sciences in Łódź). *Having a good intergenerational plan makes it possible, in most cases, to keep the business going and to maintain proper family relationships. Preparation a succession plan will help define a clear picture of the organisation and bring order to the role of the family and avoid conflicts over ownership and management.*

In Poland, the tradition of family businesses is only just being revived, therefore the topic of succession in Polish companies is also only just starting to be discussed. Unfortunately, Polish family businesses are characterised by low awareness of the need to create succession plans, indicating a scarcity of knowledge on the subject. Surveys show that family businesses are mostly at the stage of planning or preliminary discussions of the succession process. However, a trend towards accelerated succession processes in the post-pandemic era has become apparent. Health experiences have influenced more frequent analyses of the succession process and the attempts to secure the next generation in the family.

The business succession process takes up to 7-8 years. Statistics show, however, that in Poland only 8 per cent of children want to take over businesses run by their parents. This raises a lot of emotions and uncertainty in business families.

In addition to planning, there are also other elements worth analysing that affect the success of a succession (Table 1).

Table 1.
Factors influencing the succession process

SUCCESSION	Involvement in the succession process
	Raising a generation of successors
	Choosing the best successor for the business
	Choosing when to hand the company over
	Selection of alternative activities for seniors

Source: own work based on Lewandowska, Greser, Jakubowski, 2012, p. 126.

Other factors influencing the success of the succession process are, according to the author's definition (by Adrianna Lewandowska, Ph.D., President of the Family Business Institute) - business succession is based on 'five P':

- Proficiency - successor must first learn everything there is to learn,
- Power - authority that is transferred gradually,
- Property - legal aspects, formal division of the company,
- Principles - shared values establishing how one should approach development, risk or money,
- Plan - a shared vision of the future of the business discussed jointly by owners and successors.

The succession process is the most important challenge that is faced by the companies that have been operating for more than 30 years. As exemplified by the experience of Western family businesses that have longer history than ours, proven business concepts taken over from owners are often bequeathed to the next generation and successfully continued. The relationships with customers and suppliers that have been developed in an atmosphere of trust over many years are being continued by subsequent generations. A well-executed succession is therefore an indicator of a stable and secure family business. In turn, thriving family businesses strengthen the economy, ensure social development, provide employment, etc. (Cabréra-Suárez et al., 2018).

As part of the project 'Codes of Value - Effective Succession in Polish Family Businesses', eight key success factors were defined, improving the succession process from businesses' point of view:

1. it should be realised that this process is inevitable and the sooner it is undertaken, the greater the likelihood of success,
2. the company's initial situation must be properly analysed,
3. succession discussions should be initiated,
4. one should not be afraid to have a frank conversation with the family and future successors about existing concerns and come to a consensus together,
5. responsibility for the company should be extended before handing power over,
6. it is important to know that the successor is still learning and may make mistakes, but this does not imply their incompetence or lack of preparation,
7. if succession is a problem, one needs to find an expert well-versed not only in legal matters, but also in communication and understanding of succession process,
8. plan activities for the company's seniors after the handover even before it happens.

The topic of succession is still important and relevant in the turbulent environment in which companies find themselves, so it is impossible not to agree with Prof. J. Ward's words: *keeping a family business alive is probably the hardest job in the world.* On the other hand, the continuation of the business is particularly important for family businesses, because the survival of the company involves benefits for family members. Therefore, if they are properly managed and can handle succession well, they can build capacity for the years to come.

3. Company characteristics and survey methods

The research was conducted in 2022-2023 on the basis of data obtained through interviews (face-to-face interview with owners and successors of two family businesses from the Silesian Voivodeship). The sector in which the businesses are active is plastics processing (Company A) and road construction (Company B).

A common feature of the analysed businesses is that they are small family enterprises, were launched in the 1990s, and they underwent a succession process (15 years ago in Company A, 10 years ago in Company B).

The purpose of the interviews was to analyse the succession process through the eyes of the owner and the successors. Interviews among owners and successors were conducted in 2 businesses, that shared several common characteristics:

- They both operate in the Silesian Voivodship.
- Both companies were founded in the 1990s, (Company A in 1991, Company B in 1998).
- They are small family businesses.
- The successors were young people: 25-year-old son and 25-year-old daughter-in-law in in company A, 28-year-old son and 26-year-old son in Company B.
- The model that has been used for the succession is the so-called step-by-step model, which involves gradual introduction of the successor to the business they are to take over by giving them more and more responsibilities and authority.
- The reasons for carrying out the succession were identical in both cases, i.e., the desire for the younger generation to formally take over the company due to its modernisation and development.
- However, in both companies, the assets were largely transferred to the successor, but the owners left part of the company to themselves as a separate property.

On the basis of the previously conducted succession interview with the owners and successors of the two companies, a number of emerging questions with suggested answers were formulated (Tables 2-5 in the analysis and discussion chapter). Owners and successors were asked to comment on the relevance/importance of each response by marking them as: xxx - very important factor, xx - fairly important factor, x - not a very important factor.

4. Analysis and discussion

In the first question, both owners and successors were asked to tick the answer to the question 'which of the succession process factors do you consider most important' (Table 2).

Table 2.
Which of the succession process factors do you consider the most important (having the greatest impact on a successful succession process)

Responses	Owners		Successors	
	A	B	A	B
Involvement in the succession process	xxx	xxx	xxx	xxx
Raising a generation of successors	x	xx	x	x
Choosing the best successor for the business	xxx	xx	xxx	xx

Cont. table 2.

Choosing when to hand the company over	**xx**	**x**	**xx**	**xx**
Selection of alternative activities for seniors	**x**	**x**	**x**	**x**
Other				

xxx - very important factor xx - fairly important factor x - not very important factor.

Source: personal analysis of the data collected in the study.

In both companies, owners and successors alike agreed that the factors with the greatest impact on a successful succession process are: commitment to the succession process and selection of the best successor. In the case of the companies analysed, the owners passed on the companies to their own children but retained part of the company as their own property under their own management. The owners said that there was no problem with successor selection because the sons had been interested and involved in running the companies for several years before the succession. However, it should be stressed that in many cases finding a potential candidate is difficult. Children are often not interested in running the company or, on the contrary, all the children of the owners would like to manage the company in the future, although their involvement and experience may vary. In such a situation, owners have to make difficult decisions when identifying the right successor within the immediate family. The identification of a successor is a problem that is not limited to the selection of the right person with the necessary skills and seniority, because it also involves other family members and their expectations. Such decisions, however correct, can cause serious conflicts between siblings or between children and parents. The consequences might include a loss of trust in the family, disillusionment in relationships or internal conflict, all of which can have a dramatic impact on the company (Lansberg, Astrachan, 1994, pp. 39-59).

The choice of when to hand the business over was considered quite important by the owners as well as the successors, while the choice of alternative activities for seniors was considered of little importance. This is due to the fact that the parents, as well as their successors in the companies considered that the succession would take place after the successors had received adequate education and some experience in running the company. The successors are young people while their parents enter the pre-retirement age and have not completely withdrawn from running their companies. Another important issue in the area of successful succession is the element of communication, the time when succession is planned and implemented. In the companies analysed, both owners and successors agreed that discussions about succession took place very frequently. Although research indicates that, in general, owners rarely talk to their family and potential successors about succession. Such conversations are occasional, and do not result in agreements concerning details or decision-making (Lansberg, Astrachan, 1994, pp. 39-59). Perhaps this is due to the owners' fear of giving away the business, or a lack of final knowledge of the succceess.

This trend and incongruity can be seen also in the interviews conducted for this study. Although all inteviewees declared that their conversations about succussion were very frequent, when asked how long the preparations for succussion had taken, there was a certain discrepancy between the statements of owners and successors. The owners of both companies had been analysing and thinking about succession for a long time, about five years in Company A and ten years in company B. The younger generation responds however that it was about 1 year in company A, while the successors of company B believed that there was no specific preparation. This may be due to the young age of the successors (people in their early 30s in both companies), who, despite some discussion, did not see the succession process as 'mature' and future-oriented; perhaps a lack of clear communication and declaration caused a different perception. The succession process is perhaps understood by the younger generation more as specific legal steps of taking over a company rather than the planning process associated with it. According to the Insitute for Family Business in London, communication is also a very important factor in the succession process. It should be based on a partnership between the incumbent owners and the next generation. This is difficult in the case of family businesses and parent-child relationships (Haynes, 2021; Duarte Alonso et al., 2018).

Diagnostic research shows that as many as 77% of successors believe that succession is an important process in a company that needs to be planned in advance and managed in a professional manner, but they do not follow these beliefs with necessary actions. This poses a major threat to businesses as it can lead to the improper functioning of the latter. Formalisation of the succession process is one of the most important factors for successful succession (Mishra et al., 2022).

Perhaps conversations about the succession process alone are not binding and treated with responsibility especially by the younger generation and therefore it is worth writing down so-called succession plans (Halter et al., 2009).

According to the US Northwest Family Business Survey of American family businesses, only 33% of such entities to be passed on to family members have a succession plan that has been developed and written down.

Research on the succession process on the Swiss market indicates that the process usually lasts between 5 and 10 years; on average taking approx. 7 years. There are several stages to this process: - contract negotiations: 8 months, - successor assessment: 19 months, - identification of successor: 23 months, - preparation for retirement: 24 months, - withdrawal of the owner from the company: 24 months, - taking over the owner's tasks by the successor: 24 months, - accumulation of shares and ownership by the successor: 25 months, - operational transactions: 29 months (Zellweger, 2012).

Another question asked concerned support for consultation in the succession process (Table 3).

Table 3.
From whom did you seek additional consultation support during the planning/succession process?

Responses	Owners		Successors	
	A	B	A	B
Lawyers and notaries	xxx	xxx	xxx	xxx
Friends and family members	x	x	x	xx
Management consultants	xx	xx	xx	x
Long-serving company employees	x	xx	x	x
Other institutions or persons (please specify)				

xxx - very important factor xx - fairly important factor x - not very important factor.

Source: own elaboration based on the conducted research.

In the research, both owners of company A and B sought support from lawyers and notaries, as did the successors. Advice from management consultants was also sought. In the case of company B, the successors also took advice from their friends and other family members. Perhaps for the younger generation, the professional advice and the opinion of friends and other family members are important when making important decisions. It is still worth looking at this issue in the broader perspective of the generalised succession process from the point of view of owners and successors - communication with other (more neutral) people can also be an important element of a well conducted succession. If there is a lack of proper communication, succession is being dragged out, it may be worth taking advice from outsiders, people who are more neutral, and in some cases also from mediators. It is worth encouraging the younger generation to also consult others when discussing succession so that they are confident in their decisions.

Research (Halter et al., 2009) indicate that business owners in Switzerland seek support in the succession process from: tax advisors and auditors (75%); lawyers and notaries (47%); friends and family members (30%); the main bank of the family business (29%); the supervisory board of the family business (20%); management advisors (18%); long-serving company employees (12%). For the succession process to be conducted correctly and to contribute to the success of the company as such, it is certainly worth stressing the openness and communication on many levels. Every family business is a little different, so when making important decisions, it may be worth encouraging both owners and successors to have more frank discussions to avoid later misunderstandings and arguments.

Interviewees were also asked what problems have owners and successors noticed during the succession process (Table 4).

Table 4.
What problems have you noticed during the succession process?

Responses	Owner		Successor	
	A	B	A	B
Fear of changing roles within the company	xx	xx	x	xx
Employees' fear of change	xx	xx	x	x
Excessive bureaucracy involved	xxx	xxx	xxx	xxx
Lack of knowledge about the succession process - how to do it properly	xxx	xxx	xxx	
Difficulties in making a joint decision (owner-successor) about the succession and related issues	xx	x	xxx	xxx
Other…				

xxx - very important factor xx - fairly important factor x - not very important factor.

Source: personal analysis of the data collected in the study.

The information provided indicates that there is still insufficient knowledge of the succession process (how to do it properly) and excessive bureaucracy associated with the process. The younger generation of successors, on the other hand, points to the difficulty of making a joint decision (owner-successor) regarding succession and the legal issues involved. Also in a study conducted by Lewandowska (2013), owners of family businesses particularly indicate a lack of knowledge regarding the succession process. The analysis of the in-depth interview shows that when succession planning starts, it is the senior generation that seeks the primary information about succession, without even involving the younger generation in the process.

It should be emphasised that owners and successors had to jointly develop a plan for the development of the company after succession, which was not easy. The young and old generations perceived the development of the company somewhat differently, e.g., the young saw the need to invest in modern equipment in order to outperform the competition, while the experienced owners feared overinvestment. It is important that the younger generation, which has its own vision for the development of the company, openly discusses the topic with the founding generation before and after the succession.

The owners of both companies and, to a lesser extent, also their successors noted some employee concerns about changes in the companies. The owner of one of the companies surveyed said that employees initially did not trust potential successors and doubted their skills, ability to run the company properly, and independence. They pointed to their young age and lack of long-term work experience. In order to calm and soothe emotions, the owner and successors had to address the emotional reactions of employees to major changes. Among other things, they pointed to new opportunities and chances for development after the change. Often the change of power or ownership, as well as transfer of knowledge are important not only for the owner and potential successor but also for the company's employees. In the succession process emotions are being felt also by employees (Jakubowski, 2007, p. 29).

Another question was to analyse the benefits noticed by owners and successors after the process.

Table 5.
What benefits have you noticed after the succession process?

Responses	Owner		Successor	
	A	B	A	B
Survival and protection of company assets, preservation of contracts and jobs	xxx	xxx	xxx	xxx
The company will remain under family ownership and management.	xxx	xxx	xx	xx
More comprehensive development of the company, e.g., implementation of innovative solutions, expansion into new markets	xx	xx	xxx	xxx
Preservation of a company's long-established reputation	xxx	xxx	xx	xx
Other…				

xxx - very important factor xx - fairly important factor x - not very important factor.

Source: personal analysis of the data collected in the study.

The analysis of the responses in Table 5. shows that the benefits after the succession process are noticeable and appreciated by both the former owners and their successors. For the senior generation of both companies, the benefit they pointed to was the survival of the company, the protection of assets, and the preservation of contracts and jobs for their long-serving employees The fact that company remains a property of the family and under its management is very important to both owners. These issues were also important and appreciated by the successors. However, it should be emphasised that during the interview and benefit analysis, successors focused mainly on the company's health and emphasised their contribution to the further development of the company through the implementation of innovative solutions and expansion into new markets. The older generation continued to talk very emotionally about the company's origins and possible difficulties that might await it in the future. One can still see a very strong commitment and emotional connection to the company. It is very important for the owners to maintain the company's long-established reputation and goodwill in the eyes of colleagues, contractors, business partners etc. The younger generation is more focused on action, innovative solutions, concrete steps. This is due to the fact that young successors become more identified with their company after the succession. During the interview, the successors pointed to this strengthened connection to the company once they became official co-owners. Handing a company over to a younger generation is a difficult decision, but in the case of both companies, the owners say they are satisfied with the decision and the succession.

5. Summary

The history of Polish family businesses is relatively short. Few succession patterns are yet practised. This is a daunting task for owners, linked with considerable costs even if they pass the company on to their next of kin, while a lack of available knowledge on the subject of succession and considerable bureaucracy do not make the successful conclusion of the process

any easier. Therefore, it is often unduly postponed, or conducted in a quick, poorly-planned manner. Such inappropriate steps can lead to the fragmentation and even collapse of the company rather than its growth and success.

By analysing the succession processes already conducted, good practices can be identified in this respect. By implementing them, both owners and successors can certainly avoid many mistakes. An important element is to make future old-timers aware that, when building a company and thinking about its development, they should think long-term, also taking into account the role of successors from the beginning. It is also very important that communication between incumbent owners and their successors is open and unambiguous from the outset. Analysing the possibilities for a smooth succession and helping each other to find suitable solutions is the key to the success of a well-run succession. It is also worth emphasising and realising that the generation of owners will always look at the company's development from the perspective of the previous years of activity. Long-time owners are partial to analysing the past. On the other hand, acccording to the interviews, new generation does not take the past into account, and looks into the future, focusing on business development and innovation.

In the interviews, owners and successors declared that the process has been conducted fairly and that the relationship between generations has not been altered. However, it should be noted that in both companies a large part of the company's assets and property were transferred to the successors, but the owners left part of the company to themselves as a divested property. Perhaps the generation of incumbent business owners still feels a lot of apprehension as to how the younger generation would cope when the entire company is finally handed over. However, it is also a solution that is worth considering, although it is somewhat 'indirect' and can work in many family structures. In businesses where there is no clear consensus on the succession process or where it is delayed, this scheme should be applied. This allows the younger generation to develop the business, innovate and lead it to success, while the older generation smoothly withdraws from full ownership and management of the company.

In both companies, owners and successors alike emphasised that the succession process is difficult and requires a high degree of commitment from both owners and successors. The owners acknowledged that the difficulties in carrying out the succession were largely caused by a lack of sufficient knowledge of the succession process and the excessive bureaucracy involved in the process. It is important to choose the best successor, good relations and communication between owners and their children. In the case of the businesses analysed, the children of the owners were naturally involved in the business activities beforehand and tied their future to them. Although none of the successors had previous experience in other workplaces, their conviction in their professional choice was evident. They wanted to work together with their parents, and said they look forward to bringing new ideas, energy and a new quality of thinking and acting to the company. The owners of both businesses emphasised that the changes resulting from the succession are important not only for the owner and the successor

but also for the company's employees. It is necessary to prepare the workforce for the change of power and ownership in the company through discussions and explanations.

Several years after the succession, both generations are satisfied with the changes made and point to the benefits resulting from the succession process. For the senior generation of both companies, the survival of the business, the protection of assets, the preservation of contracts and jobs for their long-serving employees were all very important. Keeping the company under family ownership and management was very important to both owners but also appreciated by their successors.

Both companies are owned and managed by two generations - parents and children. It is a good deal provided there is good dialogue and joint decisions are reached. This is not easy because issues and decisions that seem obvious to present owners can be and often are seen differently from their children's perspective. Innovative solutions are appearing on the market every day, often displacing the old ones. That is why it is necessary to adapt to the changing environment. Young people are more likely to recognise these changes and be able to adapt quickly to them, while older people have more experience which is valuable when managing a company. Therefore, a discussion is needed and sometimes the parties have to compromise. It may be that the actions taken will not always be successful, not everything will work out, but the young generation wants to work at their own pace and vision from the start. Therefore, when deciding on a succession process, it is worth taking these elements and different views into account.

The success of the company following the succession process should not only be the survival of the family business, but above all the preservation of jobs or development of innovative solutions, which provide an opportunity to continue the business for future generations.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

FROM NETWORKS TO ACTION NETS: KNOWLEDGE MANAGEMENT IN NETWORKS AND CLUSTERS IN CREATIVE INDUSTRIES IN POLAND

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Purpose: The paper presents and practically verifies the concept of Action Nets Creating Emotional Values (ANCEV) which is embedded in network approach in management. The concepts is empirically verified in three cluster organizations operating in Poland.
Design/methodology/approach: The research was conducted with the use of case studies analysis where traditional networks are identified. In the network a nodes represents actors – cluster members while edges represent existing relationships between actors. Then the action net of the cluster is visualized through the Event Process Chain (EPC) diagram. The diagrams in particular presented actions (processes, activities, realized tasks) and states (effects, resources, values) and the relationships between these elements
Findings: Action nets networks and clusters in creative industries could be represented in the form of Action Nets Creating Emotional Values (ANCEV).
Research limitations/implications: The action nets represents relatively temporarily state of affairs, not formally structured. This is the main limitation of action nets identification. With this kind of research the key actions can be identified and also relationships between actions can be defined.
Practical implications: Action nets and particularly ANCEV can be implemented in unformal networks of cooperation in creative industries.
Social implications: An increasing role of creative industries and their impact on society implies the importance of research on knowledge management in creative industries. The approach presented in the paper can be useful for every kind of interpersonal and interorganizational networks.
Originality/value: The concept of ANCEV prepared by the author is new in the paper. The concept and research approach is addressed to researcher and practitioners dealing with cooperation in creative industries and the problem of knowledge management in interpersonal and interorganizational networks.

Keywords: action nets, knowledge management, networks.

Category of the paper: research paper.

1. Introduction

Recent decades have convinced us of the growing importance of cooperation in the processes of social and economic development. The increasingly advanced specialization of entities that participate in the processes of innovation implementation imposes the cooperation within inter-organizational networks. Clusters and innovation networks are an example of organizations enabling cooperation in the field of innovation development and other activities supporting innovation. A special area of inter-organisational cooperation is knowledge management, thanks to which entities in a network or cluster acquire the necessary knowledge, which is used for value creation for the customers. Inter-organizational knowledge management is, however, determined by the nature of inter-organizational relationships: networks and clusters are groups of independent entities, therefore knowledge transfer takes place through the relations of influence and flow reinforced by interpersonal trust. Arrangements and decisions concerning knowledge management in the cluster are made in the process of dialogue, in which entities formulate their expectations relating to the suggested solutions and common standards. Observation of management practices and literature indicates that this type of knowledge management models exist in almost every type of network clusters and in different sectors. They are therefore an important complement to knowledge management at an organizational level (Seufert et al., 2006). In creative sectors knowledge management has a specific nature connected with dominance of tacit knowledge transfer (the role of inspiration, presentation, and solution discussion) as well as significantly bigger rotation of intellectual property such as: copyright laws, industrial designs and utility models. Cooperation in this area is consolidated by unformalised activities, which in the case of their usefulness form networks of activities (Giddens, 1984). A network of activities is the basic process reorienting knowledge management in inter-organizational network. The aim of the article is to present the role of network of activities through their indentification and analysis in three selected creative clusters in Poland.

2. Literature review

Knowledge is revealed and verified in activities – this is a the basic assumtion for analysing knowledge management in this studies. Davenport and Prusak (2000) emphasise that societies and organizations create and accumulate knowledge in order to create value for the environment through actions. Most definitions of knowledge management (Davenport, Prusak, 2000; Wallace, 2007; Jashapara, 2004) point to the process and the cyclical nature of this phenomenon. Part of the process of knowledge management is the application of knowledge in

action, which verifies its usefulness (generating know-how knowledge is based solely on experience) and generates new ideas. The knowledge management process can take place within the organization, based on internal repositories or in networks of independent entities (Alavi, 2000; Seufert et al., 2006). The use of networks is connected not only with knowledge creation, but foremost with creating values for the society, which are provided in the form of products and services. Therefore, knowledge is necessary to undertake action and on the other hand action is the source of new knowledge. A research implication of the above is the necessity to take into account the analysis of key processes, actions, activity in the analysis of knowledge management processes.

In the Resource Based View tacit and explicit knowledge resources are one of the resource forms, which are configured by processes. What Prahalad and Hamel view as key competences is a combination of resources, processes and abilities underlying the competitive advantage of an organization. Key competences may allow for access to important markets or market segments, are the source of benefits (values) appreciated by clients or allow for the creation and management of strategic architecture — network of external connections constituting the grounds for creating value added (Prahalad, Hamel, 1990). Knowledge management is therefore of static nature (accumulated resources of tacit and explicit knowledge), and dynamic - the process of value creation in the network in which value of the final product depends on the value of knowledge obtained by the participants of the network. This process might have a cognitive nature - conscious acquisition, creation and accumulation of knowledge or autopoietic nature dependent on intention, role and value of the network/organisation participants (von Krogh et al., 1994). The latter process of knowledge creation, which takes place in networks and clusters, can be influenced indirectly through: relations of influence and flow, using its position in the network or knowledge resources. The autopoietic process is therefore of social nature - categories of social communication described a.o. by Luhman (1986) are more adequate in its description and understanding.

In management sciences, the essence of knowledge management is shown in the concept of ‘action nets’. It was put forward by Czarniawska (2010), after the proposition by F.H. Allport (1954), who indicated conscious formation of the ‘chain of events’ that is consecutive events, dependent on the entities which influence them. Czarniawska stresses the fact, that a network are radiating connections between different activities in all directions, contrary to a chain, where sequence of events (actions) is assumed. A similar definition of a network was suggested by K. Weick, for whom chain of events does not operate synchronically, and some of them are skipped or looped through the process of sense making (Weick, 1995). A network of activities is therefore a process, however, conscious shaping of the whole process is impossible, especially in networks and clusters of independent entities.

Lindberg and Czarniawska (2006) stressed that ‘The concept of the action net is based on the assumption that organizing (and its special of case: management) requires that several different collective actions be connected according to a pattern that is institutionalized at a given

time and in a given place. The collective actions concerned need not necessarily be performed within the bounds of a specific "organization"' (Lindberg, Czarniawska 2006, p. 293). For this reason the concept is so useful in interorganizational networks and clusters where the several actors are involved in different activities.

Both autopoietic networks of ativites and structural business processes aim at creating value for the customer. Cutomer value is the central concept of business model (Teece, 2010; Ostewalder, Pigneur, 2009), it is strongly determined by expectations and subjective assessment of the customer (customer perceived value). In marketing marketingu customer-perceived value is the difference between a prospective customer's evaluation of the benefits and costs of one product when compared with others (Kotler et al., 2004). The following values can be distinguished: functional value, monetary value, social value, and psychological value. In recent years we have been able to observe an increase in the significance of social values, emphasised by researchers (Gopaldas, 2015), whereas in creative industries the most important are artistic and culture values, which have emotional significance for the customer (Di Maria, Paiola, 2012). The most vital entities in creative sectors are creative enterprises. According to Rosenfeld (2004): "…any company for which the primary value of its products or services is rooted in their emotional or aesthetic appeal to the customer".

In networks and clusters we deal with co-created value - various actors are involved in their creation: economic entities, scientific, academic and business institutions. According to Alves et al. (2015), a particular interest of researchers in value co- creation took place in the period 2012-2014 and in research processes it is connected with four conceptual groups: (1) business logic, (2) new product/service development, (3) co-creative experiences and loyalty, (4) co-creation and relationships.

Analysis of the process of knowledge management involves various research techniques like: knowledge maps and matrices (Probst et al., 2000), network diagrams of knowledge flow using Social Network Analysis (SNA) (Liebowitz, 2005; Borgatti et al., 2013). However, literature on the subject lacks a comprehensive approach which would treat the existing activity of the network as a process integrated with knowledge management. Such an approach would allow to treat knowledge management as a strategic process integrated with the basic activities of organizations or networks that is constituting the essence of business model of an organisation.

3. Research model

Proposed methodology for analysing action nets will be applied to the study creative clusters — clusters existing in creative industries. In the research the following definition of creative cluster will be adopted: "a group of cooperating organizations and individuals

originating from local and regional societies, representing business, science, the arts, culture, education, health, entertainment and leisure activities. The cluster dynamics come from the creation of a regional identity, the innovative utilization of resources and a talent search with the protection and development of local and regional values. The creative clusters are the reservoir of creative resources and skills for other clusters and innovative environments" (Knop et al., 2013) This definition is consistent with the understanding of a cluster in creative sector proposed by Chapain et al (2010), and it results from a wide definition of a cluster adopted by Gordon and McCann (2005), Immarino and McCann (2006) or the most often quoted M. Porter (1998), stressing mostly cooperation between entities forming the cluster.

Analysis of the knowledge management process in a creative cluster requires taking into account the nature of the new environment, especially the existence of knowledge in multi-actor network (inter-organisational knowledge) as well as the specificity of knowledge in creative branch, which to a large extent relates to tacit knowledge and the area of creativity which covers the first stage of the innovative process. The specific system of knowledge management in creative industries was paid particular attention by Chapain et al. (2010), especially the fact that "innovations in these industries tend to present an 'aesthetic', 'artistic' or 'stylistic' element". The nature of the system significantly influences the construction of research models of knowledge management. Therefore, in order to diagnose the process of knowledge management the article author's methodology was applied. According to adopted methodology the analyses in the three substantive areas have been provided: relations between cluster members, key competences of the cluster members and mapping action nets (Olko, 2017).

According to Czarniawska (2010) an action net can be regarded as "a network of interdependent activities carried out by the actors of the socio-institutional network creating value for the environment." In clusters and networks existing in the creative industries, we can speak of the Action Nets Creating Emotional Values (ANCEV), a network that creates emotional values, such as:

- artistic and culture values – artists' creations made available in the form of services in culture facilities: concert halls, theatres, cinemas, museums;
- design values – one of the important types of innovation in creative industries are design-driven innovations. This phenomemnon is described by Verganti (2009), with focus on the role of the designer as well as the nature of the design process. Design values concern both aesthetic aspects and the functional projects and services. The significance of aesthetic values in marketing was appreciated in the 90s (Simonson, Schmitt, 1997);

- ethical and moral values – included in the obeyed norms and values relating to rules of running an organization: respect for human rights and dignity, respect for natural resources, sustainable development or the Corporate Social Responsibility (CSR), which comprehensively encompasses all the issues;
- sentimental values – e.g. sentimental tourism, collector's products.

Table 1.
Characteristics of the analysed cases

Case number	Cluster name	established	number of members
1	Kraków Film Cluster	2013	52
2	Silesia ICT and multimedia cluster	2007	25
3	Dobroteka – agglomeration of furniture makers in Dobrodzień	2012	10

Source: self elaboration.

The choice, description and analysis of cases was carried out through the use of case study methodology in line with the approach by Yin (2003). Two kind of instruments were used in describing the cases:

1. telephone interview with cluster members – for identifying relationships between cluster members,
2. in-depth interview with the coordinator of the cluster – for mapping cluster-specific action nets.

From the telephone interview the network diagrams were created representing the nature existing relationships between cluster members. The following relationships were investigated:

- interpersonal relationship (who knows whom?),
- inspiration relationship (who is an inspiration for me?),
- tacit knowledge exchange (with whom do I exchange tacit knowledge?),
- cooperation relationship (with whom do I collaborate?).

During the research four kind of network diagrams were prepared corresponding to four kind of relationships. In the paper only one type diagram for each cluster is presented: an integrated network of personal relationships and cooperation. To prepare network diagrams and calculate basic network parameters UCINET software were utilized (Borgatti et al., 2013).

Mapping the action nets was conducted primarily on the basis of in-depth interview with the coordinator of the cluster, which was carried out twice. During the first interview, the most important activities carried out by members of the cluster were established and on that basis a scheme of network operations was designed. In the second interview with the coordinator accuracy of the presented action nets scheme was verified (Olko, 2017).

The following research questions were formulated together with the choice of clusters for case studies:

- Which internal relationships corresponds with the key actions taken within the cluster?
- Do cluster members cooperate in terms of creating emotional values?
- What elements does this cooperation concern?

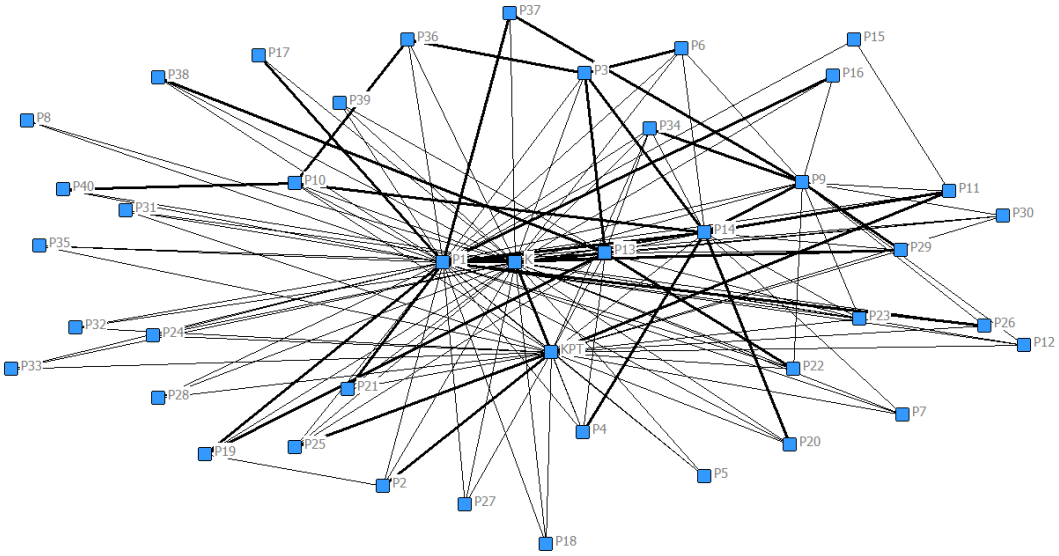
As the result of selection, three creative cluster presented in Table 1 have been analysed.

The network of activities scheme was designed based on the Event Process Chain EPC, which presents activities, static elements – states (resources, effects) as well as interdependencies between these elements. Particular attention was given to the presence of effects in the form of emotional values and possible methods of commercialising these values.

4. Findings

4.1. Case 1: Kraków Film Cluster

Kraków Film Cluster (KFC) was founded at the beginning of 2005 as an agreement, coordinated by Kraków Technology Park (KPT). Thanks to the realisation of an investment project called 'Małopolska Information Technology Park' a number of elements of special equipment for film production, posproduction or multimedia production was purchased in order to create the so-called Multilab.



Network density	Number of ties	Average degree
0,109	221	4,452

Figure 1. Network of interpersonal relationships and cooperation in Cracow Film Cluster.

Source: own elaboration.

The basic function of this facility is the production and postproduction of films and audiovisual effects with the use of highly-efficient computers equipped with specialistic software. Multilab is equipped with:

- 6 workstations with monitors of the highest quality (including reference monitors); 8-10 production workstations,
- room for final technical inspection of the visual materials with a professional workstation for correction of colours and postproduction workstation, sound – showroom,
- FX room – multifunctional room with the motion capture system, green screen (cyclorama), photography station, scanner 3D with the possibility of recording sound.

Figure 1 presents the integrated network existing in KFC, while Figure 2 shows the identified action net in the cluster.

The KFC network of activities presented in figure 2 involves mainly all the stages of film production, starting from preparation, organisation, casting to shooting, renting equipment, specialistic services and postproduction. In order to compete in the internatonal market joint internationalistic actions are being undertaken. What gives the cluster advantage and distinctness among others, especially in terms of creative activites, is cooperation with independent film makers. In order to implement these actions cluster takes advantage of KTP resources.

Among activities currently not being implemented, the ones worth noticing are trainings and workshops in the area of using modern technology in film production and post-roduction. Due to the modern production background as well as cooperating experts with experience in film production, it is the potential further development direction for the network of activities, dependent on the needs and expectations of cluster members and external entities. So far, such actions have not been undertaken.

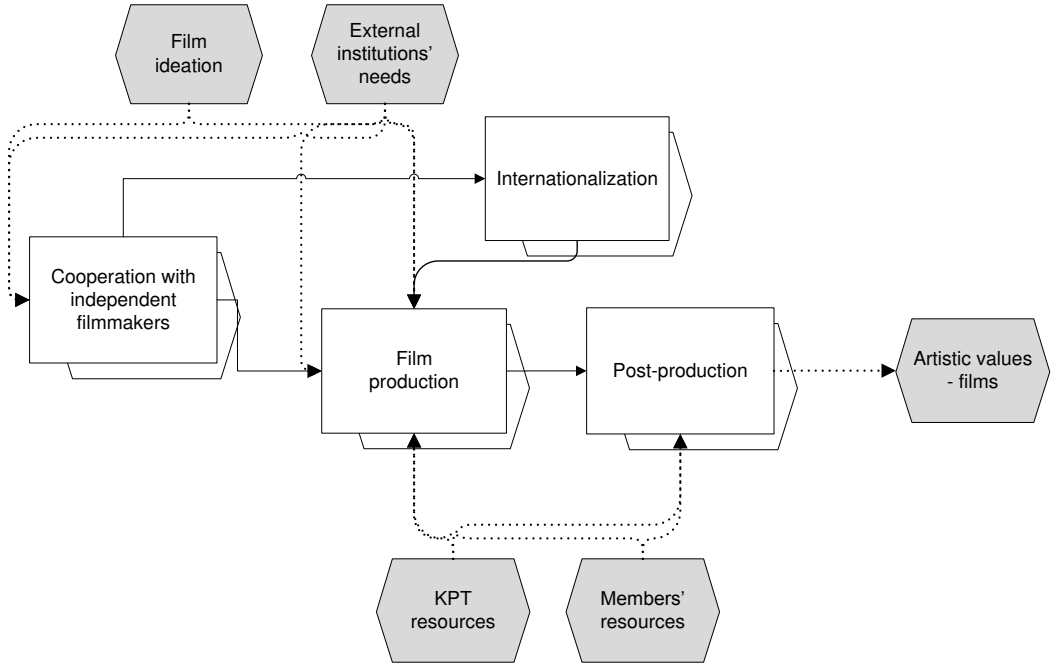
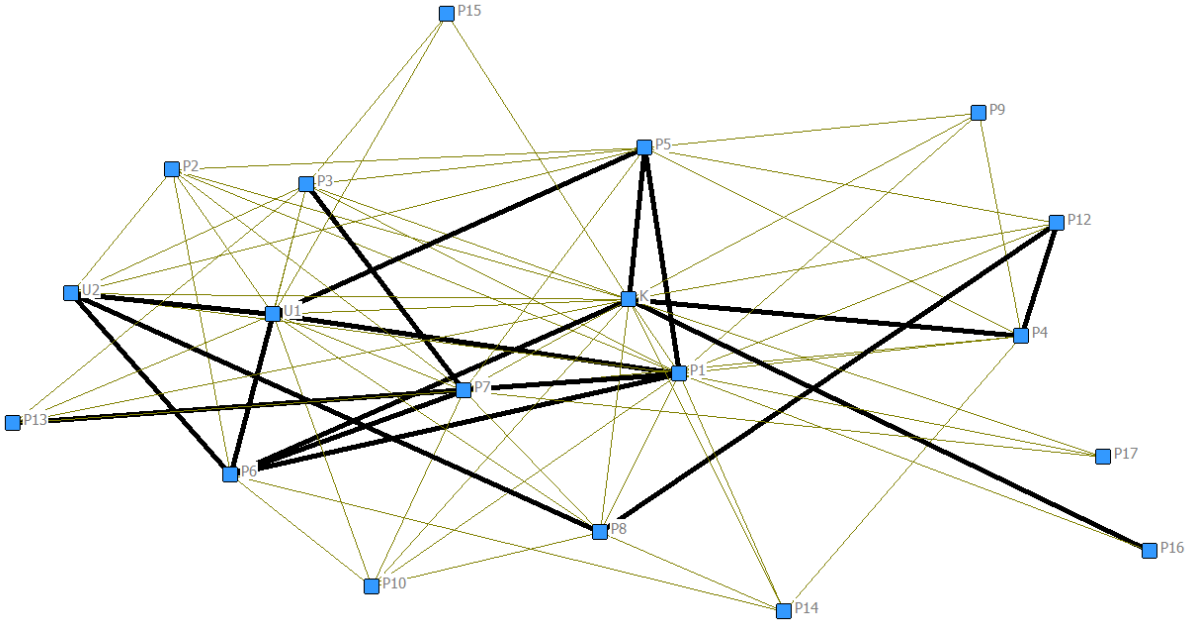


Figure 2. Action net of the Kraków Film Cluster.

Source: own elaboration.

4.2. Case 2: Silesian ICT and multimedia cluster Hub Club

The Silesian of ICT and Multimedia Cluster Hub Club was established in January 2013 on the initiative of a group of entrepreneurs from the ICT sector cooperating with the Rudzki Inkubator Przedsiębiorczości (currently the Silesian Incubator of Entrepreneurship) in Ruda Śląska. The formal coordinator is the Innovare foundation, which acts as a social body supervising the activities of the cluster. The Foundation is located on the premises of ŚIP, which also has its representatives in the Cluster Council. The Hub Club cluster meets cluster management standards. Hub Club is particularly active in internationalization activities, since its inception, 19 international promotional trips have been organized, including to Sweden, Denmark, Germany, Finland, Spain, Brazil and Japan.



Network density	Number of ties	Average degree
0,439	184	7,895

Figure 3. Network of interpersonal relationships and cooperation in Silesia ICT and multimedia cluster. Source: own elaboration.

The research was conducted in the period May - June 2016 by direct contact (e-mail or telephone) with entrepreneurs - members of the Hub Club of the Silesian Multimedia Cluster. 15 respondents took part in the research, and an attempt was made to contact all members of the cluster — 25 respondents on the basis of the available contact list.

The average density of the interpersonal network is relatively high compared to other creative clusters and amounts to 0.338. The high value results from the density of the network is related to the declared large number of acquaintances between Hub Club entrepreneurs. The network of inspiration in the Hub Club has the highest density among all creative clusters in which the research was conducted. This is due to the large number of innovative projects carried out by cluster members, most of them of an application and business nature.

A comprehensive image of the network, which uses two types of relations (acquaintance and cooperation) in the Hub Club cluster is shown in Figure 3. The Coordinator (K) and the Silesian Entrepreneurship Incubator (P1) are in the center of the network. Entrepreneurs P6, P7, P8, as well as both universities - members of the cluster (U1, U2) also have high values of centrality in this network. The relationship of cooperation coincides with the relationship of acquaintance. According to the information obtained from the members, the original relations were the relations of acquaintance, the subsequent relations related to the exchange of tacit knowledge and the relations of trust. With time, among the members of the cluster, along with getting to know the effects of the work of others, relations of mutual inspiration appeared, which in the case of Hub Club are the strongest among all analyzed creative clusters.

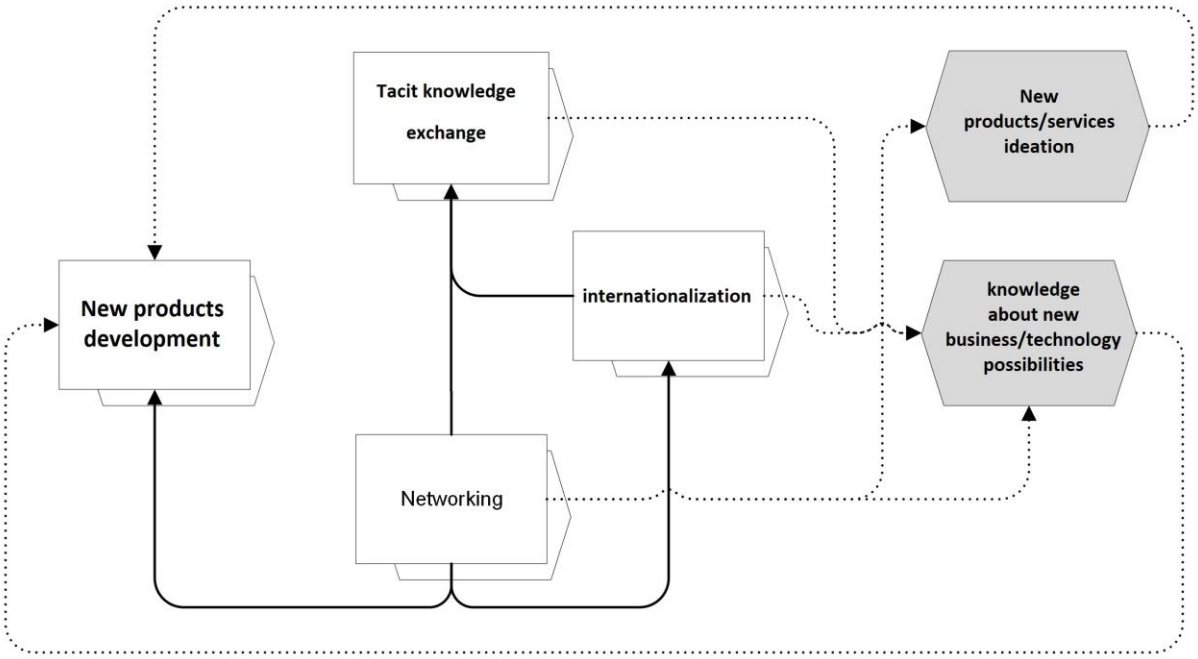


Figure 4. Action net of the Silesia ICT and multimedia cluster.

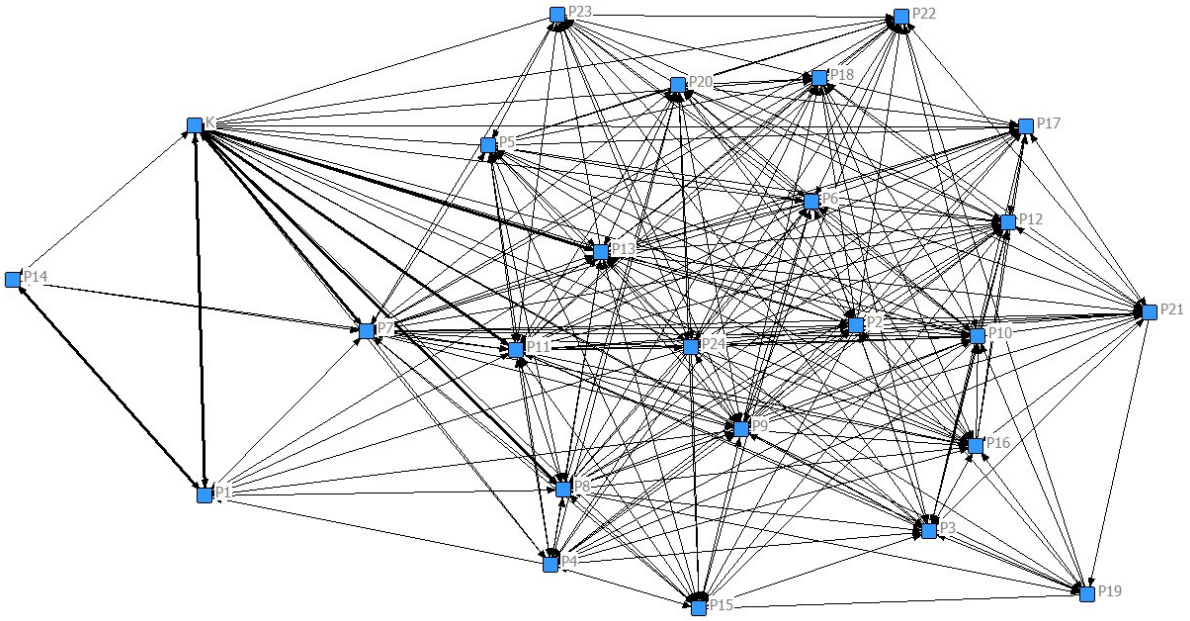
Source: own elaboration.

4.3. Case 3: Dobroteka – agglomeration of furniture makers in Dobrodzień

Dobroteka is not a cluster in terms of the realised cluster policy in Poland as it does not have a formal agreement between its members. Dobroteka is a new type of place selling furniture, administered by MD Connect company, dependent on the renowned furniture manufacturer Kler SA. A small space (2300 m^2), considering the realities of furniture stores, houses the presentation of 10 local furniture manufacturers, as well as the following elements of infrastructure:

- apartment of the future – demonstration and laboratory room, which can be an inspiration for customers and at the same time a place for testing innovative solutions in the field of interior design. This place enables behavioral studies of consumers that can be carried out at the request of furniture and other home furnishing products manufacturers;

- showroom - a place prepared specifically for architects and designers, who can meet their clients here. Samples, catalogs and price lists of all manufacturers whose brands are present in Dobroteka are available here. The place is available free of charge for the designers;
- auditorium and conference room – place for organising bigger events, trainings and seminars;
- historic room – exhibition of traditional Silesian furniture crafts with multimedia screens, creating emotional values among the visitors;
- reading room – equipped with literature and leisure furniture;
- relaxation furniture – the biggest in Poland upholstered piece of furniture (it covers 3 stories of the building). It is a place for fun and leisure for children constituting one of the biggest attractions of Dobroteka;
- 'Dobre Bistro' – a place for the visiors to relax, offering drinks and snacks. The bistro is equipped with chairs which you can buy in the store;
- a place for organising artistic workshops for children and adults;
- artistic exhibitions gallery – a 70 m^2 room for presenting artefacts and projects of design, architecture and interior design.



Network density	Number of ties	Average degree
0,557	334	13,360

Figure 5. Network of interpersonal relationships and cooperation in Dobroteka.

Source: own elaboration.

Its infrastructure determines the unique attractiveness of Dobroteka, providing aesthetic values for visitors who do not buy products. The creation of Dobroteka was subsidized with 6 million PLN from public funds under the Opole Voivodship Regional Operational Programs. Although formally only a few manufacturers rent a spot in Dobroteka, there is also informal cooperation with designers and other local producers. In Dobrodzien itself (over 4000 inhabitants) there are 30 furniture manufacturers, while in the district of Olesno more than 70. In Dobroteka we can distinguish four basic activities carried out for members of the network, each of which is meaningfull in terms of business:

- marketing activity – promoting Dobroteka and its members among Polish and foreign customers, fixed demonstations and displays in Dobroteka;
- providing services for investments – performance of big orders for furniture and interiors from institutional clients, from preparation through realisation and delivery. Activities in the area of serving investments were not initially planned as the aim of the coordinator of Dobroteka. They were born out of the needs of major business clients with specific expectations when it comes to interior design;
- developing creative sensibility – activity for entrepreneurs and clients based on organising trainings and workshops on creativity and furniture design;
- research and development – research on the furniture market in Europe, opinion polls and tesst on the solutions presented in the apartment of the future.

Entrepreneurs on the premises of Dobroteka do not cooperate in the process of production – it is run individually by particular producers. Even in the case of joint deliveries (investment service) making-up the order takes place on spot from the products delivered by producers.

The above tasks are conducted by staff employed by a company administering the furniture store, therefore financed by the income of this entity, yet, they are made for all the entities located in Dobroteka and they affect other furniture manufacturers in Dobrodzień. In comparison to other clusters functioning in Poland, Dobroteka carries out significantly more joint ventures aimed at serving the network members. They also managed to devise a business model thanks to which the undertaken actions are inscribed in the process of value creation for the customers, hence there is a source of funds for these actions. A unique and particularly valuable activity is testing solutions presented in the apartment of the future in Dobroteka. Research of this type does not have its equivalent nationally and consists in qualitative research of client approval of the presented solutions in the available apartment. The equipment in the apartment of the future was supported by public funds from the Opolskie Voivodship Regional Operational Programme. The value of the project called ‘Apartment of the future – modern R&D laboratory created in the MD Connect structure in order to conduct research on model solutions concerning interior design and accessories’ amounted to 490 000 PLN.

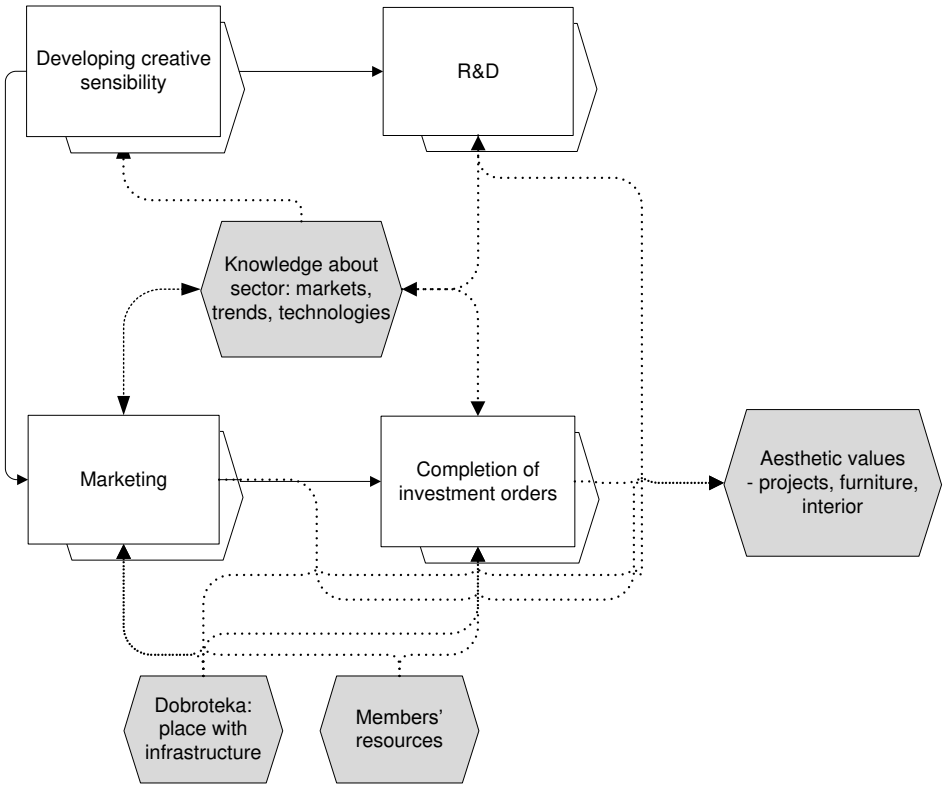


Figure 6. Identified action net of Dobroteka.

Source: own elaboration.

5. Conclusions

On the basis of the collected research results the following conclusions might be formulated in the area of knowledge management in clusters and networks in creative clusters:

1. The established action nets, even though not described or formalised, constitutes the main process of knowledge management in cluster/network, with subordinate knowledge resources and the implemented methods and tools of knowledge management. Supplementary information in the area of knowledge management in cluster are provided by: the analysis of inter-organisational network of relations and map of competencies. The creative clusters under analysis did not have an identified network of activities and they did not analyse inter-organizational relations inside the cluster. The only implemented instrument relating to inter-organizational knowledge management was the characterisation of specialisation and offer of particular cluster members.

2. A action nets is a practical complement to the operational strategy of a cluster. Similarly to the way a business model defines current tasks and resources responding to the strategic objectives, a network of activities defines interconnected activities, which contribute to accomplishing mission and achieving the strategic objectives of a network. A network of activities can identify additional tasks, whose usefulness results from the current needs of cluster members. For instance, the activity connected with completing investment deliveries in Dobroteka, which was not planned or formulated in strategic documents. This example shows that the real network of activities shapes the structure of relations in a cluster or network organisation as postulated from theoretical point of view by Weick (1995) and Giddens (1984).
3. All coordinators of the presented clusters claimed that the identified graphic presentation of network of activities is a useful practical tool being an addition to the cluster strategy.
4. A network of activities undergoes evolutionary changes during the development of a cluster: activities valuable for the cluster members are strengthened and more resources are attributed to them. Actions of low efficiency and usefulness for cluster members are 'suppressed' by gradually limiting the resources. It mostly concerns the actions, which can be more efficiently implemented by cluster members individually, e.g. production, logistics an technology development in Dobroteka, international activities in Hub Club, development of employees in Krakow Film Cluster
5. In all the analysed clusters emotional values, which constitute an essential element of competitive advantage of cluster members, were identified. These are the following values: artistic (Krakow Film Cluster), aesthetic (Dobroteka), social (Hub Club). It is stressed by all coordinators of the clusters that strengthening these values is a strategic objective for cluster development.
6. In the presented examples of creative clusters actions are implemented by members of the network both in cooperation with other members (within the same cluster) as well as individually through members (outside the cluster). Differentation between these activities is not possible which in turns conditions the dependence between actions forming a network. This aspect might constitute a considerable cognitive limitation in the presented research.
7. A strong integrating factor for actions in a cluster are common infrastructural resources. Dobroteka is a furniture store with its infrastructure (apartment of the future, screening rooms, room for children), whereas in the Kraków Film Cluster it is the Multilab infrastructure enabling the realization of post-production activities. Joint infrastructure, financed from public funds, ensures bigger credibility of the members in the eyes of clients rather than individual infrastructure of cluster members. Lack of common resources is a significant limitation in opportunities to implement actions: cluster which does not have common resources, has the least complex of the analysed action nets.

8. Internationalization is a key joint activity realized by the clusters with a very good effects (Dobroteka, Hub Club). This activity is also reported as an effective actions realized in other countries (Kujala&Törnroos, 2018).

Acknowledgements

The paper presents selected results of the research project no. 2012/07/B/HS4/03016 entitled *The models of knowledge management in networks and clusters of creative industries in Poland and EU countries.* This is extended version of the article presented during European Conference on Knowledge Management ECKM 2016.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

BUSINESS ANALYST – A POSITION ATTRACTIVENESS AND MARKET REQUIREMENTS, A SAMPLE FROM POLAND

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Purpose: The aim of the study is to classify job offers for analyst positions according job title and job requirements and, on this basis, to use machine learning methods of text mining to build job profiles for selected job categories.
Design/methodology/approach: Expert classification and machine learning algorithms.
Findings: The study shown specific set of keywords for business and financial analysts, financial controller, data scientist, system and security analysts. Research also discovered the coherence relationship of job title and job responsibilities and how job title is used for prestige.
Research limitations/implications: Research is limited to sample of data.
Practical implications: The study deliver multidimensional knowledge for managers.
Social implications: The study describe an analyst position as the sets of skills expressed by keywords completed based on job level, job title and job requirements and by that helps different groups of people as for example students to allocate their attention properly to the market and the industry they match.
Originality/value: We use ensemble strength of expert judge and machine learning. Using expert approach we recognized job categories base on text summary prepared by ML and then continue job offer classification by applying algorithmic text mining.

Keywords: business analyst; text classification; job position, machine learning.

Category of the paper: Research paper.

1. Introduction

Business analysis is increasingly used in organizations, especially those whose activities are based on the processing of various types of operational data in transactional systems (Goh et al., 2019). J. Park and S. Jeong (2016) recognize business analytics as an element necessary for the success of a project related to IT systems. According to the Global State of Business

Analysis Report, created by the International Institute of Business Analysis, as many as 46% of organizations have increased their involvement in projects based on data analysis (IIBA, 2021). Canges in organizational structures caused by the COVID-19 pandemic and the global increase in the level of cyber threats have contributed to the increased demand for specialists in the field of data analysis, agile analysis and digital initiatives.

As of March 1, 2023, the Web of Science database contained a total of 4,696 publications on this subject of business analytics, and the Scopus database contained 600 publications. However, there are much fewer publications devoted to the business analyst (WoS: 61, Scopus: 449). For years, the theoretical study A Guide to the Business Analysis Body of Knowledge, created by the International Institute of Business Analysis (IIBA, 2015), was considered a compendium in the discussed area. This study was the basis for research conducted by J. Park and S. Jeong (2016). However, their literature review and conducted research were limited to the years 1990-2016. They can be treated as an important basis for further research, but the results of research published in 2016 should not be considered up-to-date from the perspective of people managing the organization in 2023. studies on the role of a business analyst in an organization are most often theoretical in nature (Gobov et al., 2020).

Pracuj.pl reports that the pandemic break shown a little stagnation in recruitment activity in the finance and banking sector, but now they become again the most frequently recruiting industries. In 2022 finance sector overtook the IT industry of 21%, where IT was the leader of the year 2021. The jobs offered by financial sector counts 12% (130,000) of total offers published in Pracuj.pl where IT published 107,000 offers. IT and finance together shown the dynamics of 103% y/y. Pracuj.pl reports that the demand for different digital based and data mining specialists are increasingly growing among wide range of sectors, even for which the area of technology is not the main profile of business activity. That is why, we were motivated to investigate the job offers characteristics where the demand is placed for analytical skills in IT and finance sectors and then convert it to the model for that kind job's skill description for other industries.

The aim of the study is to classify job offers for analyst positions according job title and job requirements and, on this basis, to use machine learning methods of text mining to build job profiles for selected job categories. An attempt was made to answer the following questions:

1. What the analyst position's categories can be extracted from the titles of employment offers. What are the most important phrases offers have used? How we can define "the most important phrases" Are they the differentiation factors between job categories?
2. What is the persona profile in selected categories of business analyst. What kind of skills should the offeror have? What responsibility employers allocated to those positions and what benefits they offers?

We decided to select IT and finance as the mature sectors, which can deliver a most solid and reliable job description on the certain position. We were also interested if we can investigate that kind of dataset by utilization text mining methods. Thus, the whole study brings clear benefits for academia and practitioners. As researchers, we can better understand how the analyst-kind job is defined, described and latently understand by industries. The industry practitioners can utilize this knowledge to understand more precisely the area of skills other company tries to cover and then better express their demand for candidate profile. In addition, it should be emphasized that among numerous scientific publications devoted to the subject of business analyst, there is definitely a lack of publications devoted to the requirements of employers with regard to the position of a business analyst in the current market reality. Our research presents the current requirements of employers, in line with market realities.

2. Methodology

2.1. Flowchart

The goal of our research is to create the profile of business analyst as the job position now and its projection for the future. Dataset has been built based on collection of active job offers published in the most popular polish recruitment portal "Pracuj.pl". According to the their report they have published 1,103,000 offers in 2022. It makes them an ultimate market leader in Poland. In the report they pointed that there is clearly visible demand of digital competences in the candidate profile. This includes not only pure IT and financial competences but also analytical, data mining and data science as becoming a core competences in numerous sectors. This trend can be noticed not only in IT and Finance but in the range of sectors. Another observation they signaled was a tendency in work organization. A full remote or hybrid work organization becomes a constant proposal for new employment. This change can indicate a progressing growth in the flexibility of work organization in companies where the job done is more important than physical presence in the office.

Because there are some variation of business analytics position understanding in different industries we must detect those differences and then create the analyst persona for each category. The whole analytical flow and data research is presented in figure 1.

The analysis is based on dataset composed from the internet job offers, collected by using a web scrapping. All data a publicly available from the internet browser without any brake of the login or other authentications or security features.

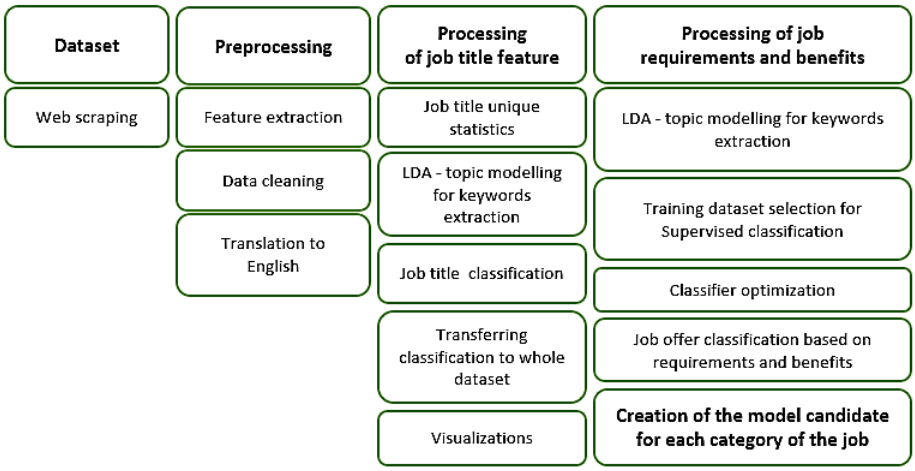

Figure 1. The flow of data research.

Source: own work.

In our research, we have collected job offers from categories IT and Finance with additional filtering for phrase "analyst". The offers can be distinguish between two groups. The first group, includes the majority of the offers, which is published in form of short description in the listing page and comprehensive description in the offer's card. The second group of nearly 20% of total offers in the sample included the offers published only as the reference to the offeror's web page where the offer was encapsulate inside company website. Because of individual composition of every offer they have been excluded from dataset. Finally we have collected a sample of 3,467 unique offers from the period of 6 weeks. The final sample for the research represents 1.3% of total offers in categories IT and Finance. Because we cannot calculate our sample relation to total population of offers the result of our investigation cannot be interpreted as representation of phenomenon.

In the analytical phase we have made data cleaning, feature extraction and translation to English using Google translate. Finally we have got a dataset consistent of following columns: pos_href, pos_title, pos_level, job_offer_cart, pos_level_en, pos_title_en, responsibilities, requirements, offered, technologies, training-space, and benefits. We believe the columns meaning is understandable without further explanation.

First do a selection of unique job titles and position levels for clustering. The goal of the clustering procedure was to classify job titles based on keywords we have extracted from job titles. We have utilized Latent Dirichlet Allocation (LDA) procedure (Blei et al., 2003) from Java based implementation Mallet (Shawn et al., 2012). Since we have job offers categorized we have transferred them to all records in dataset. We documented all operations and changes occurred in data in tables and visualizations.

The next analytical phase was to study the requirements and benefits of the job offer and check how they feet to category build based in previous phase. We proposed this direction of the research because job title is straightforward job description, limited in size and that is why relatively easier to classify. The risk is if the job requirements are following job title, therefore

we processed also additional features from the dataset for confirmation or correct previously setup classification.

In the third step we build classification model for job requirements and job benefits, optimized classifier and finalize classification taking to account: job title, requirements and benefits.

Finally, we build job personal for all categories, what was the idea and goal of the research.

2.2. Classifier optimization

For classifier optimization we have used FLAML, which is a Python library (https://github.com/microsoft/FLAML) designed by Microsoft to optimize machine learning models with low computational cost. It supports machine learning and AI tasks like NLP classification, which we were used in our study (Wang et al., 2021; Liu, X., Wang, C. 2021).

3. Results

3.1. Position level

We have analyzed demand for the particular position levels. A major demand is visible for the regular specialist. The second group is senior and junior specialist. They appears in almost equal frequency of 17-18% each (35% together) in job offers. Therefore, the top-three box score is equals 91% of total. The remining 9% of demand is distributed among the managers, trainee, and assistants. For details see table 1.

Table 1.
Position level statistics

Position level	Count	%
specialist (mid regular)	2,361	57%
senior specialist (senior)	740	18%
junior specialist (junior)	687	17%
expert	169	4%
manager coordinator, director	113	3%
apprentice trainee	48	1%
assistant	23	1%
	4,141*	100%

Note *) the quantity 4,141 excide total number of records in the sample (3,467) because a some number of offers include a double options for position level.

Source: own work.

The count 4,141 excide total number of records in the sample (3,467) because some number of offers includes a multiple options for position level.

3.2. Job title statistics

As mentioned, before processing the analysis we have made dataset preparation in order to eliminate punctuation, stopwords and special characters. We also removed double wording like male and female names for the position which in English is the same word. As the next step we have applied NLTK's WordNetLemmatizer for lemmatization. Finally, we have built the job title for the analysis from the list of lemmas. Total unique job titles equals 1,837.

The jobs titles statistics is presented in figure 2. There are only 8 job offers where the job title consistent of only one word, like "analyst" or "accountant", 224 offers for 2 word jobs like "business analyst" or "data scientist", 630 offers includes 3-words job title like "business intelligence specialist" or "financial controlling specialist", and 512, 4-words job's titles like "power bi data analyst" or "business analyst sale support". As the conclusion one can note that the majority of job titles consists of 3 or 4 words. The details can be seen from figure 2.

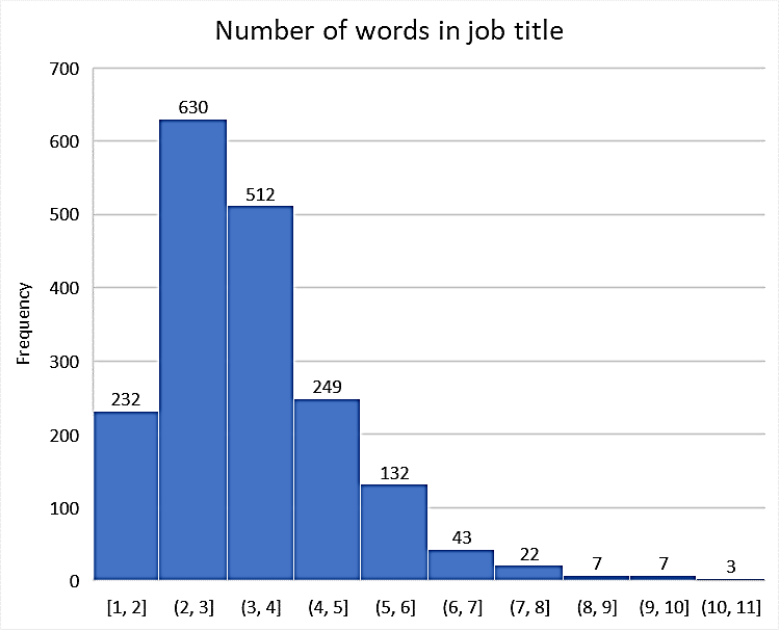

Figure 2. Number of words in job title.

Source: own work.

The statistics of the job positions demand in the sample of job offers shows that the top 10 position in a list is occupied as follows: "financial analyst", "business analyst", "financial controller", "accountant" , "controlling specialist", "data analyst", "data engineer", "business system analyst", "data scientist" and "analyst". As we can see, the top demand goes to financial and business analyst but also accountant and financial controller and controller specialist have go numerous demand, however we have been searching for "analyst". Perhaps some comment con be placed to "accountant" which is seen partially as an analytical position.

3.3. Bigram analysis

Bigram analysis shows words collocation. We have built bigrams based on job position titles. The top 20 bigrams is presented in figure 3. One can see that we have clear collocations between an "analyst" and "business", "system", "financial" and "controller", but also "finance" and "accounting". An "analyst" is also linked to "risk", "credit", "it" and "support". Then we have node "data" in between and collocation to "scientist" and "engineer". Through node "analysis" we have got a "specialist" of "settlement", "controlling" and "reporting". A collocation analysis of "annalist" with its specialization is presented in figure 4. One can see that "analyst" has a strong collocation to the nodes mentioned before but also to "sales", "project", "planning", "reporting", "operations", "client", "management" and "market". Therefore we can conclude that analyst position is expected as to person with the skills extended to different area of business operations and the position is situated in different departments.

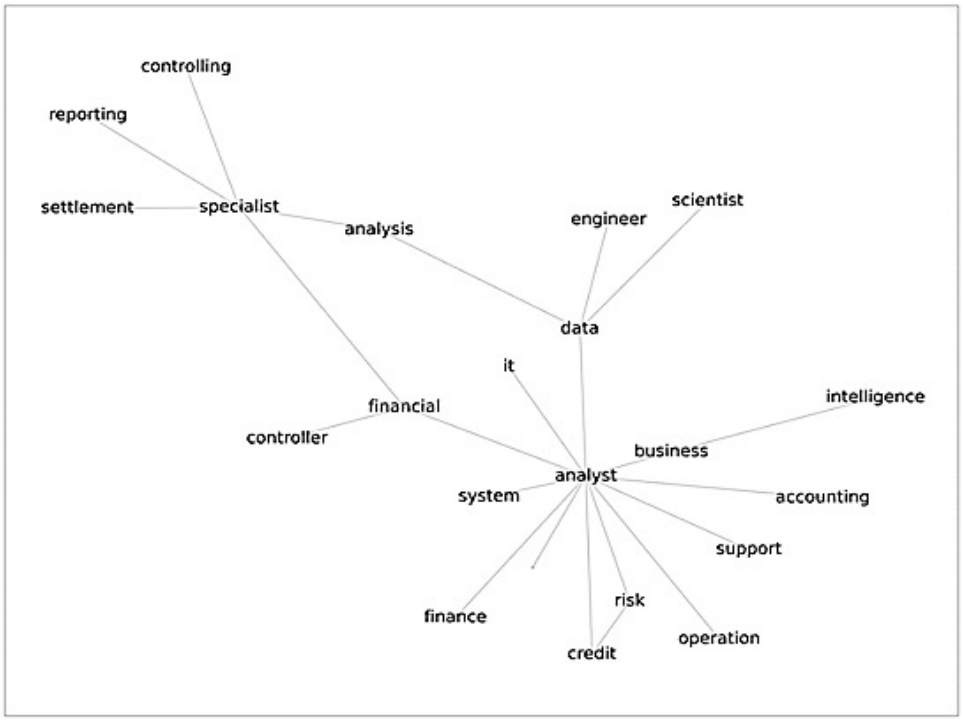

Figure 3. Top 20 bigrams.

Source: own work.

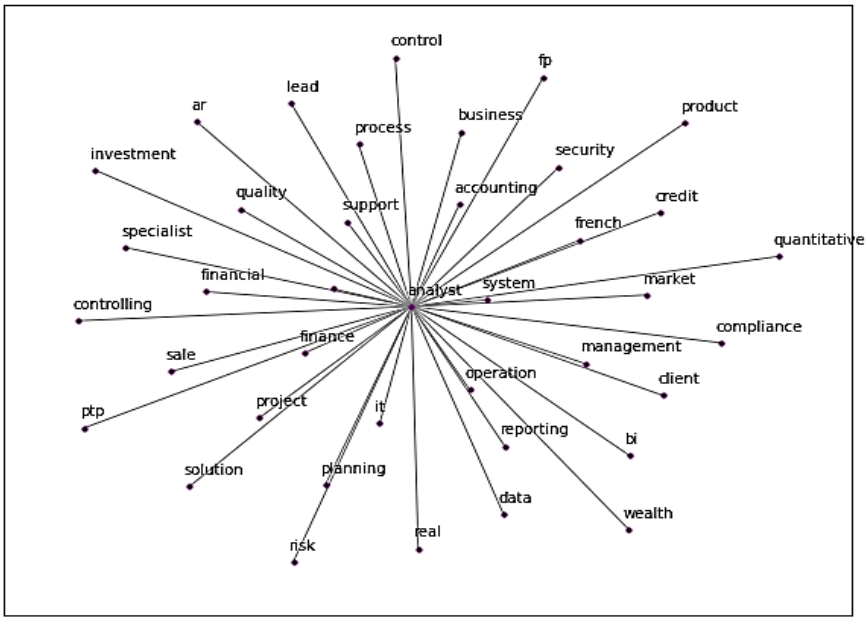

Figure 4. Direct collocation of "analyst" with to 50 specialization.
Source: own work.

That means that people employed on the position of analyst should investigate very deeply the specifics of the certain area of the business where they are working. This make challenge not only for education of such students but also for themselves, as employee for self-education on on duty on the job position or advanced onboarding. This, in turn, require a high self-organizing skills, willing and ability to extend education in the moment they it just finished. This also means for the company, to have an organizational culture with high tolerance for errors during self-education or huge education budget. It is easier make onboarding if the company has an analytical team, but if it that is the new employed person on the empty ground, the future depends of survival skills.

3.4. The wording structure in the job tittle

Based on Mallet topic modeling (Shawn G, et al. 2012), we have selected eight main category of analysts: "business analyst", "data scientist", "financial analyst", "financial controller", "intern analyst", "security analyst", "system analyst" and "other". We prepared other category if the process cannot classify a job to any of named category.

Mallet is a Java-based application for language processing, including document classification, clustering, and topic modeling. It uses different variants of Latent Dirichlet Allocation for topic modelling. Mallet process lest for topic modelling in two steps: the topic importing from the raw data set and the topic training. The only thing we must tell the Mallet is the number of topics we want to test. The rest parameters like number of iterations or smoothing are adjusted during internal optimization. Finally we have got the results contains the topic key words, and the matrix of the most prominent documents for each topic.

We have tried different number of topic from 5 to 60. If there is too little topics selected then we got not clear theme and consistency visible form keywords in each topic. I case where we have got to may topics the wording is repeated with a little variations. The most clear keywords, consistent internally which looked logically dispersed we have got for 50 topics. The several topics for illustration is presented in Table 2. but most important wording in each category in form of word cloud is presented in figure 5.

Table 2.
Illustration for topic modelling

Topic
business analyst - topic 0 * analyst (232.0) market (121.0) data (101.0) power (71.0) trading (61.0) energy (51.0) cee (30.0) sustainability (20.0) researcher (20.0) trainee (20.0)
business analyst - topic 1 * process (187.0) automation (140.0) robotics (62.0) trainer (62.0) expert (47.0) rpa (47.0) operational (47.0) tool (47.0) tester (31.0) robot (31.0)
financial analyst - topic 2 * analyst (235.0) credit (163.0) risk (146.0) management (72.0) team (42.0) expert (40.0) model (30.0) collection (20.0) retail (20.0) language (17.0)
data scientist - topic 3 * data (294.0) scientist (163.0) engineer (101.0) lead (70.0) learning (39.0) machine (31.0) pricing (16.0) banking (16.0) workday (16.0) delivery (16.0)
system analyst - topic 4 * sap (137.0) center (59.0) key (59.0) user (59.0) commerce (39.0) planner (39.0) field (39.0) inhouse (39.0) competency (39.0) hana (39.0)
financial analyst - topic 5 * excel (67.0) resilience (67.0) national (67.0) hire (67.0) financial (1.0) analyst (1.0) accountant (1.0) business (1.0) controller (1.0) controlling (1.0)

Note: Category is set based on wording analysis. The number in brackets indicate the "power" of word in documents cooperating to the topic.

Figure 5. WordCloud presentation for the most important key words for job category "business analyst", "data scientist", "financial analyst", "financial controller", "intern analyst", "security analyst", "system analyst".

Source: own work.

One can see the difference if formation of the job title for every of the job category. We believe that visual outlook clearly differentiate above mentioned categories.

3.5. Job categorization

We have built job category based on keywords of topic modelling. We applied expert methodology combined with machine learning tests for consistency. It was working this way, that we after keywords selection we run classification model to check selection consistency

based of confusion matrix. We tried to maximize the distinctions between categories based on unique and distinct sets of keywords. Finally we have completed the most important, 128 keywords in seven categories which are presented in table 3. The database of keywords was used to job classification based on job title and responsibility area.

Table 3.
Keywords for each category

Category	Keywords	No
Business analyst	analyst, specialist, business, product, management, monitoring, market, process, service, controlling, automation, pricing, transaction, personal, project, corporate, data, center, planning, sale, risk, supply, operation, customer, system, transfer, excellence, contract	37
Data scientist	data, specialist, engineer, developer, analytics, program, analysis, scientist, sql, graduate, innovation, analytical, associate, report, reporting, lead, etl, team, forecast, cloud,	21
Financial analyst	analyst, specialist, account, accountant, settlement, accounting, tax, support, credit, financial, risk, fund, derivative, control, reporting, billing, cost, receivable, insurance, asset, class, investment, finance, management, ptp, valuation, excel, resilience	35
Financial controller	financial, controller, accountant, general, controlling, analyst, ledger, accounting, finance	9
Other	internship, audit, intern, crm, processing, consultant	4
Security analyst	analyst, security, client, aml, prevention, anti, revenue, know, soc, designer, fraud	10
System analyst	network, administrator, performance, sap, analyst, tester, computer, center, key user	12

Source: own work.

One can note, that some keywords are common for two or more profiles. For example, “analyst” and “specialist” are present in different categories, what means that they do not differentiate the job profiles. We can find “analyst” in all categories and “specialist” in “business analyst”, “data scientist”, and “financial analyst”. There is also some common wording in “financial analyst” and “financial controller”.

We have distinguished “financial analyst” and “financial controller” because we found the phrase “financial controller” explicate placed in job title in many where in other job offers called the position as “financial analyst”. We assumed that it covers some prestige of financial controller. A similar situation we can also note in “data scientist” and “business analyst”, which include common words to all kind of “analytics” but the only job name is distinctive. The common keywords are as follows: “analysis”, “data”, “reporting”, “team”, etc. We decided not to eliminate common wordings because it is quite clear for everyone that the job positions can overlap in some areas. In case of analytic position is even more natural then for others. The preliminary profiles created for “business analyst” and “data scientist” based on job titles is presented in figure 6. As we can see, there are not overlapping keywords in the top 10 keywords presented on the pictures, but the difference in the intensity of wording is clear visible.

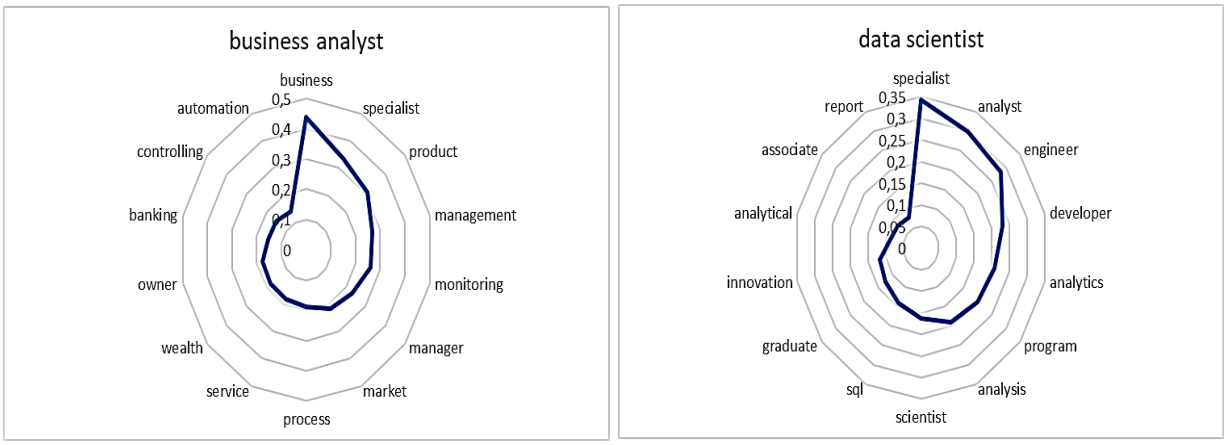

Figure 6. Preliminary profiles built base on job title word statistics.

Source: own work.

Finally, we have created job categories based on topics and then mapped job offers to categories (Table 4). We utilized mixed models of expert's and machine learning algorithms for classification. Based on that we can note that 31% of jobs belongs to category "business analyst". The next is "data scientist" – 16% and "financial analyst" – 27%. The position of "financial controller" covers 8% of jobs. The rest 2% and 7% of job offers belong to the category "security" and "system" analyst. We have got 10% of uncategorized jobs. The statistics suggests that the first four jobs are really demanding on the market and creates profile of the future of analytical sector.

Table 4.

Job classification

Category	Job offers count	% in total
Business analyst	1084	31%
Data scientist	546	16%
Financial analyst	948	27%
Financial controller	264	8%
Analyst (other)	323	10%
Security analyst	68	2%
System analyst	235	7%

Source: own work.

In next chapter we analyze what are the job description and the requirements expected by enterprises from the certain job position and how the requirements are consistent with the job title.

3.6. Job requirements classification

Job description (requirements) as a set of keywords is much longer then job title. As one can see the most frequently appearing job requirements is between 20 and 58 words, what can be seen from figure 7.

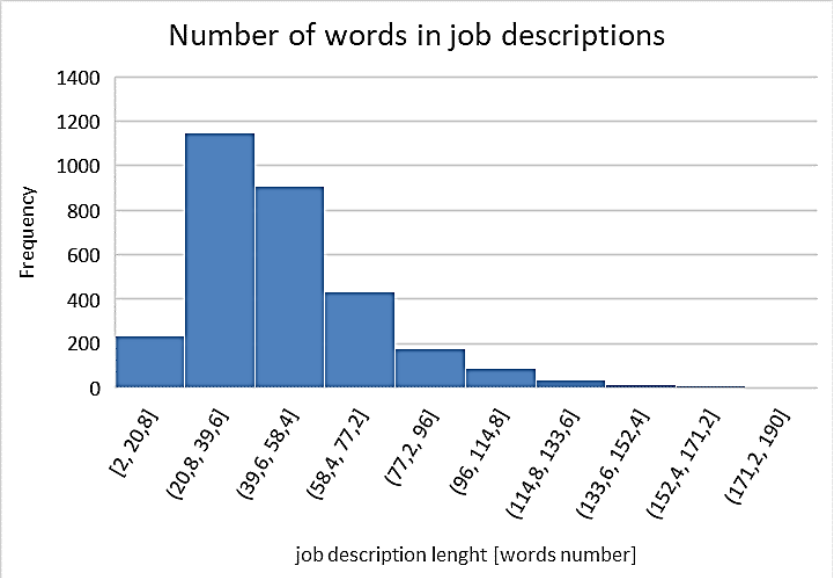

Figure 7. Job description wording histogram.

Source: own work.

Job description's bigrams cooccurrences form complicated network figure. It suggests that offers expect the responsibility for following areas: tools for controlling and analytical support, active participation in multiple projects and business processes, responsibility for business intelligence, budgeting and forecasting, decision making support, processes continuous improvement, and periodical reporting annually, quarterly, and monthly. We also can note some nodes with required responsibilities for new solutions and implementation of the projects, projects development and cooperations in internal teams or with external partners. More details you can see from figure 8, which is just the only the crop of the center part of the full picture.

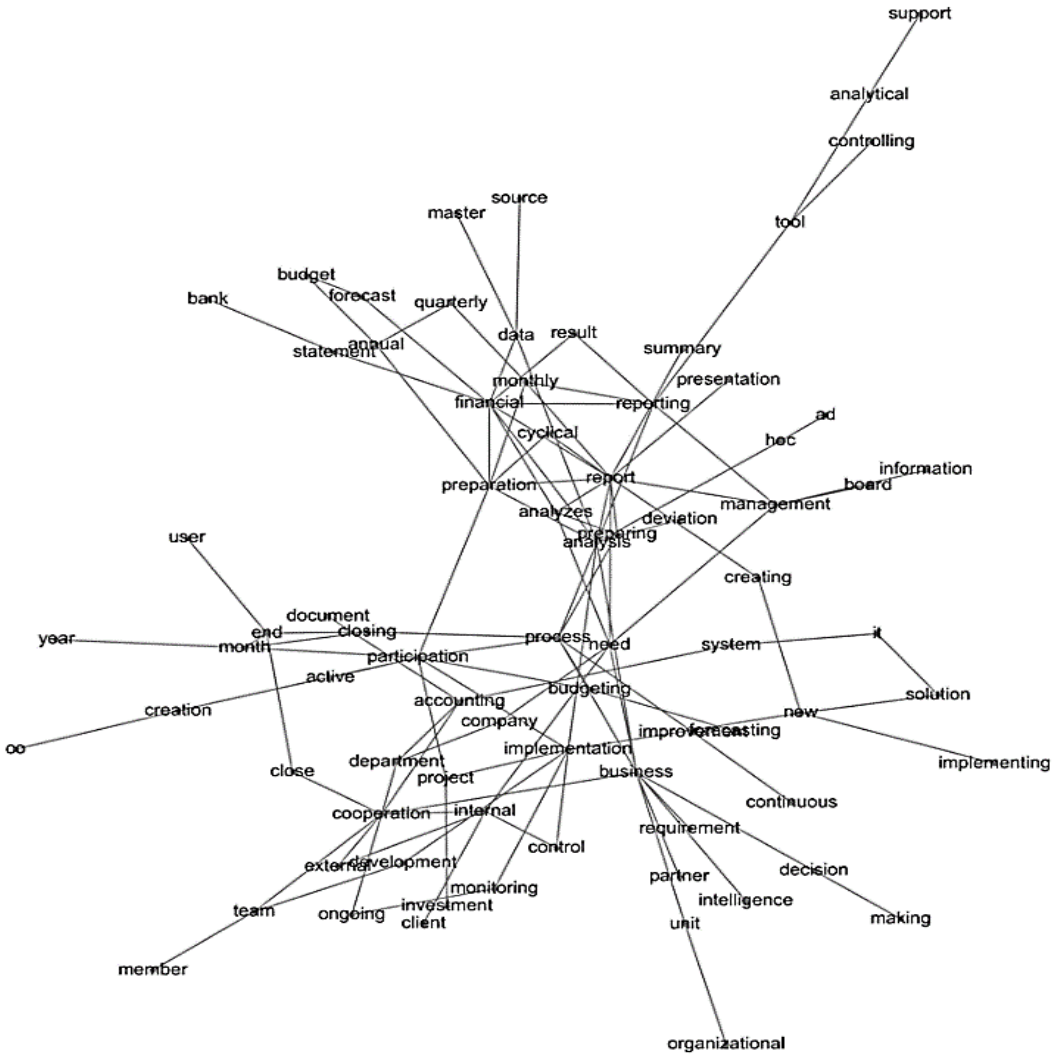

Figure 8. Job position responsibility, a central nodes.

Source: own work.

The important aspect of the job title analysis was the corresponding job description and its coincidence. If the job title is formulated in the way corresponding coherently with job description (requirements) then the reader which is a potential employee can standardize the job understanding in his imagination and relay on job title for next offer supposing that they expects skills and fields of responsibility as usual. Naturally, description of certain field of responsibility can vary from one to another industry but in the same group of firms like finance or IT the job title is expected to follow by more or less the same requirements.

As we have seen in previous chapter, job offers was allocated to seven categories based on job title topic modeling and experts work. Now we are going to check how the same categories classify job descriptions. This operation will verify profiles created based on job title.

As before, we used the similarity calculation between sets of keywords representing certain category with the set of keywords comprising job description. We used the Jaccard Index. Similarity in terms of this measure is the distance between two vectors where the vector

dimensions represent the features, in our case keywords of two objects: category and job description. In our case the comparison is equal the common keywords belonging to both vectors. The biggest number of common keywords determine the category.

3.7. Job description categories

As a result of Jaccard measure we have got a matrix of job descriptions divided to categories. Now, they can be compared with the job title categorization it see how many offers can be judged as the job title is consistent with the job description. As consistent we understand that they operate the same wording belonging to the same category. Detail of comparison you can see from table 5.

Table 5.
Comparison of job title and job description categorization

Job description / Job title	business analyst	data scientist	financial analyst	financial controller	security analyst	system analyst
business analyst	862	94	114	1		12
data scientist	324	185	26			10
financial analyst	469	48	422	2		4
financial controller	138	20	105	1		
security analyst	52	7	6		3	
system analyst	195	11	9			19

Source: own work.

We clearly see that 862 offers for business analyst is consistent in title and job description. Similarly, 185 data scientists and 422 financial analysis. In this cases job searcher will experiment coherent picture of job offer. In some cases job offer description belong to other category then job title. In our case 324 job offers from title category “data scientist” belong to category “business analyst” and 26 to financial analyst when we considering job description. We didn’t find “financial controller” like wording in job description, but we found “business analyst” and “financial analyst” instead.

3.8. Job requirements

As job requirements offers describe at least experience, degree, accounting or business administration skills, analytical and organizational ability, advanced options for excel or other skills to work effectively, team environment attention, accuracy and confidence for information produced, fluency in English written spoken or other needs for a job. As example we can analyze following requirements: “bachelor degree, finance related minimum two year experience, controlling project comparable industry advantage solid knowledge, sap fi module, office tool, especially excel strong analytical skills, problem solving approach, high level interpersonal communication English” or “master degree, finance accounting or business administration minimum 3-year experience, controlling good knowledge, sap advanced, excel skills, fluency in English, written and spoken, soft analytical, paying attention, detail

communication, diligence high sense, ownership ability, work effectively, team environment, time management, prioritize task well, pressure prerequisite, meeting deadline, highest quality, propose improvement process".

As technical requirement job offerors enumerate: sql, python, jira confluence, sap, uml, bpmn power bi, enterprise architect, agile scrum, ms office, power query, active directory, panda, scikit learn, keras, pytorch, tensorflow, aws,l git, docker, apache spark, mlflow, nosql, google analytics, tag manager, azure, google cloud. More you can see in Appendix 2.

4. Discussion

The results of the study are in line with the results of research conducted by Verma (2019) and IIBA (2015; 2019): depending on the perspective and thematic scope of the person specializing in business analysis, different job descriptions are used. Common names include business analyst, business intelligence analyst, data analyst and data scientist (Verma et al., 2019). A person focusing mainly on data analysis may, in turn, be assigned the following roles: subject matter experts (SMEs), data architect, data engineer, data scientist, data analyst, data journalist and also business analyst.

Among the job advertisements we analyzed, the most common job titles were: business analyst, data scientist, financial analyst, financial controller, system analyst and security analyst. After defining the specific categories of job positions, we conclude that 31% of jobs belongs to category "business analyst", 16% to "data scientist", 27% to "financial analyst" and 8% to "financial controller". The next 2% and 7% of job offers belong to the category "security" and "system" analyst. There are 10% of uncategorized jobs.

According to IIBA (2015), business analysis is a practice that enables making changes in an organization by identifying its needs and recommending solutions that are beneficial from the point of view of stakeholders. It can be strategic, tactical and operational. Business analysis does not refer to one thematic context, but to a number of different business areas and perspectives.

A related term is business data analytics. It is defined as a specific set of techniques, competencies and practices used to continuously explore, study and visualize business data (IIBA, 2019). Business analytics therefore focuses primarily on data. The purpose of this process is to gain insight into the business, which enables better evidence-based decision making. C. Aasheim et al. (2015) define business analytics as a subcategory of data analytics that is applied in a business environment to analyze related problems.

In turn, a business analyst (BA) can be defined as any person performing business analysis tasks (IIBA, 2015). The position and organizational role of this person is not important (Gosh, 2015). BA is tasked with creating and analyzing information received from, among

others, from managers, other departments or units cooperating with the organization. Importantly, the business analyst is responsible for identifying the real needs of stakeholders. A frequent goal of BA is to facilitate communication between organizational units of the company by defining the scope of possibilities to meet the needs of stakeholders using ICT solutions (Chernysheva, Shepelenko, 2018). In other words, BA defines the scope of analytical work and then uses the results to support the business decision-making process and the implementation of decisions resulting from this process (IIBA, 2019). The business analyst is the key link between the customer with specific requirements and the development team offering a given solution (Shah, 2017). He is responsible not only for identifying the business problem or the organization's needs, but also for presenting these needs in a way that is understandable to the teams providing the solution (BAE, 2014).

This is consistent with the results of our research. The offers we analyzed require the responsibility mainly in the following areas: tools for controlling and analytical support, active participation in multiple projects and business processes, responsibility for business intelligence, budgeting and forecasting, decision making support, processes continuous improvement, and periodical reporting annually, quarterly, and monthly.

The BABOK study presents the Business Analysis Core Concept Model™ (BACCM™), enabling the core of business analysis, regardless of the industry, methodology, perspective or level in the organization. BACCM consists of six elements: Change, Need, Solution, Stakeholder, Value and Context. According to this model, the answers to questions about these elements are crucial for the work of a business analyst (IIBA, 2015):

- What changes are being made?
- What needs should be met?
- What solutions are being changed or created?
- Who are the stakeholders involved?
- What is the context, i.e. the circumstances that influence the change?

When analyzing the previous research on the business analyst, the focus was on publications in the Web of Science and Scopus databases as of March 1, 2023. The selection criteria were Author Keyword='business analyst', publication years: 2014-2023 and publication type: open access. The selection process for the above-mentioned publications is presented in Table 6.

Table 6.
Selection of articles using the SPL method

Search stages	Number of publications	
	WoS	**Scopus**
Keyword='business analyst'	61	449
Year of publication: 2014-2023	44	221
Type: open access	13	36
SUM: WoS + Scopus	49	
Removing duplicates = **final number of publications**	**43**	

Source: own work based on WoS and Scopus.

In the first step, publications with Author Keyword='business analyst' were searched. As can be seen, significantly more articles meeting the criteria were found in the Scopus database (449 in Scopus vs. 61 in WoS). Then, the search criteria was narrowed down to years of publication and its type. The total number of publications after removing duplicate items was 43. Due to such a low number of search results, the stage of title and abstract analysis was abandoned and the final content analysis was started. There were also no further narrowings, e.g. to the Management category. If, as a result of the content analysis, it was found that a given publication did not meet the search results, it was not described in this article.

Due to the fact that business analysis can be conducted from different perspectives (IIBA, 2015), the position of a business analyst was described by researchers in various areas and thematic contexts. A. Babar et al. (2018) focused on business analyst competencies. Their research confirmed that BA competencies play an important role in the requirements elicitation process. Requirements engineering in terms of business analysis was also the subject of research by M. Daneva et al. (2019). In turn, T. Chakabuda et al. (2014) assessed the competency gaps of people employed as business process analysts using the competency framework created by Sontaya and Seymour. They found that the biggest gaps concerned knowledge about the organization. Researchers also described the use of user stories by business analysts (Chauhan, 2015), the role of BA in agile ASD development teams (Ndlela, Tanner, 2022), the educational requirements for the BA position (Richards, Marrone, 2014) and the relationship between key skills for BA and the learning outcomes of students in selected fields of study (Zych, 2020). The BABOK guide (IIBA, 2015) presented BA's work from the following perspectives: agile, business intelligence, information technology, business architecture, and business process management.

From the point of view of managerial practice, it is particularly important to define the competencies relevant to the position of a business analyst. BABOK (IIBA, 2015) presents six main categories of competences: (1) analytical thinking and problem solving, (2) behavioral characteristics, (3) business knowledge, (4) Communication Skills, (5) Interaction Skills and (6) Tools and Technology. Based on these categories, J. Park and S. Jeong (2016) proposed their own version of the key competence areas for the role of a business analyst (Table 7).

Table 7.
Business analyst competencies

Area	Competencies in the mentioned area
Attitude	accountability, adaptability, ethics, time management, trustworthiness
Knowledge	business acumen, domain knowledge, methodology knowledge, organization knowledge, solution knowledge, technical knowledge
Analysis	root cause analysis, structured analysis, decision making, statistical analysis
Thinking	client experience thinking, conceptual thinking, creative thinking, learning, system thinking
Communication	Listening, non-verbal communication, verbal communication, written communication
Interaction	conflict resolution, facilitation, leadership, 481uestioning/interviewing, relationship building, teaching

Source: Park, Jeonga, 2016.

The main areas of competence indicated in the table above are attitude, knowledge, analysis, thinking, communication and interaction. Selected competencies have been assigned to each area. The authors of the study examined how important individual competencies are for the position of a business analyst. The order in the ranking is as follows (starting from the most important competence): root cause analysis, listening, accountability, leadership, ethics, written, conflict resolution, system thinking, trustworthiness, verbal communication, domain knowledge, decision making, time management, relationship building, facilitation , business acumen, questioning, conceptual thinking, organization knowledge, client experience thinking, teaching, structured analysis, statistical analysis, creative thinking, adaptability, solution knowledge, learning, non-verbal communication, methodology knowledge, technical knowledge (Park, Jeonga, 2016, pp. 3996-3997).

The competences of persons dealing with data analysis in relation to business data analytics depend on the scope of duties in a given position. The most frequently mentioned competences are: specific knowledge of the business sector or specified business domain, technical skills to create and run analytics model to obtain insight from data, the ability to analyze and interpret data (IIBA, 2019). A. Verma et al. (2019) extend this list by grouping individual competencies of data analysts into the following categories: enterprise systems software, visualization techniques, specialized analytics solutions, programming skills, project management, advanced modeling/analytics techniques, web scraping, hardware, networking, statistical package, data mining techniques, structured data management, big data management, decision making skills, communication skills, organization skills and business domain.

Our research did not focus directly on the competencies of a business analyst, but presented a number of Job Position Responsibility related to the competencies presented in the literature. Examples of keywords of job position responsibility analyzed by us are as follows: process, project, report, data, management, decision making, preparation financial data, internal cooperation, budgeting, controlling, etc. These areas require the competencies described by J. Park and S. Jeong (2016) and A. Verma et al. (2019).

The study also confirms the conclusions of the 2021 Global State of Business Analysis Report. This report presents a list of job titles where employees most often define their role in the organization as a business analyst: business analyst, business analyst/project manager, IT business analyst, consultant, manager/director/VP/C-level, business systems analyst, product owner/product manager, senior business analyst (IIBA, 2021). According to the 2021 Global State of Business Analysis report, the key competences of a business analyst are: communication, problem solving, creative thinking, facilitation, organizational knowledge, leadership & influencing, specialized skills (IIBA, 2021).

5. Summary

The idea of the research was to use ensemble approach of the expert judgment and machine learning methods to identify candidate profiles for analyst job position. The object of the analysis was the sample of job offers published in the internet job offer portal operating in Poland.

As the first, we have analyzed the most demanding skill levels for an analyst job position. As we shown, the most frequently (almost 60%) a mid and regular level of specialists are searched by offerors. The next two positions occupy junior and senior with almost the same (18%, 17% respectively) demand.

In the second part, we used LDA topic modelling from Mellet package to made a job offer's text (job title) summary into 50 topics and by utilizing expert's judgements establish seven categories of analyst jobs based on keywords appearing in job offers. We built the most descriptive vocabulary for every category and analyzed job profiles.

As the next step we analyzed job descriptions (responsibilities). We applied previously established classification, keywords, vocabulary and machine learning to classify jobs according job description. We obtained confusion matrix where we associated job categories for job title and job description. This allows us to deliberate about coherence between job title and job description in context of recruitment marketing and job position understanding in organization.

However our dataset was not representative for any society group or industry the research delivers interesting highlights for academia and practitioners:

a) An application of machine learning text mining techniques for job's offer analysis and categorization, however very rare in literature, is possible and delivers functional results.
b) We combined expert method of judgment with machine learning preprocessing and then utilize computational technique to extend the judgment to wide range sample of data what is essential for supervised machine learning classification.
c) We detected significant inconsistency in job description and job titles advertised in recruitment process. This suggests that managers can mix requirements for different positions with improper use of job title in recruitment process. This means that job title is used as prestige title is some cases where the job description is taken from more common position. We suspect that a number of offers for "financial controller" is functioning as prestige job title for "financial analyst". Similarly "data scientist" is functioning as for other analytical positions (business, financial).

d) Imprecise job description lead also to confusion in relationships on organizational level. If candidate or organization understand job title in some way but recruiter is asking something else or candidate expect different requirements the confusion can occurs in both side.

We believe the presented study is important both from the point of view of science and managerial practice. We are going to continue our work in further research to recognize the profile of candidates and work environment which offerors propose for the new type of workers as hybrid work place, flexible time, freelance employment, gig economy, etc. It will contribute to increasing the state of knowledge about the function of a business analyst in organizations, and at the same time it can be a guide for managers and HR departments looking for competent business analysts.

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Appendix 1

Most frequent key words in selected categories

Category	Most frequent key words	Topic
business analyst	analyst, market, data, power, trading, energy	0
	process, automation, robotics, trainer	1
	analyst, service, business, customer	11
	monitoring, transaction, remediation	14
	wealth, banking, personal, mobile, marketing	22
	analyst, sale, business, support, development, system	24
	analyst, manager, project, operation	32
	analyst, real, estate	33
	analyst, corporate, business, treasury, client, investment	34
	analyst, management, market, risk, quantitative, asset	38
	analyst, business, system, consultant	39
	management, expert, contract, ssc, travel	41
	product, owner, manager	42
	analyst, pricing, supply, transfer, chain, planner	43
	analyst, center, excellence, pay	48
	specialist, controlling, analysis, planning	49
data scientist	data, scientist, engineer, lead	3
	program, graduate	6
	analytics, associate, team, sql	8
	data, innovation, analytical, forecast	15
	data, engineer, developer, cloud	18
	developer, report, sql, etl, power, record, programmer	27
	specialist, analysis, data, reporting	30
	analyst, data	40
financial analyst	analyst, credit, risk, management	2
	excel, resilience, national, hire	5
	research, offshore, black, sea, grain, oilseed	7
	analyst, control, cost, financial, specialist, operation	10
	analyst, tax, accountant, italian	13
	support, financial, valuation	16
	specialist, settlement, billing	17
	account, accountant, receivable, ptp, payable, lease	20
	analyst, reporting, accounting, finance, financial, specialist	23
	analyst, fund, accounting, investment	29
	derivative, insurance, asset, class	47
financial controller	controller, financial, controlling, team, project, officer	9
	financial, analyst, accountant, business, controller	26
	financial, controller, analyst, finance	28
	financial, analyst, accountant, business, controller	36
	accountant, general, ledger, accounting, controller	45
intern analyst	internship, audit, crm, consultant, summer, team	35
	intern, processing, insurance, life	37
security analyst	analyst, security, soc	12
	designer, fraud	25
	client, prevention, anti, know, money, laundering, onboarding	31
	security, revenue	44
	analyst, kyc, aml	46
	sap, center, key, user	4
	performance, analyst, tester	19
	network, administrator, computer	21

Appendix 2

Most frequent key words in job requirements for technology

		in tot %	30,9%	5,6%	9,5%	2,3%	1,4%	2,3%	1,6%	2,5%	1,1%	2,7%	1,9%
	19 094	769	3 049	171	291	71	43	69	50	76	33	82	57
index	**dł**	**count**	**tech_len**	**python**	**sql**	**jira**	**spark**	**uml**	**google**	**azure**	**excel**	**power**	**java**
sql	3	46	1	0	1	0	0	0	0	0	0	0	0
python sql	10	16	2	1	1	0	0	0	0	0	0	0	0
sql python	10	15	2	1	1	0	0	0	0	0	0	0	0
jira confluence	15	12	2	0	0	1	0	0	0	0	0	0	0
sap	3	10	1	0	0	0	0	0	0	0	0	0	0
uml bpmn	8	9	2	0	0	0	0	1	0	0	0	0	0
	0	8	1	0	0	0	0	0	0	0	0	0	0
sql power bi	12	6	3	0	1	0	0	0	0	0	0	1	0
enterprise architect	20	6	2	0	0	0	0	0	0	0	0	0	0
python	6	6	1	1	0	0	0	0	0	0	0	0	0
bpmn confluence jira sql enterprise architect	45	6	6	0	1	1	0	0	0	0	0	0	0
agile scrum	11	5	2	0	0	0	0	0	0	0	0	0	0
m office vba python powerquery power bi	39	5	7	1	0	0	0	0	0	0	0	1	0
active directory	16	4	2	0	0	0	0	0	0	0	0	0	0
uml bpmn sql	12	4	3	0	1	0	0	1	0	0	0	0	0
python panda scikit learn kera pytorch tensorflow aws s	105	4	16	1	1	0	1	0	0	0	0	0	0
sql sa python	13	4	3	1	1	0	0	0	0	0	0	0	0
bpmn uml	8	4	2	0	0	0	0	1	0	0	0	0	0
google analytics tag manager sql python	39	4	6	1	1	0	0	0	1	0	0	0	0
sa	2	3	1	0	0	0	0	0	0	0	0	0	0
agile	5	3	1	0	0	0	0	0	0	0	0	0	0
uml enterprise architect	24	3	3	0	0	0	0	1	0	0	0	0	0
azure	5	3	1	0	0	0	0	0	0	1	0	0	0
google analytics tag manager	28	3	4	0	0	0	0	0	1	0	0	0	0
sparx enterprise architect	26	3	3	0	0	0	0	0	0	0	0	0	0
sql python sa	13	3	3	1	1	0	0	0	0	0	0	0	0
sql python git google cloud	27	3	5	1	1	0	0	0	1	0	0	0	0
python java opencv scikit panda pytorch nlp jenkins dock	79	3	13	1	0	1	0	0	0	0	0	0	1
jira confluence sql	19	3	3	0	1	1	0	0	0	0	0	0	0
microsoft excel	15	3	2	0	0	0	0	0	0	0	1	0	0
sql python google cloud platform	32	2	5	1	1	0	0	0	1	0	0	0	0
uml soapui postman	18	2	3	0	0	0	0	1	0	0	0	0	0
python docker kubernetes	24	2	3	1	0	0	0	0	0	0	0	0	0
sql hive python apache spark	28	2	5	1	1	0	1	0	0	0	0	0	0
confluence jira	15	2	2	0	0	1	0	0	0	0	0	0	0
figma	5	2	1	0	0	0	0	0	0	0	0	0	0
sql bpmn uml microsoft office erp system crm sent emcs	68	2	12	0	1	0	0	1	0	0	0	0	0
agile scrum six sigma	21	2	4	0	0	0	0	0	0	0	0	0	0

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

EXPECTATIONS OF MEDICAL STUDENTS TOWARDS FUTURE EMPLOYERS

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Background: The Polish healthcare system is undergoing a human resources crisis regarding labour shortages and unfavourable demographic changes, which affects the future demand for medical workers. Poland's healthcare workforce is ageing, and there is an urgent global need to attract young medical talents. The expectations of medical students towards their future employers are therefore crucial for ongoing healthcare planning.
Purpose: For this reason, the nationwide study aimed to identify medical students' expectations towards future employers (healthcare entities) in Poland. The study defined their developmental needs as well as organisational and motivational expectations.
Design/methodology/approach: A questionnaire addressed to students of medical faculties was used to collect the data. Four hundred-eight respondents from all over Poland took part in the survey. A five-point Likert scale was used to assess students' expectations towards future employers. In order to determine the variables to measure the expectations of medical students, an Exploratory Factor Analysis (EFA) was performed using the principal axis method with Varimax rotation and Kaiser normalisation. The data was then analysed using descriptive statistics. The analyses were carried out using the IBM SPSS Statistics version 27.
Findings: The factor analysis showed that three dimensions should be distinguished in the questionnaire of the examined needs and expectations of medical students: developmental needs (1), organisational expectations (2), and expected motivators (3). The results showed that the greatest expectations of medical students relate to organisational aspects and, above all: a good atmosphere in the workplace, work-life balance and the right climate created by managers. The expected motivators are the least important for students, especially the medical staff salaries' dependence on seniority and material benefits.
Originality/value: The study contributes to the new knowledge regarding the expectations of medical students towards future employers in the Polish healthcare sector. The results can help healthcare organisations plan recruitment and marketing processes in line with the expectations of young healthcare professionals. The information obtained will also be useful for governments and universities in planning strategies to improve the health professions' current state of human resources.

Keywords: healthcare entities, medical students, future expectations, human resource management.

Category of the paper: Research paper.

Introduction

Health is one of the most important values valued in Polish society. An important role in delivering this value is played by the National Healthcare System (NHS), which aims to promote and maintain public health (Chomątowska et al., 2020). The results of inspections carried out by the Supreme Audit Office in recent years show that the NHS in Poland is in bad condition, as it does not sufficiently ensure the effective use of public funds, is not very patient-friendly and, above all, does not ensure adequate availability of medical staff (Łuczak et al., 2018). Due to the inappropriate policy towards medical staff, the Polish healthcare system struggles with serious problems, such as workload and shortages of medical staff, emigration of healthcare workers and limited access to health services (Domagała, Klich, 2018). Poland has one of the lowest ratios of the number of doctors and nurses per capita compared to other European Union countries (OECD and European Union, 2020). For years, the problem of imbalance between the constantly growing demand for health services and the supply of human resources necessary to meet the health needs of society has been observed.

There is a shortage of both general practitioners and specialists in Poland, and demographic factors (ageing population) cause more and more people to enter the period when they need medical care the most (Kludacz, Piekut, 2014). At the same time, an increasing percentage of medical staff is in advanced age (over 60 years old), and the supply of young doctors and nurses is insufficient. The insufficient number of young doctors entering the Polish labour market is caused, among others, by limits of admission to medical universities and difficult access to specialisations.

Another problem in the Polish healthcare system is migrating medical personnel (doctors, nurses and midwives). The main reasons for the emigration of qualified employees from the country are low wages, worse working conditions and limited opportunities for professional development (Żuk et al., 2019). The problem of healthcare worker migration is becoming increasingly popular worldwide. The ageing European society creates new opportunities for Polish doctors, and inadequate working conditions and relatively low wages encourage many highly qualified healthcare professionals to look for work abroad (Krajewski-Siuda et al., 2012). The brain drain from developing to industrialised countries is a long-standing phenomenon in the medical profession but has taken on extreme proportions in recent years. Medical staff mobility is, therefore, highly asymmetric, to the detriment of less developed countries, which lose not only much-needed human capital but also significant investments in

education and tax revenues (Domagała et al., 2022). The result is staff shortages in Polish health care that are burdensome for society.

The long-term course of acquiring and expanding professional qualifications, with the insufficiency of the education system and postgraduate training, causes shortages of specialised young medical personnel. Rational planning of educating young medical personnel and persuading the right number of people to study medical professions is an increasing challenge. Appropriately educated and available human resources are needed to ensure quality healthcare to improve public health.

It is argued that low professional satisfaction and failure to meet the needs and expectations of healthcare professionals are important determinants of the declining attractiveness of medical professions (Marchal, Kegels, 2003). What motivates students to study at medical universities and to work in their learned profession? What are their development needs and organisational expectations from the future employer? What are the key work-life issues for today's students? What is their attitude towards their own development? These are some of the practical questions that continue to intrigue organisers and planners of medical education programs around the world. Unfortunately, there are not many studies on these issues among Polish students. So far, it has been shown that such factors as developmental needs influence the professional decisions of young medical personnel (Kruk et al., 2010), future expectations (Kolčić et al., 2014) and working and living conditions (Humphries et al., 2015; Mayta-Tristán et al., 2017).

The first factor that will be examined in this study will be the developmental needs of medical students. The success of healthcare systems worldwide depends on their physicians' competence development (Spilg et al., 2012). According to evidence-based management theory, physicians have a craft that can be developed with the right guidance through practice and experience. Knowledge of medical students' developmental needs can help organise an appropriate clinical learning environment, i.e., one that provides organisational and sociocultural interactions that support interns' entry into this environment's formal and technical elements. Such an environment should provide structured activities, resources and opportunities for practice. Knowledge of the developmental needs of medical students should therefore help provide high-quality education that will provide exposure to various medical cases, treatment scenarios and diagnostic tools to ensure the appropriate level of medical competence (Sheehan, 2010; Subramaniam et al., 2015).

The second factor that will be examined in this study will be the expected motivators. Research into the motivation of students to choose the medical profession and their plans to become a doctor seems paramount for decision-makers and educators (Gibis et al., 2012). Evidence from previous research shows that the motives, beliefs and values of medical students related to their studies and future profession influence their willingness to accept a training program and their academic performance, as well as the choices they make about their future career path (Draper, Louw, 2009; Gąsiorowski et al., 2015; Khader et al., 2008).

The third factor that will be examined in this study is organisational expectations, which are the main concern of all medical students (Khadem-Rezaiyan et al., 2015). It is precisely because of the failure to meet these expectations that there are difficulties in providing adequate healthcare in society. What medical students expect from their future employers can influence how they learn. These expectations contribute to students' ever-changing mental image of their careers and thus influence their apprenticeship expectations. Associated with this image are certain values, beliefs, and priorities related to the medical profession that students take with them to an institution that has its own set of values, beliefs, and priorities (Draper, Louw, 2009). When medical students expect that their future medical career will bring them professional satisfaction, they will stimulate interest and set goals, improving their academic achievement and ultimate professional skills (Wang, Mei, 2022). This will have a far-reaching impact on their career choices and future professional development (Pham et al., 2020). Therefore, it is crucial to anticipate these expectations and factors influencing their preferences, such as the working environment and conditions of employment and time flexibility (Khadem-Rezaiyan et al., 2018). The organisational expectations of medical students may also potentially be affected by the perception of future work-life balance (WLB) (Takahashi et al., 2017). Work-life balance can be defined as being satisfied and functioning well at work and home with minimal role conflict (Clark, 2000).

Medical professions in Poland are classified as professions of public trust. Therefore, it is associated with the need to complete university studies, constantly deepen knowledge, and have high competencies. Parallel to the discussion on the impact of a limited workforce on the healthcare system, attention is drawn to the younger generation of physicians, who may have a different attitude to work than their older colleagues (Diderichsen et al., 2011). There are concerns that the younger generation of doctors is less engaged and less hardworking. In order to understand and anticipate changes in attitudes towards work, it is not enough to look at the needs and expectations of modern physicians. We need to ask our future doctors about these needs. This is important because their attitudes, values and aspirations have a long-term impact on the quality of the healthcare system (Diderichsen et al., 2011).

Rational planning of the education system for young medical personnel is therefore becoming one of the priorities of NHS in Poland. This is of particular importance because medical universities accept representatives of the "Z" generation and the first graduates of this generation to enter the labour market. Therefore, it is important to get to know and understand the youngest generation of future doctors, see what they are like, learn about their values, expectations, and needs, and understand what motivates them and why they behave the way they do (Chomątowska et al., 2020).

Therefore, our research presented in this article aimed to examine Polish medical students' motivations, organisational expectations and development needs. Greater knowledge about the attitudes and expectations of medical students regarding their future careers is important for

healthcare planners as well as for medical teachers involved in education. This article presents only a fragment of a broader study conducted by the authors among medical students in Poland.

Methods

A questionnaire addressed to students of medical faculties was used to collect the data. A five-point Likert scale was used to assess students' expectations towards future employers, from 1 (strongly disagree) to 5 (strongly agree) (Elliott, Woodward, 2007). The survey of medical students from across Poland was conducted in 2021. The survey was anonymous, and the results were used in an aggregated manner for research purposes only.

Most universities, for the duration of the suspension of teaching due to the COVID-19 pandemic, introduced remote learning arrangements. In this situation, students must equip themselves with remote working tools and provide Internet access. On this basis, it was assumed that every medical school student had access to the Internet from their phone, computer or tablet. It was therefore decided to conduct only Computer Assisted Web Interview (CAWI) surveys. The inclusion criteria were: consent to the survey and being a medical student. Identification of the target group was possible by diversifying the sources of reaching the respondent. The authorities of 22 Polish medical universities (including medical universities, universities with Collegium Medicum, university faculties with medical programmes, and non-public universities with medical programmes) were contacted by email and telephone to obtain consent to conduct the survey among students. Two of them refused to participate in the study. The remaining universities agreed to allow students to participate in the survey (they provided their students internally with a link to the survey) or instructed them to contact the Student Council and Student Research Groups directly (96 emails containing a link to the survey were sent for this purpose). In addition to students at faculties of medicine, students from other medical faculties (including nursing and midwifery) were also surveyed.

The International Medical Students' Association IFMSA-Poland was also contacted. This organisation brings together students of all medical programmes in Poland. It is also the largest student organisation in the world, with students from 121 countries belonging to it through national organisations. The dissertation author provided the link to the survey to 18 branch presidents and one vice president.

Using MS Forms, an online survey tool in Office 365, responses were collected from 408 respondents. The platform allowed the results of the surveys to be verified while they were in progress; this functionality helped to determine the degree of progress. Data from the platform was exported to Microsoft Excel. Statistical analyses were then carried out using the IBM SPSS Statistics version 27 package for primary data analysis techniques. In order to determine the variables to measure the expectations of medical students, an Exploratory Factor

Analysis (EFA) was performed using the principal axis method with Varimax rotation and Kaiser normalisation. The data was then analysed using descriptive statistics.

Results

Characteristics of respondents

The survey of medical students involved 408 respondents from all over Poland. Preliminary characterisation of the respondents allows us to understand their structure and design more advanced analyses. The study group consisted of 315 women and 93 men.

One intuitively thinks of youth When considering studies and students in terms of age. However, the category of youth is no longer clear-cut. The phenomena of pluralisation and hybridisation of age categories in society make it difficult to define the point at which a person ceases to be counted as a youth and becomes an adult (Szafraniec, 2012). In the case of students, there are no definitional problems with the lower age limit. It has been shaped by the so-called traditional pathway to higher education. Any person who has completed secondary school and passed the matura examinations (i.e. usually 18-19 years of age) can become a medical student. For the upper age limit, the situation is no longer so clear-cut. Therefore, a maximum value for the age variable has not been assumed, as medical studies can be undertaken regardless of how old one is. Table 1 includes statistics for the age variable.

Table 1.
Age of students - number, mean, median, dominant, minimum, maximum, standard deviation

Variable	N	M	Me	Mo	Min	Maks	SD
Age	408	22.24	21.00	19	18	51	5.325

N – number, M – mean, Me – median, Mo – modal (dominant), Min – minimum value, Max – maximum value, SD – standard deviation.

The average age of respondents was 22 years. The mean is affected by extremely large values. The median (also known as the 50th percentile) - that is, the value where half of the observations have a value less than it and the other half have values greater than it - is 21 years. In this situation, the survey is based on an even number of observations, so the median is the average of the two middle observations in the sample sorted in ascending order. It should be noted that the value of the mean and median differ slightly, so the age variable takes on maximum extreme values that affect the mean.

The dominant or most frequent value (as many as 103 times among all students) was age 19. The youngest respondents were 18, and the oldest was 51. The standard deviation of the age variable was 5.325.

The survey questionnaire addressed to medical students contained four possible fields of study and an open-ended answer - other. A pie chart (Figure 1) is shown below, together with the percentage structure indicators, showing what percentage of those with the characteristic under consideration are in the entire study group.

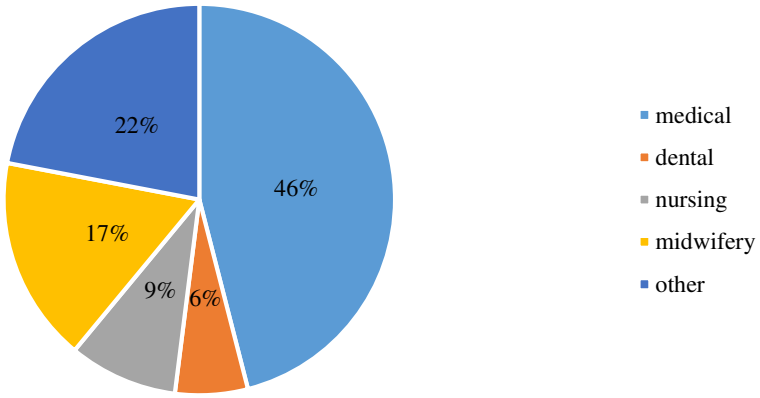

Figure 1. Respondents' fields of study.

Students of medicine-based programmes - doctors (46%) and doctors-dentists (6%) - were the dominant group. Nursing and midwifery students made up a total of 26% of all respondents. In contrast, 22% of respondents reported that they were studying another medical subject.

The survey was conducted among students from all over Poland. Respondents were asked to indicate where they grew up (rural or urban), the number of inhabitants in the locality in which they were studying, their mode of study and whether there were persons who could be considered representatives of the medical profession among their immediate family members. Respondents were also asked about their preferences with regard to the type and form of ownership of the medical entity in which they would like to work in the future and their professional activity (Table 2).

Table 2.
Characteristics of respondents

Variables		**Frequency (N)**	**Percentage (%)**
The number of inhabitants in the town where the university is located	Less than 50 000 inhabitants	37	9.1
	50 000-100 000 inhabitants	24	5.9
	100 000-500 000 inhabitants	168	41.2
	Over 500 000 inhabitants	179	43.9
	Total	408	100.0
Background	Rural	148	36.3
	Urban	260	63.7
	Total	408	100.0
Medical professionals in the immediate family of respondents	Yes	118	28.9
	Not	290	71.1
	Total	408	100.0
Mode of study	Full-time	371	90.9
	Part-time	37	9.1
	Total	408	100.0

Cont. table 2.

Preference for a type of treatment provider	Primary healthcare facility	45	110
	Outpatient specialised care facility	30	7.4
	Dental facility	31	7.6
	Hospital	277	67.9
	Health care facility, nursing and care facility, therapeutic rehabilitation facility, hospice	25	6.1
	Total	408	100.0
Preferences regarding the form of ownership of the treatment entity	Public healthcare entity	161	39.5
	Non-public healthcare provider	157	38.5
	Individual medical practices (doctors, nurses, midwives)	54	13.2
	Group medical practices (doctors, nurses, midwives) in the form of a civil law partnership or partnership	36	8.8
	Total	408	100.0

The medical institutions of higher education attended by the respondents were located in large agglomerations of more than 500 000 inhabitants (43.9%) and cities of 100 000-500 000 inhabitants (41.2%). Residents of cities (63.7%) were more likely to choose to study medicine than those from rural areas (36.3%).

Students were also asked whether there were any people among their immediate family members who could be considered to be medical professionals. More than 70% of the students surveyed did not confirm that there were medical professionals among their immediate family members.

The next variable to be analysed is the mode of study. Respondents studying full-time were the dominant group (90.9%). Those studying part-time accounted for 9.1% of all respondents.

The medical students also presented their preferences with regard to the type and form of ownership of the healthcare entity where they would like to work in the future. The majority of respondents would like to work in hospitals in the future (277 people, or 67.9% of all students). The least number of students (6.1%) preferred to be employed in healthcare facilities, nursing and care facilities, therapeutic rehabilitation facilities and hospices. In terms of the preferred form of ownership of a medical entity, the largest group were students wanting to work in public medical entities (161 people); however, this was only 39.5% of the respondents. Only 1% fewer respondents wanted to work in non-public healthcare entities (which is 157 people). Within individual medical, nursing and midwifery practices, 13.2% of respondents wanted to pursue their careers, and in group medical practices in the form of a civil law partnership or partnership, 8.8% of respondents.

Students were also asked about their professional activities. Respondents were given a choice of four options: working in the healthcare system, working outside the healthcare system, not working and looking for work, and not working and not looking for work. A summary of the student's responses regarding their current professional activity and the preferred form of ownership of the healthcare provider they would like to work for is presented in Table 3.

Table 3.
Relationship between the form of ownership of the health care entity where students would like to work and their current work activity

Variables		Ownership of the healthcare entity where students would like to work				
		Public healthcare entity	**Non-public healthcare provider**	**Individual medical practices**	**Group medical practices**	**Total**
Professional activity	I work in the healthcare system	24	19	4	7	54
	I work outside the healthcare system	19	25	7	5	56
	I am not working, and I am looking for a job	12	18	6	2	38
	I am not working, and I am looking for a job	106	95	37	22	260
	Total	161	157	54	36	408

The predominant group were students who were not working and were not looking for work (260 people, or 63.7% of all respondents). The survey shows that the decision to take up any casual work while studying is not a simple one. Only 27% of the total group decided to combine their medical studies with a job (of which 13.2% of the respondents were already working in the healthcare system (54 people), and 13.7% were working outside the healthcare system (56 people), while 9.3% of all respondents were not yet working but showed a desire to work during their studies (38 people).

Data was obtained on the inflow of medical students to healthcare entities in the future. The largest subgroup of students wishing to work in public healthcare facilities in the future (26% of all respondents) were students who were not economically active and did not plan to look for a job during their studies. If they do as declared, they will join the ranks of employees in public facilities, but most likely only after graduation, as they are not currently planning to combine study with work. In this situation, ambitious student has the opportunity to devote themselves fully to furthering their knowledge, so this will be an invaluable gain for their future employer, but they will nevertheless have to wait longer. This group will not make up for the pressing staff shortages of public healthcare providers in the short term (the only exception may be students above the fifth year of study).

In the near future, people who are not currently working but are looking for a job (unfortunately, this is only 2.9% of all respondents) may start working in public healthcare institutions. Taking into account their preferences regarding the form of ownership of the facility in which they would like to work - it can be assumed that, given the choice of working in different facilities, they will choose the public ones.

Measurement of medical students' expectations

In order to establish variables to measure medical students' expectations, an Exploratory Factor Analysis (EFA) was performed using the principal axis method with Varimax rotation with Kaiser normalisation. Initially, all variables relating to medical students' expectations and needs were entered. The adequacy of sampling was checked using the Kaiser-Mayer-Olkin (KMO) coefficient. Its formula takes the form (Kaiser, 1974):

$$KMO = \frac{\sum_j \sum_{h \neq j} r_{jh}^2}{\sum_j \sum_{h \neq j} r_{jh}^2 + \sum_j \sum_{h \neq j} \hat{r}_{jh}^2}$$

where:

r_{jh} is the correlation coefficient between variables numbered j and h,

$\hat{r}_{jh}^2$ is the partial correlation coefficient between them.

This coefficient takes values in the range [0,1]. The higher the value of the coefficient, the stronger the basis for using factor analysis in assessing the relationships between the observed variables. H.F. Kaiser (1974) proposed the following breakdown of KMO: 0.9 - very high, 0.8 - high, 0.7 - medium, 0.6 - moderate, 0.5 - very low. Values lower than 0.7 may suggest the need to remove some of the variables (Rozmus, 2018). Some researchers believe that this indicator should take a value higher than 0.5 (Staniec, 2015).

The KMO measure of sampling adequacy is at a satisfactory level with a value of 0.842 (Sztemberg-Lewandowska, 2008), and Bartlett's test of sphericity is statistically significant: $\chi 2(153) = 1846.34$; $p < 0.001$. This indicates the validity of conducting a factor analysis (Bartlett, 1950). The analysis made it possible to identify four factors, explaining a total of 50.19% of the variance. The first factor explained 27.20% of the variance, the second 8.95%, the third 8.24% and the fourth 5.80%. The extraction of factors was carried out on the basis of both eigenvalues (>1.0) and the scatter plot (Kowalska-Musiał, 2013). According to the Cattell test criterion, four factors should also be selected. In the next part of the analysis, the values of the factor loadings were verified after applying the rotation. Factor 4 was formed only from one item. Furthermore, another item in no factor reaches a charge value greater than 0.30. Therefore, it was decided to abandon the 4-factor structure in favour of a 3-factor structure.

In the next step, items with a charge value of less than 0.40 were excluded from the analysis (six items). The KMO measure was again at the appropriate level: 0.833; as well as the desired Bartlett's sphericity test results were obtained: $\chi 2(66) = 1393.75$; $p < 0.001$. Results based on eigenvalues (<1.0) indicate a 3-factor structure. In addition, the scatterplot (Figure 2), as well as the factor charge values (Table 4), are presented.

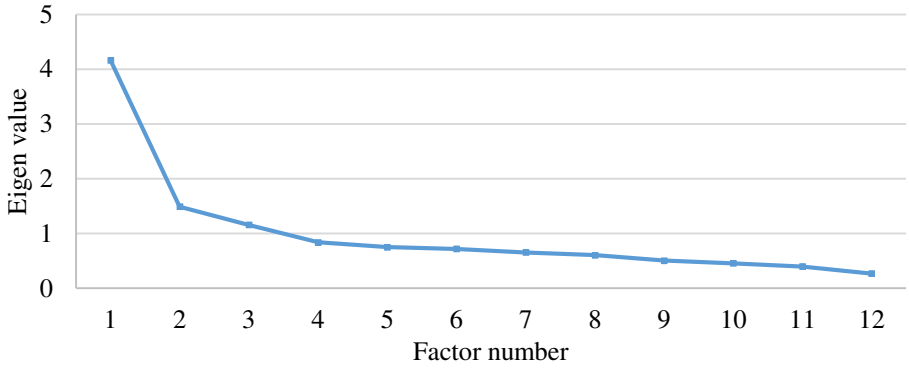

Figure 2. Scatter plot for variables relating to medical students' expectations and needs.

As it turns out, the entire 3-factor model explains 56.76% of the variance. This is sufficient in identifying the latent construct. Reliability methods are only applied after assessing unidimensionality. In this case, Cronbach's alpha coefficient was determined, indicating whether the way the individual questions were answered was consistent (Carmines, Zeller, 1979). It measures the ratio of the variance of individual items to the variance of the entire scale (the sum of these items):

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} S_i^2}{S_\Sigma^2}\right)$$

where:

k - number of items,

S_i^2 - variance of the i-th item,

S_Σ^2 - variance of the whole scale (sum of all items).

Reliability describes the accuracy with which a factor (dimension) measures what it measures. High-scale reliability is indicated by values of this factor greater than 0.7 (Carmines, Zeller, 1979). The level of reliability for all analysed dimensions is at an acceptable level (Table 4). The reliability level for the dimension 'Expected motivators' is lower than for the other two dimensions but takes a value above 0.7.

Table 4.

Factor charge values for the three-factor solution for "Expectations and needs of medical students"

Variables	**Factor**		
	Development needs	**Organisational expectations**	**Expected motivators**
My future employer should have learning and development programmes that aim to develop talent	0.816		
The employer should organise training to develop competences	0.793		
The healthcare entity should offer the opportunity to apply for funding to improve professional skills	0.524		
The employer should provide opportunities for advancement	0.439		
There should be a friendly atmosphere in the workplace.		0.691	

Cont. table 4.

Terms and conditions of employment should allow for a work-life balance.		0.662	
Managers should create a professional climate in which medical staff are shown respect.		0.639	
Remuneration should be commensurate with the duties and responsibilities performed.			0.537
Remuneration should be commensurate with qualifications and training acquired.			0.511
The employer should recognise the commitment of employees and praise them for their successes.			0.478
Remuneration should be linked to employee performance.			0.452
The facility should have a reputation for caring about the quality of its medical services.			0.440
% of explained variance	34.71%	12.42%	9.63%
Cronbach's α	0.77	0.75	0.72

Method of extracting factors - Main factor.
Rotation method - Varimax with Kaiser normalisation.

A high level of reliability of the scale was noted (Cronbach's alpha index values $\alpha > 0.70$) (Hair, 2013). Factor analysis showed that there were three dimensions to be distinguished in the questionnaire of the surveyed medical students' needs and expectations: developmental needs (1), organisational expectations (2), and expected motivators (3). Eighteen statements were analysed.

Analysis of medical students' expectations

The responses of future doctors, nurses, midwives and other interviewees expressing their developmental, organisational and motivational expectations of future employers are shown in Table 5 and Figure 3.

Table 5.
Expectations of medical students surveyed towards future employers

Construct	Variables		Mean	Standard Deviation
Development needs	DN1	The healthcare entity should offer the opportunity to apply for funding to improve professional skills	4.72	0.613
	DN2	The employer should organise training to develop competences	4.66	0.642
	DN3	My future employer should have learning and development programmes that aim to develop talent	4.38	0.853
	DN4	The employer should provide opportunities for advancement	4.70	0.611
Expected motivators	EM1	The employer should recognise the commitment of employees and praise them for their successes	4.73	0.557
	EM2	The facility should have a reputation for caring about the quality of its medical services	4.79	0.492
	EM3	Remuneration should be commensurate with the duties and responsibilities performed	4.84	0.467
	EM4	Remuneration should be linked to employee performance	4.23	0.944
	EM5	Remuneration should be commensurate with qualifications and training acquired	4.58	0.679

Cont. table 5.

	EM6	There should be a fair staff remuneration policy in the healthcare entity*	4.73	0.635
	EM7	The employer should provide attractive financial benefits (e.g. company housing, additional medical care, additional pension insurance)*	4.06	1.009
	EM8	I expect job security from my future employer*	4.73	0.585
	EM9	My workstation should be equipped with modern equipment*	4.67	0.575
	EM10	Remuneration of medical staff should depend on the length of service*	3.44	1.142
Organisational expectations	OE1	There should be a friendly atmosphere in the workplace	4.89	0.423
	OE2	Terms and conditions of employment should allow for a work-life balance	4.84	0.504
	OE3	Managers should create a professional climate in which medical staff are shown respect	4.84	0.426
	OE4	The organisation should have a flexible working time system*	4.07	0.880

* variable excluded from the model (based on the factor analysis performed).

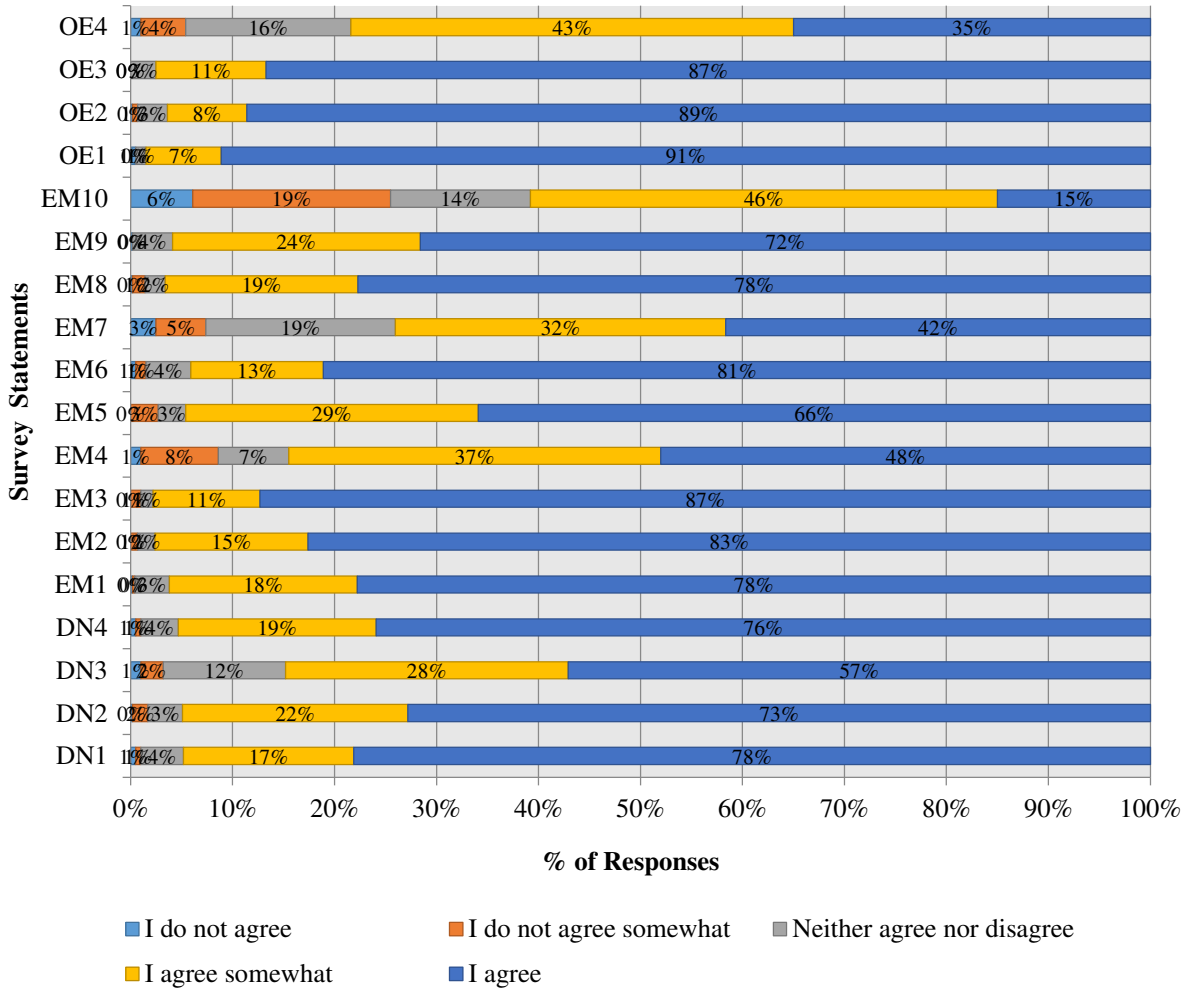

Figure 3. Distribution of survey responses.

The development expectations of medical students are related to the first dimension. The survey questionnaire verified their attitudes towards training provided by the employer, promotion opportunities, learning and development programmes offered, and the possibility of applying for funding to improve their professional qualifications.

The majority of medical students (78.2%) had very high expectations of the financial support they thought the healthcare facility should provide to its employees for the improvement of their professional qualifications (DN1: M = 4.72; SD = 0.613), and 16.7% of respondents partially agreed with the statement that the facility should offer the possibility to apply for funding for the improvement of professional qualifications. About 1% of the students completely or partially disagreed with this statement, and 4.2% of the respondents did not want to take a position on this issue. According to 72.8% of the students, the employer should organise competence development training. 22.1% of the respondents partially agreed with this statement (DN2: M = 4.66; SD = 0.642). Approximately 5.1% of the students thought that the healthcare entity did not need to provide staff training or had no opinion on the subject. The mean and standard deviation for the next variable (DN4: M = 4.70; SD = 0.611) were similar to those for DN1. In the opinion of 76% of medical students, there should be an opportunity for career advancement within the structures of the medical entity (DN4).

In contrast, 19.4% of the respondents were of the opinion that the employer should rather provide the opportunity for promotion. It was very important for 57.1% of the students surveyed and rather important for 27.7% of the respondents (DN3) that healthcare entities have learning and development programmes to develop talent. About 12% of the respondents did not respond to this statement (M = 4.38; SD = 0.853).

The second dimension presents what motivators medical students expect from their future employers. The questionnaire makes it possible to examine the respondents' attitudes to: the need to appreciate commitment and praise for success; motivation in the form of working in an organisation with a reputation for the quality of medical services provided; adjustment of remuneration to duties and responsibilities performed and qualifications and education obtained, or to link them to the effectiveness of the employee. The survey showed that the majority (77.7%) of the students believed that the employer should value the commitment of employees and praise them for their successes (EM1: M =4.73; SD = 0.557). This view was partially shared by 18.4% of the respondents. For 82.6% of respondents, it was very important whether the facility where they were considering working had a reputation for caring about the quality of services provided (EM2: M = 4.79; SD = 0.492), and 15% of respondents partially agreed with the statement that a healthcare entity should have a good reputation for them to want to work there. The majority of respondents (87.3%) believed that the remuneration should be adequate for the duties and responsibilities performed, and 10.5% of respondents were of the opinion that such a relationship should rather exist (EM3: M = 4.84; SD = 0.467). Those surveyed responded as to whether they thought remuneration should be linked to employee performance (EM4: M = 4.23; SD = 0.944). This expectation was completely

confirmed by 48% of medical students and partially confirmed by 36.5% of respondents. 1% of the students would not like to encounter such a relationship with their future employer. 65.9% of the students completely agreed with the statement that the salary should be adapted to the qualifications and education acquired (EM5: M = 4.58; SD = 0.679). This view was partially shared by 28.7% of the respondents. The majority of students (81.1%) believed that there should be fair remuneration rules in the healthcare entity where they would like to work, while 13% of respondents partially agreed with this opinion (EM6: M = 4.73; SD = 0.635). According to 41.7% of the respondents, the employer should provide attractive benefits to employees such as for example, company housing, extra medical care or extra pension insurance (EM7: M = 4.06; SD = 1.009). 32.4% of respondents partially agreed with this statement. Some 7.4% of students did not feel the need to receive motivators in this form. Job permanence is very important for 77.7% of medical students and somewhat important for 18.9% of the respondents (EM8: M = 4.73; SD = 0.585), and 1.4% of the respondents did not expect their future employer to ensure that they would establish a long-term relationship with them. A condition that should be fulfilled by the employer in order for medical students to find the job offer with them very attractive is that the workstations should be equipped with modern equipment (EM9). 71.6% of respondents fully agreed with this statement, while 24.3% of respondents partially agreed. None of the medical students surveyed stated that equipping their future workstations with modern equipment was unnecessary (representing M = 4.67; SD = 0.575). Approximately 15% of the respondents believed that the salary of medical staff should depend on their seniority (EM10: M = 3.44; SD = 1.142). The majority of respondents (45.8%) partially agreed with this statement. A group representing 25.5% of respondents was against this (of which 6.1% categorically denied this dependence).

The third dimension identifies the expectations of medical students with regard to the organisation of healthcare entities: the atmosphere in the workplace, the work-life balance, and the atmosphere created by managers. The survey shows that, according to the majority of students (91.2%), there should be a friendly atmosphere at the workplace (OE1). This statement was partially agreed with by 7.4% of the respondents (M = 4.89; SD = 0.423). The respondents responded to the statement about whether the employment conditions should allow for a work-life balance. This was fully confirmed by 88.5% of respondents and partially confirmed by 7.8% (OE2: M = 4.84; SD = 0.504). The majority of medical students (86.8%) surveyed believed that managers should create a professional atmosphere in which respect is shown to medical staff (OE3). About 11% of the surveyed students partially agreed with this statement (M = 4.84; SD = 0.426). According to 35% of the students surveyed, there should be flexible working hours at the institution where they would like to work (OE4). The largest group of respondents (43.4%) partially agreed with this statement. 16.2% of the respondents did not respond to this statement (M = 4.07; SD = 0.880).

Discussion

The aim of this study was to identify medical students' plans, needs and expectations towards future employers (healthcare entities) in Poland. This survey shows that medical students representing the upcoming generation of doctors are most interested in working in a hospital (68%). The great interest in working in hospitals may be due to the fact that in order to obtain the right to practice medicine, medical graduates must, among others: complete a 13-month internship in hospitals on the basis of an employment contract. The conducted research showed that a high number of students want to work for the public sector (40 %), but the majority of them prefer employment in non-public and private entities (medical practice) (60%). This may be due to the expectation of higher income from unpublic employers. A study conducted on a group of Polish students in the first decade of the 21st century showed that preferences regarding the place of employment depend on the study period (Gąsiorowski et al., 2015). The results then showed that half of the first-year students and most of the graduates expected to work in hospital conditions. More than 40% of first-year students then said they did not know their preferences, and those who did most preferred working in the private sector. On the other hand, all the last-year students who answered indicated their preferences, and the majority expected to work in the public sector or in the public and private sectors. According to the authors, the shift in preferences between the first and the last year of studies towards favouring work in the public sector seems to correspond with the greater attention that the students of the sixth form pay to job safety. This can be taken as an indication that graduates are genuinely concerned about finding a secure employment option. This may also indicate that students who prefer future work in the public sector are slightly more socially minded.

The results of studies conducted in other countries in this area have been inconsistent. For example, students in Germany preferred working in the public sector over the private sector (Gibis et al., 2012), while more students in South Africa chose the private sector (De Vries et al., 2010). On the other hand, most students from African countries preferred to combine work in the private and public sectors (Ferrinho et al., 2010, 2011; Fronteira et al., 2011).

Medical students seem to know that they will be needed in the public sector and that this is an opportunity to contribute to the public good. On the other hand, however, their expectations in order to improve their earnings require combining practice in the public sector with private medical work. For example, the income expectations of students from African countries amounted to 2-3 times the average salary per month (Ferrinho et al., 1998). In terms of income, also surveys of students in other countries (Angola, Guinea-Bissau and Mozambique) (Ferrinho et al., 2011) showed that most students would like to earn well above the income offered by public sector jobs, creating a context that encourages overlap between public and private practice. Salary expectations are, therefore, highly inflated, suggesting that new doctors will seek other sources of income to supplement their salaries in the public sector (Ferrinho et al.,

2011). Health systems should therefore be prepared for dual practices (in the public and private sectors), which should be regulated (Ferrinho et al., 1998).

The survey also reflected the general trend of women making up a higher percentage of doctors than before (77%). The higher proportion of women reflects the increasing representation of women in medicine (Adams, 2010). The feminisation of students is an important issue that affects career choices in other countries as well (Dorsey et al., 2005; Ferrinho et al., 2015; Fukuda, Harada, 2010; Lambert, Holmboe, 2005). As in other studies worldwide, a small proportion of students (37.5%) came from rural areas (Kruk et al., 2010; Shankar, Thapa, 2012). Almost one-third of respondents have representatives of medical professions in their immediate family. As in the case of other studies, relatives practising the medical profession significantly influence the choice of a medical profession (Ferrinho et al., 2015).

Researchers around the world agree that the motives for choosing medical studies are a combination of development needs supported by professional interests and ambitions, material and recognition needs (salary, perceived prestige of medical professions and social position), and on the other hand, the expected lifestyle and family needs (Gąsiorowski et al., 2015).

The study showed that such development needs and expectations of Polish medical students in relation to future employers are high. Most medical students have very high requirements for financial support that, in their opinion, a medical entity should provide to its employees as part of improving their professional qualifications. According to the majority of respondents, the employer should organise training to develop competencies. They also expect the possibility of professional advancement from the employer. The need for professional development of medical students has also been confirmed by research conducted in Iraq (Lafta et al., 2018). Meanwhile, the policy regarding developing medical staff in Poland is currently insufficient and inadequate. There is no comprehensive, long-term strategy for training medical staff adapted to society's rapidly changing health needs, which may be dangerous for the Polish healthcare system (Domagała, Klich, 2018).

The organisational expectations of medical students are also very high. The vast majority of future medical employees expect a friendly atmosphere in the workplace (98.8%), employment conditions allowing for a balance between work and private life (95.9%), and a professional atmosphere and respect in the workplace (98.1%). Flexible working hours are of the least importance to them (80.8%).

The importance of the atmosphere in the workplace was also confirmed by research conducted among Iraqi students (Barnett-Vanes et al., 2016; Lafta et al., 2018). Students realise that a bad atmosphere causes mental exhaustion, weakening of personal security, anxiety and depression. Therefore, future Polish medical staff will be motivated by a friendly and professional working atmosphere. Still, they also emphasise the importance of a reasonable work-life balance as a key element in providing sustainable healthcare services, which aligns

with other researchers worldwide. For example, medical students in Norway highlight a good work-life balance as one of the main values in their future working life (Fimland et al., 2019). They expressed a strong motivation to become a doctor and concern for their professional future and development. They were prepared for several dilemmas, such as choosing between professional development and family time, as well as the fact that they will have to work a lot of overtime, which can be a problem in prioritising their needs. On the other hand, German students highly rated aspects such as flexible working hours, career prospects and work-life balance. Work-life balance was the most preferred item over all other expectations, followed by flexible working hours and career prospects (Baller et al., 2013).

Work-life balance and flexible working hours are highly important to students worldwide today. Interviews with Australian medical students showed that they placed great importance on their future family plans, the possibility of part-time work and the possibility of taking longer holidays (Tolhurst, Stewart, 2004). On the other hand, research conducted among Asian students showed the important role of the family in making decisions regarding the choice of place of employment (Draper, Louw, 2009). In studies conducted in Germany, the reconciliation of professional and family life was very important for both men and women, as evidenced, among others, by the increased interest in hired work in this country (Gibis et al., 2012). Other authors (Andlauer et al., 2012; Bickel, Brown, 2005; Sanfey et al., 2006) point to the generational shift in priorities among medical students. Today's students, regardless of gender, seem to pay more attention to work-life balance, spending time with family, friends and hobbies, which requires a more flexible approach to working life (Andlauer et al., 2012; Sanfey et al., 2006). Unable to achieve a work-life balance contributes to medical staff burnout (Suresh et al., 2020).

Swedish and Australian students also express concerns about how to reconcile a professional career with non-professional life (Johansson, Hamberg, 2009; Tolhurst, Stewart, 2004). A Scandinavian study showed that when students chose a career after medical school, work-life balance was important to them (Aasland et al., 2008). It was important to achieve balance by managing and negotiating the spheres of work and family and the boundaries between them. Most of these students were work-oriented but clarified that they wanted more out of life than work. In Sweden, 55% of doctors declare they are either too tired or have too little time for private life. Such conditions may contribute to the desire to maintain a work-life balance and the desire for a richer life among students. This would also explain why older students with more clinical experience focused more on family, leisure time, and quality of personal life than first-year students (Diderichsen et al., 2011). Most work-life balance studies identify two domains: home/family and work (Clark, 2000; Hakim, 2002). However, research from Sweden suggests that there is a third important domain: leisure time (Diderichsen et al., 2011). When work and family involve meeting other people's needs, physical activity, spending time with friends, and hobbies can meet personal needs. Therefore, Medical students are focused on work, but they intend to balance and negotiate the domain of work with the domain

of the home and the domain of recreation. This was particularly emphasised at the end of medical studies, suggesting that future doctors would emphasise the importance of family, free time and quality of personal life, but not at the expense of work. Perhaps when these three domains are balanced, "Quality of Personal Life" is achieved.

The smallest needs of the surveyed students were related to motivators in the future workplace. Here, the most important were remuneration adequate to the duties and responsibilities, a fair remuneration system, the opinion of a facility that cares about the quality of medical services, recognition of the employer (praise and a sense of appreciation), job safety, and modern equipment in the facility. The least important were remuneration depending on working time and material benefits.

Our results from the student survey confirm the research conducted in Iraq that emphasised the need for adequate remuneration for medical staff, material benefits and equipping the facility with modern equipment (Amin, Khoshnaw, 2003; Lafta et al., 2018; Squires et al., 2010). The salary was the lowest factor in job satisfaction here. However, it is generally not expected that new medical graduates will be strongly motivated to work in this system due to perceived insecurity by students. Financial motivators are the most important for Polish students. A different picture emerges from earlier research conducted in the 1980s among senior medical students, who said they viewed the physician's role from a more professional perspective, having more to do with alleviating suffering than with money, prestige and success (Powell et al., 1987).

The main advantages of our study were the large-scale nature of the study and representation from most medical universities throughout Poland. In addition, factor analysis allowed for the verification of the original tool for measuring medical students' developmental needs and expectations. Poland is still an under-researched country (Domagała, Klich, 2018), so the analysis presented in this article makes a theoretical contribution to the scarce literature on the labour market in the Polish healthcare system.

The article is not free from limitations. First of all, the factors influencing Polish medical students' developmental needs and expectations were not considered. Therefore, some issues raised in the article require a broader development, for example, the impact of socio-economic factors, year of study, and medical speciality on students' expectations. Investigating the factors behind students' decision-making would provide a better understanding of what drives their choices. In subsequent studies, it would also be worth taking into account humanitarian motives, e.g. the possibility of helping and caring for people, and scientific ones, taking into account the entire period of study (Draper, Louw, 2009; Gąsiorowski et al., 2015; Puljak et al., 2009). The earlier study conducted in Poland showed that among the five different expectations related to job security, high prestige and income, and further professional development, Polish students attributed the greatest importance to the perspective of performing socially important work (Gąsiorowski et al., 2015). It is unclear whether the humanitarian and scientific motives for studying medicine remain constant throughout the study (Draper, Louw, 2009) or decrease

significantly (Puljak et al., 2009). Earlier exploratory research conducted among Polish students showed that the most frequently indicated motives for choosing medical studies were internal motives, such as the desire to help others and interest in medical subjects and issues. However, the frequency of such motivators was higher among first-year students than graduates (Gąsiorowski et al., 2015). It would also be worthwhile to carry out an international comparison in this area.

Summary

The shortage of doctors in certain specialities is becoming one of the most important reasons for limited access to health care. The key challenge is implementing a holistic, systemic approach to planning medical staff based on strategic principles and practices and using tested models and tools. The lack of such a mechanism results in increased workload and doctors' dissatisfaction with working and employment conditions.

Our research has revealed that Polish medical students have high development needs and organisational expectations. First, they expect support from future employers to meet the challenge of balancing private life and a medical career. Perhaps today's medical students intend to "work to live" rather than "live to work." This trend towards a more controlled lifestyle may react to today's physicians' heavy workload. These results indicate the need for continuous research into the possibilities of improving work-life balance in the medical profession. Today's medical students want more out of life than work. The medical profession is known for its long hours and heavy workload. These professional attitudes and values among future physicians pose a challenge to the planning of medical professions. Part-time work can be one way to achieve a work-life balance. However, we suggest that it is important for policymakers and healthcare planners to plan for full-time work that also provides time for family and recreational activities. Interestingly, despite sociocultural differences and different educational traditions, Polish medical students' developmental needs, motivations, and professional expectations are essentially similar to those reported in various international samples of medical students.

Our data can guide future labour market trends in the healthcare system. The transformational planning of this labour market must be tailored to the needs of future healthcare workers to counteract the erosion of the workforce of healthcare systems. The high development needs of medical students indicate that their future workplaces should be properly structured and support trainees' learning. A holistic, systemic approach to planning human resources in the health service should be implemented, based on an effective system for monitoring professional development (including diploma and postgraduate training) and the structure of employment in the Polish health care system, taking into account the needs of the new generation of students. One of the most urgent actions should be to retain medical staff,

including improving working conditions (e.g. remuneration, workload) and facilitating career paths (e.g. specialisation and professional development) so that medical staff educated and trained in the country also choose to work in Poland. We also suggest that discussions about work-life balance should be included in the curricula of medical schools.

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SILESIAN UNIVERSITY OF TECHNOLOGYPUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIESNO. 177

HETEROGENIC IMPACT OF ARTIFICIAL INTELLIGENCE ON WORK AND PROFESSIONAL STABILITY

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Purpose: The purpose of this paper is to analyse the impact of new technology like Artificial Intelligence (AI) on human-work system functioning in the context of quantitative changes (mainly the reduction of the employment level) as well as the qualitative ones (work stability, remuneration changes, change of competence profile.
Design/methodology/approach: It is an opinion-forming paper. It is an attempt to interpret the dependencies between the level of AI adoption by contemporary organisations and changes occurring in the conditions of highly-digitalised working environment.
The research problem analysed in this paper regards the impact of AI technology on work process changing the conditions of working environment in the aspect of mental and social dangers. The paper presents the literature overview in this scope with the use of the results of secondary empirical research describing the analysed issue.
Findings: The considerations presented in the article show that the picture of advantages and disadvantages connected with the greater and greater use of AI in the workplace and its impact of the conditions of working environment is complex and varied. The implementation of modern technologies such as AI in current organisations creates more productive workplaces. However, from the employee point of view, it may be a reason for serious worries referring to the adaptation processes to the new conditions of working environment. Thus, the key issue comprises the elimination or minimising the disturbances in employment and problems accompanying them and mental and social threats (changes in the load of work process, technostress, workers' anxiety and fears, changes in remuneration and work time) which may contribute to the worsening of health condition and ability to work.
Originality/value: The paper is a theoretical contribution to the issues of the impact of AI technology on work process. It was shown that the use of AI is not only optional any more, it is an indispensable ingredient of creating the competitive position of an organisation. The employees will not avoid the necessity to adapt to the changing composition of tasks, to new conditions of technologized working environment, to the mobility between positions at the labour market and to the effective use of AI. The actions of entrepreneurs, decision-makers, engineers and scientists should be applied to help the employees in these processes in order to redesign the tasks, positions and conditions of working environment properly.

The work is original due to the multi-aspect approach to the scientific issues and the obtained results may be useful both for the management practitioners and be the inspiration for further research.

Keywords: Artificial Intelligence, AI adoption, conditions of working environment, technological unemployment.

Category of the paper: general overview, point of view.

1. Introduction

The labour market is regularly disturbed by the technological development. At present, Artificial Intelligence (AI) is one of the innovative technologies changing the professional life. The disturbances in employing and dismissing the workers are the key aspect of many future scenarios connected with the use of AI (Boucher, 2019; Georgieff, Hyee, 2021, p. 8; Bordot, 2022). AI, developing intensively in the global scale, affects the employment, economy and society more and more (Świątkowski, 2021, p. 114). Automation based on AI will probably cause that many tasks (and as a result many present professions) will be unnecessary and the serious problem of technological unemployment will occur (Polityka dla rozwoju…, p. 14; Servoz, 2019). Its full macroeconomic effect[1] will depend on the fact whether new work places will be created in the companies introducing AI – both as a result of creating new professions or as a support of production growth (Bughin, 2017).

However, there are reasons to think that the impact of AI on employment may be different than in the case of previous waves of technological progress. Even if AI automatises non-standard and cognitive tasks, it does not necessary mean that it will replace workers. The effects of workers' employment are ex-ante inconclusive. On the one hand, the employment may fall with the task automation (substitution effect). On the other hand, higher work efficiency and lower production costs may increase production if the demand for goods/services is sufficient (productivity effect) (Georgiedd, Hyee, 2021, p. 8), however, Malik et al. (2021) notice that AI technology may increase the workers' productivity to a certain level and then it only causes the technical overload and so-called technostress. AI may mobilise the workers to work non-stop even in the time when they should rest, spend time with family and do other tasks. Apart from employment, the use of AI in more and more companies may also affect the workers' remuneration and the workers' approach to work in many ways and their mental

[1] Work overload, role ambiguity, infringement of privacy, work-home conflict, work dynamism and insecurity affect the workers' mental safety which increases technostress additionally. Also the lack of face-to-face interactions with other workers is also a negative factor and may cause serious stress for workers. Moreover, workers feel endangered to lose their work for the benefit of other people who understand new technologies better (Malik et al., 2021).

condition[2] which determine: work satisfaction, stress and health (Yamamoto, 2019; Acemoglu, Restrepo, 2017, p. 35).

Thus, the impact of AI on work and professional stability is heterogenous. It also depends on, among others, company branch, level of the workers' education, their gender and age. In the wider aspect, as Li Yan-ping and Qi Ai-qin (2022) notice, the influence on AI on the labour market is far-fetching, complex and cannot be summarised in simple categories as "positive" or "negative". The question how AI will affect work and professional stability is the main question referring to the work future with the potentially significant implications for workplaces, efficiency and wellbeing of workers. It is also interesting to determine how workers adapt to the reality in which they face AI (Milanez, 2023).

2. AI technology and current work places

AI technology has existed since 1950s. Unlike the industrial revolution, the revolution connected with the introduction of AI consists in not only increase in the human physical strength thanks to machines but also the mental strength. Andrew Ng (2017) specified AI as "the new electricity" which will change every sector of the economy[3].

AI can be defined as the machine ability to solve the problem itself, without the use of previously designed operation algorithm prepared by the man (Walczak-Duraj, 2019, p. 106). It is also defined as the system which shows intelligent behaviour by analysing its surroundings and taking actions – with some autonomy – in order to achieve specified goals (A definition of AI…, 2020). AI is the result of using cognitive techniques to create something artificial which performs the tasks which may be performed by people – such as reasoning, natural communication and solving problems[4]. It is important because it may help people to perform cognitive tasks (mental and cognitive ones) better and automate tasks which are difficult or impossible to perform for people now (The Impact of Artificial Intelligence on the Future …, 2022, p. 5). When it comes to employment, AI may support workers in some tasks and replace them in others offering them profits in a way of productivity growth and potentially creating new work places (Boucher, 2020).

[2] Bughin (2017) claims that at present AI is in the era of "the new spring" and it may result in the growth of productivity and company profits and the employment dynamics does not have to be so bad as some economists expect. The companies introducing AI are also the ones which strive to increase the employment – especially the ones which use AI as the way of innovations and production.

[3] Taking the functional approach to AI, it is possible to distinguing the following technologies which it comprises: image recognition, natural language processing, virtual assistants, intelligent robotics and autonomous vehicles which are based on the algorithms of machine learning of new generation.

[4] The high-tech, telecommunication, motor, media and financial companies are dominant in the area of AI applications. Such companies are both more digitalised and also expect high future demand for AI business models, products and services. The analysis on the level of companies confirms the correlation between digital maturity and AI adoption and between profit expectations and AI adoption pace.

Pentland et al. (2019) claim that "future strategic advantage[5] depends on the ability to use AI such as machine learning, computer vision and autonomic systems and integrating them with workers to create symbiotic systems human-machine".

The digital transformation process of companies by AI introducing will probably lead to creating new work places which would never exist without AI (The Impact of Artificial Intelligence on the Future …, 2022, p. 42). The AI tools may bring a lot of profits but also need the improvement of workers' technical skills to implement them properly (Arora, Siradhana, 2022).

Many economists claim that there will be people who will suffer due to the decrease in demand for their skills[6]. It may lead to longer unemployment periods and greater need of workers' retraining. Such jobs may also appear which workers will not want to perform. Older workers have greater difficulties to retrain, "to start everything from the beginning" and complain about technological status which may degrade them in the professional status and remuneration (Stevenson, 2019, p. 191). Thus, the introduction of AI may have a negative impact on the work quality of employees, which causes challenges concerning the lack of employment stability, income changes and non-standard working conditions[7].

Nurski and Hoffman (2022) emphasise the necessity to minimise the negative consequences of AI introduction towards workers. At first, they pay attention to maintaining the good quality of workers' job – among others positive workers' wellbeing (including physical and mental health), honest employment conditions, supporting and constructive social relations with superiors and co-workers.

Stevenson (2019, p. 191) claims the failure to distinguish the short- and long-term effects of AI implementation is one of the misunderstandings referring to the fact what will happen with employment and unemployment as a result of using AI in companies[8]. Whereas the way how the disturbances in employment and how human resource management will look like during these changes is regarded as the real uncertainty connected with AI. The transformation

[5] AI changes the labour market introducing new challenges concerning the abilities for future workers. It is important not to exclude women from the growing demand for specialists in the area of STEM/AI (Science, Technology, Engineering and Mathematics – STEM/AI) in this process. Multi-dimensional aspects connected with various labour markets, economies, culture and norms concerning worker's gender should be considered at designing and introducing AI systems (UNESCO…, 2022, p. 9).

[6] The unemployment (including this caused by introducing the AI technologies) is becoming one of the main economic but also social and political problems. One of the suggestions minimising the negative unemployment effects is the idea of so called universal basic income (UBI) which would provide decent life to everybody independently of the fact whether he has work or not (Rąb, K., Rąb, Ł., 2016; Niedbał, 2018; Goolsbee, 2018; Furman, Seamans, 2019).

[7] The common use of AI may deepen the existing inequalities if it works without regulations. It will contribute to the polarisation of labour market and incomes. Although this process brings potential benefits for qualified workers, it puts some groups of population (including women and older employees) in adverse position (Deshpande et al., 2021, p. 29; Li Yan-Ping, Qi Ai-Qin, 2022).

[8] According to Mutascu (2021) there is a positive impact of AI on employment but only to some level conditioned with the level of inflation. The further impact of becomes neutral after excessing this level which proves the non-linear connection. According to him, AI facilitates the reduction of unemployment but only with low inflation rates.

to the economy more dominated by AI will eliminate the positions of low-qualified workers significantly. Jobs which require the performance of really repetitive tasks are more endangered on change. As a consequence, the majority of positions created as a result of AI introduction will require upskilling and reskilling of work force. However, AI may also play an important role in helping future work searchers to find new employment possibilities (The Impact of Artificial Intelligence on Unemployment, 2022). Whereas, when it comes to highly-qualified workers[9] and professions requiring creativity and social and technological competences, their situation will improve clearly. Thus, the dualism of labour market will increase not only when it comes to income but also in the forms of employment or its security and stability (Ćwiek et al., 2021, p. 79; Fossen, Sorgner, 2019).

In 2021 the national strategy "Policy for the development of artificial intelligence in Poland since 2020" was announced in Poland. It emphasises that "as much as 49% of working time in Poland may be automated with the use of existing technologies". Such forecasts generate the need of creating adequate tools of fighting technological unemployment[10]. These challenges are in particular directed to the educational system with the consideration of life-long learning (Symela, Stępnikowski, 2021, p. 21). Within a decade AI will replace about one third of existing work places all over the world whereas, these changes will affect the United States (up to 40%) and Japan (50%) the most. However, according to OECD AI Policy Observatory, AI will create more work places than eliminate. The companies which pioneer in AI development and scaling have not reduced any work places in the net approach so far. According to OECD AI Policy Observatory, there are no signs that this tendency will not continue in the assumed future (Przegalińska 2022, p. 13).

[9] Felten et al. (2019), doing research on AI impact on employment and remuneration in the United States, did not notice any connection between AI and general employment. However, they found the positive AI impact on the remuneration growth (in professions requiring programme skills and in highly-paid professions), which suggests that the AI productivity effect may exceed the substitution effect.

[10] In 2017 European Economic and Social Committee (EESC) undertook to monitor the AI development in the European Union member states – not only in the production and technological zones but also in the matters of safety, ethics and society. EESC has no doubts that AI will affect the size of employment and the kind and type of many work places. The implementation of AI technologies may contribute to the situation that daily (eight-hour) and weekly (forty-hour) norms of currently binding working time will be reduced for the benefit of extended rest periods. AI may also contribute to the different approach of entrepreneurs, workers and trade unions in the processes of negotiating working conditions and work remunerations (Świątkowski, 2021, pp. 114-116).

3. Heterogenic impact of AI on the human – work system in the light of secondary empirical research

Within the project performed in the Research Institute of Science and Technology for Society – RISTEX of the Japan Science and Technology Agency, Yamamoto (2019) performed the analysis of the impact of new information technologies (IT) including AI on the workers' attitude to work and their wellbeing. The tendency which shows the growth of work-related stress is worrying. Many workers who experience the introduction of new IT feel stressed connected with the increase in task complexity (which in consequence may lead to the health worsening). The workers need to get new skills and knowledge to deal with new tasks. At the same time, the more complex the work, the greater feeling of job satisfaction.

The research performed by Bughin (2017) among the senior managerial staff from 3000 companies in 10 countries showed that about two thirds of them is AI aware. The examined companies were divided into three groups: (1) about 20% of them were the companies adopting AI (Adoption leaders – mainly introducing the technologies of machine learning or visual processing), (2) about 40% of companies started experimenting or were users of AI in small degree (Experimenters), (3) other 40% of examined companies did not experiment or introduce AI (the main reason for that was not the lack of faith in AI but commercial and technical abilities to implement AI). The number of companies expecting the employment reduction was similar amounting to 45% for companies adopting AI (Adoption Leaders) and 44% for companies experimenting or being the users in the low extent (Experimenters). However, the companies which implemented and use AI (Adoption Leaders) showed much higher willingness to increase employment (22%) in comparison to companies experimenting or being the users of AI in small extent (Experimenters) (6%) (Table 1).

The results of research carried out on the group of 7502 respondents were presented in the report "IBM's Global AI Adoption Index 2022". Each respondent needed to have significant influence or participation in taking decisions referring to IT in their company. According to the above report, 10 most numerous groups of AI users in modern companies comprise: IT specialists (54%), data engineers (35%), programmers and data analysts (29%), security specialists (26%), customer service specialists (25%), marketing specialists (23%), product managers (21%), sale specialists (21%), HR specialists (21%), finance specialists (21%). Over one third of respondents (35%) declared that they train and retrain employees to work with new software and AI tools. It is especially visible in bigger companies (IBM Watson, 2022).

Table 1.
Impact of AI adoption on workers' employment

Expected employment change	**Experimenters** (%) n = 1200 No technologies at scale	**Adoption leaders** (%) n = 600 1 technology or more at scale
It will increase our need for employees	6	22
It will not change our need for employees significantly	50	33
It will reduce our need for employees significantly in some areas	26	30
It will reduce our need for employees significantly	18	15

Source: prepared on the basis of Bughin (2017).

The research "The state of AI in 2022 – and a half decade in review" were conducted on the sample of 1,492 respondents and they showed that the most popular strategy when it comes to gathering new employees – AI talents is the so called "employees' reskilling" – i.e. the process of retraining or new training of employees to adapt their skills to new requirements. Almost half of the respondents (47%) answered in this way. Acquiring talents at technical universities (also 47%) and from technological companies (34.5%) took the following places (Chui et al.).

The research conducted by Malik et al. (2021) on the AI impact on employees in companies of Industry 4.0 showed that the phenomenon of technostress appears among employees. However, it is necessary to notice that "technostress" is a consequence of excessive and continuous use of any technology – not only AI. The quantitative research was conducted in a group of 32 workers who were experienced in work on implementation projects of Industry 4.0 in international companies. The most important effects of AI implementation in workplaces comprise: work overload (14%), job insecurity (12%) and job complexity (12%) (Table 2).

The results of research carried out by Milanez (2023) in 96 production companies and from finance branch in eight countries OECD show that the AI introduction results in work reorganisation more often than in workers' redundancies. The improvement of work quality connected with AI implementation, more engagement and improvement of physical safety are the greatest advantages from the worker's point of view. However, the employees reported greater stress connected with the necessity to learn new systems and worries connected with greater supervision, increase in the work intensity arising from higher performance aims and greater complexity of tasks. The employment levels remained stable when the AI was introduced. The companies had to allocate workers to different business areas, slowed down recruitment and natural employees' rotation maintaining for example the employees close to the retirement age or waiting until they resign in order to achieve this aim (Milanez, 2023, pp. 11-12).

The impact of AI on workers of production companies (group 1) and companies from finance and insurance branches (group 2) of seven EU countries (Austria, Canada, France, Germany, Ireland, the United Kingdom and the United States) was examined by OECD (Organisation for Economic Co-operations and Development). The results of performed research show that employees express fears referring to the work stability in both examined groups of companies. The respondents are more worried about the loss of work within the next 10 years than within the next 2 years. The workers using AI are more worried about the work stability. It may result from the fact that people not using AI expect that they will not be using this technology within the next 10 years and therefore will be less endangered on its effects. Another explanation may be that AI users are more aware of the possibilities of this technology and the automation potential connected with it.

Table 2.
Identification of mental and social factors in the working environment after the AI adoption AI[11]

Mental and social factor in working environment with AI	Characteristics of features of work with AI	Consequences for the employee and organisation	Number of experts indicating the factor (%)
Work overload	Work intensification; extending the work time with simultaneous reduction of time to perform the tasks together with the increasing amount of information; time pressure and multitasking; technology requires faster and greater amount of work; AI systems contribute to non-stop work; "omnipresence of workplace".	Technostress, growing mental tension leading to the chronic fatigue, depression, professional burnout; absence; presenteeism; increased rotation of employees; frustration and demotivation of employees; lower job quality and productivity; lower organization efficiency.	65
Job insecurity together with techno-insecurity and unpredictability of work processes	Permanent technical interventions; constantly new digital solutions; dynamic, continuous need to learn; high compatibility of employees with AI solutions; clearly steep curve of learning process of employees who are not "digital natives"; highly-technologized, omnipresent workplace.	Anxiety and fear for employees'' dismissals or downsizing; no stability or certainty of employment continuance; feeling of being eliminated by technology or more digitally-smart employees; unproportionally high level of digital addiction; lowered productivity and job quality; difficulties in planning the path of professional career;	90

[11] The strategic prevention actions in the fields above comprise: promotion of healthy organisation culture; shaping health work organisation; monitoring work process overload and work intensification; training and development of time management ability; employees' training regarding the development of digital competences; training developing the ability to cope with professional stress; promotion of organisation culture based on trust management; efficient systems of communication with employees concerning their professional roles and responsibility om the work process; employees' training concerning the aware application of digital technology and shaping healthy habits in the AI working environment; adoption of the work organisation promoting regular breaks from technology; implementation of organisation culture promoting work – life balance and offline time.

Cont. table 2.

High job complexity	High complexity of AI applications; very short lifecycles of information systems; intense effort to update digital competences; pressure of time and responsibility for the adoption of frequent technological changes.	No feeling of being useful and significant at work; the syndrome of chronic fatigue; frustrations; demotivation; professional burnout; lower quality of performed work; lower efficiency of work processes.	56
Invasion in personal life	No work – life balance; omnipresent workplace; 'technoinvasions' – the worker may be reached at every place and time; overlapping of professional and occupational obligations; blurring of the boundary between working hours and rest;	Technostress; psychosomatic disorders, among others the condition of permanent stimulations, problems with concentration; low level of readiness to work; worsening of health condition; drop of life energy; lowered life quality; lowered productivity of an employee.	37
Role ambiguity in work processes with AI	Work both in the physical space as well as in the cyberspace; no time and space limits; high integration of information and communication technology in work processes; digitalised communication systems based on AI; dynamic changes in the scope of tasks, expectations, objectives.	Technostress; frustration, lowered motivation and engagement; lower job quality; lower productivity of work processes and in a consequence lowered efficiency, effectiveness, and productivity of the whole organisation.	25
Digital overdependence	Digital technology is a dominant element in the working environment; high dependence of work processes from AI technology; continuous need of adaptation to the new, dynamically developing information and communication technologies.	Technostress; employees' inability to service ICT in a healthy way; social isolation; experience of information overload; fall of concentration blurring of the healthy working hours with AI technological systems; lower productivity of employees.	22

Number of experts n = 32.

Source: own study on the basis of (Malik et al., 2021).

Considering the perspective of the next 10 years, younger employees, women and people with high education are the most worried about the job stability (Table 3). Older employees are less worried about the possibility of losing job as they usually work on the basis of more stable contracts. Greater worry among women arises partly from the fact that men take managerial positions more often and due to this fact, the worries connected with the job loss are smaller among them (Lane et al., 2023).

Table 3.
Impact of AI adoption on employees' remuneration

AI impact on salaries (remuneration)	Age		Gender		Education	
	16-34	35+	Male	Female	University degree	No university degree
	Group 1 – employees of production companies (%) n = 2772					
Increase	22	13	14	19	23	22
Decrease	46	40	41	42	38	26
No impact	19	26	26	24	24	42
Don't know	13	21	19	25	15	10
	Group 2 – employees of companies from finance and insurance branch (%) n = 2562					
Increase	14	11	24	9	26	7
Decrease	46	39	36	46	37	46
No impact	21	28	24	23	22	25
Don't know	19	22	16	22	15	22

Note: Workers were asked: "Do you think that AI will have an impact on wages in your sector in the next 10 years? Yes, AI will increase wages; Yes, AI will decrease wages; No, AI will not impact wages; Don't know".

Source: own study on the basis of Lane et al. (2023, p. 51) after: OECD worker survey on the impact of AI on the workplace

According to the employees in both groups of examined companies, AI will impact their remuneration negatively. It was the opinion of all respondents regardless of their age, gender and education (Table 3) (Lane et al., 2023).

The use of AI may contribute to professional burnout. The workers' insecurity concerning the future of their work connected with introducing AI technology causes fear, the feeling of insecurity, tiredness and anxiety that their work may get obsolete in the near future. The fear refers mainly to workers who are aware of the AI possibilities. They understand the necessity of adaptation to new highly-technologized working environment and the increase in "know-why", "know-how" and "know-who" competences. Thus, the AI impact on work may be regarded as significant to maintain sustainable professional career (Kong et al., 2020).

4. Conclusion

The introduction of modern technologies in companies, such as AI, creates more productive workplaces. However, from the worker's point of view, they are the reason for serious fears referring to the processes of adaptation to the new conditions of working environment. These adaptations may be both quantitative (employment reduction) and qualitative (change of remuneration, forms of employment or job stability) (Ćwiek et al., 2021, p. 79).

The opinion expressed by Palos-Sánchez et al. (2022) is right. According to them, it is obvious that using technologies such as AI will not be optional but necessary in the long-term. Otherwise, the company will not be competitive, will lose its market position or even will disappear.

The picture of advantages and disadvantages connected with the greater and greater use of AI in the workplace and its impact on work conditions is complex and varied. The key issue is to minimise the existing disturbances in employment and problems connected with it – e.g. changes in employees' burden, changes in remuneration and work time, technostress, anxiety and employees' worries which may be reflected in the worsening of health condition. The main challenge in the next 20-30 years will be the solution of the problems of the people who will be affected with the problem of long-term technological unemployment. The role of educating future employees will be as important so that they possess competences difficult to replace by AI (Błachowicz, 2019, p. 14). The workers will not avoid the necessity to adapt to the changing composition of tasks to perform, to new conditions of technological working environment, to mobility between positions at the labour market, to efficient use of new technologies such as AI. The actions of entrepreneurs, decision makers, engineers and scientists should support employees in the processes of adaptation in order to redesign tasks, positions and work conditions.

The research problems presented in the paper which refer to shaping current workplaces adopting AI technology comprise the basis to perform deepened scientific empirical analyses that will be described in detail in future publications.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

PROCESS CYCLE TIME AS A BASE OF CONSTRAINT IDENTIFICATION IN TOC APPLICATION TO A PRINTING PRODUCTION SYSTEM

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Purpose: The purpose of the article is to locate a bottleneck in a printing production system.
Design/methodology/approach: The study is conducted through a case study utilizing bottleneck detection methods based on processes cycle times.
Findings: The study conducted reveals the problem that finding a bottleneck is not a simple task, and the methods used may point to another bottleneck. The study implies that not every method used identified the same process as the bottleneck of the production system under study.
Research limitations/implications: The study describes a case of a single manufacturing company from the printing industry. The results of the research should be regarded as a pilot study.
Practical implications: The results of the survey are of particular importance to managers in charge of production management, providing valuable insights and pointing out areas that require special attention and monitoring.
Originality/value: In the TOC, the first step is to identify the bottleneck. The study shows that identifying a bottleneck in a production process is not an easy task. Different methods may indicate different bottlenecks.

Keywords: bottleneck identification, Cycle Time, Theory of Constraints, TOC.

Category of the paper: Research paper, Technical paper.

1. Introduction

Identification and management of bottlenecks is a key component of Theory of Constraints (TOC) and is the main objective of implementing the approach in practice. A bottleneck refers to a constraint that is a major obstacle to the operation of a fully efficient system. This means that the work rate of this constraint is lower than the work rate of the other processes in production (Goldratt, Cox, 1992). Bottlenecks are the cause of reduced capacity and throughput of the production system, resulting in, among other things, downtime, built-up inventories, and, above all, reduced productivity of the system as a whole (Urban, Rogowska, 2018).

According to Goldratt, every process has at least one constraint that blocks its full throughput, and improvements should be focused only on that constraint, not on other parts of the process. The creator of TOC has documented his ideas and illustrated their application in many novels such as *The Goal* (Goldratt, Cox, 1984, 1992), *It's Not Luck* (Goldratt, 1994), *Critical Chain* (Goldratt, 1997). On the other hand, a description of the concept itself can be found in books such as *The Haystack Syndrome: Sifting Information from the Data Ocean?* (Goldratt, 1990), *Goldratt's Theory of Constraints: A systems Approach to Continuous Improvement* (Dettmer, 2007) and *Theory of constraints handbook* (Cox and Schleier, 2010). Despite the availability of many literature items related to the application of TOC, there is a need for empirical studies on the issue of practical implementation of this concept in production systems (Urban, 2019). Bottleneck analysis is of high interest in manufacturing operations and in recent years a great deal of research has focused on the area of bottleneck identification (Sims, Wan, 2017; Prasetyaningsih, Deferinanda, 2019; Chen et al., 2021).

The research purpose of this article is to apply selected methods for identifying bottlenecks based on processes cycle times. The study was conducted using the case study method. The object of the study is a printing production system characterized by product diversity, i.e. assortment variability has a major impact on the flow of products through the production system.

2. Theory of Constraints as basis of manufacturing system management

TOC called in practice constraint management is one of the tools designed to support the production manager's continuous decision-making. Israeli physicist Eliyahu Moshe Goldratt is believed to be its creator (Wojakowski, 2015). The origin of the concept dates back to the 1970s, when Goldratt and his team developed a production planning and control system, initially called Optimized Production Timetable (Mabin, Balderstone, 2003). The concept has been gaining many supporters since it was developed. Its holistic approach is based on the idea that an organization should be viewed as an interconnected system, rather than a collection of separate parts. TOC seeks to optimize the performance of the entire system, not just individual parts or processes. According to Goldratt, the real goal of TOC implementation is not to make more money, but to attitude the organization up for continuous improvement and transform it into a constantly evolving entity (Barnard, Immelman, 2010). Application of the concept in industry translates into significant improvements in efficiency and productivity by identifying and eliminating constraints in production. Goldratt bases his theory on three main assumptions:

1. The existence of constraints.
2. The need to identify them.
3. The need to eliminate them through continuous improvement.

TOC's basic continuous improvement cycle (in the literature, known as Five Focusing Steps) is based on five steps (Yu et al., 2022):

1. Identify the bottleneck namely place or process that limits the throughput of the entire process.
2. Exploit the identified bottleneck that is decide how to increase its throughput, without major expensive upgrades or changes.
3. Subordinate to the decision made in step 2, that is, to adjust the work rate of the remaining resources to the work rate of the constraint.
4. Elevate the bottleneck namely increase its capacity.
5. Observe if the bottleneck has been eliminated and return to step one.

Despite its simple, straightforward approach, it is not an easy tool to use especially in complex production systems. Many implementation obstacles can be encountered during the practical application of TOC to a production system. Identifying the bottleneck is the first and most important step. If the bottleneck is not identified, it will be difficult to increase the efficiency and profitability of the company. It is important to find the actual bottleneck, not its symptoms, in order to effectively and permanently solve the problem. Without identifying the real bottleneck, the actions taken by the company may be ineffective or temporary. Identifying the bottleneck is a key and important issue in research related to the production system (Urban, Rogowska, 2020). A number of methods for identifying bottlenecks can be found in the literature. This article focuses on three bottleneck detection methods. The first is a cycle time-based method of determining how long it takes to produce a unit of product in a given production process. To do this, measure the duration of each process and compare it to the duration of other processes. Another method is cycle time taking into account production losses, i.e., any delays that prolong the processing of a production batch, such as preparing a machine or production line to produce a specific product, machine stops or breakdowns (Yu, Matta, 2016). The last method is cycle time corrected by process engagement in production of the product range. As the name suggests, cycle time and the individual engagement of each process in production product range should be examined, and the product of these values will indicate the actual time required to produce the product. This approach is aimed at obtaining a more precise assessment of the time required to process a unit of product and its impact on the entire production system (Urban, 2019).

3. Research Method

The article presents the practical application of bottleneck identification methods based on processes cycle times founded on a case study in a printing production system. A case study is a qualitative method of carefully analyzing a single case or series of cases, and can be conducted

by a single researcher or a research team. The purpose of this method is to learn the details and circumstances of a case and draw conclusions, as well as implications for further research or practice. The case study uses a variety of data sources to provide a complete and comprehensive picture of a case. In this way, you can study the problem from different perspectives and get a lot of information to make a more precise analysis and get reliable results (Creswell, 2007). An important element of the case study is the research questions, which allow to focus on the key issues related to the case under study. In this paper asks the following question: Will each bottleneck identification method used identify the same process as the bottleneck? Several data sources were used to analyze the case studied, namely: direct observation of the production process, analysis of material flow and historical data, direct interviews with production managers, and participatory observation. The company's historical data represented cognitive material, and the data contained therein enabled detailed analysis. The use of cycle time-based bottleneck identification methods is presented in the following sections of the study.

4. Investigated Manufacturing System

The company under investigation is a manufacturer of specialized printed packaging. The products are designed for the food, medical and healthcare industries. The production system is organized as batch production. This means that packaging is produced in large quantities based on the same design, with uniform quality and dimensions. The company works three shifts, five days a week. Figure 1 presents the stages of the production process.

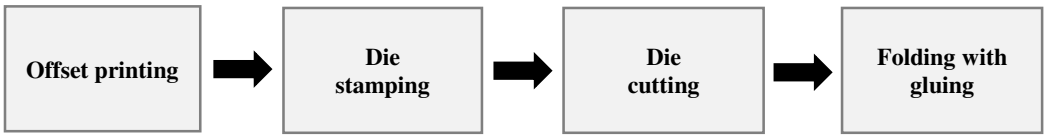

Figure 1. Production process analyzed.

Source: own elaboration.

The production process for printed packaging consists of four stages:

1. offset printing, which involves transferring ink from the print master to the surface of the package,
2. die stamping foil using the hot-stamping method, which involves heating and transferring paint from the foil to the surface of the substrate,
3. die cutting, which is the cutting of shapes from a sheet of paper using a special embossing form called a die-cutter,
4. folding with gluing is an automatic process of folding layers of material in a certain direction and shape, and then gluing the layers of material to each other with an adhesive so that they form a package.

All of the manufacturing processes mentioned use advanced technologies. The production system under study is characterized by low batch repeatability, short orders and long changeover times. An additional characteristic is the lack of continuity of the product flow through the production process. This means that the product can, but in most cases does not always include all the previously mentioned manufacturing processes.

5. Bottleneck Identification

A bottleneck is a place in a production process where there is a throughput constraint and is the main reason for slowing down the flow of the entire process. The following are the results of identifying the bottleneck of the production system under study using selected identification methods founded on processes cycle times.

Cycle Time of a process (C/T)

The first method used to identify the bottleneck is the cycle time of each process. Due to the high speed of the machines in the production system under study, actual C/T measurement is not possible. Therefore, in order to determine C/T, the data of each process was analyzed, i.e. production time and the number of products produced (volume) in a typical one month. Table 1 shows the C/Ts of the three manufacturing processes.

Table 1.
Cycle Times of processes

Process	Volume [printing sheet]	Production time [hr.]	Cycle time [sec]
Offset printing	5 832 065	483	0,3
Die stamping	2 648 156	836	1,14
Die cutting	5 810 595	1048	0,65

Source: own elaboration based on company data.

When analyzing the data of the fourth process, which is folding with gluing, an obstacle was encountered regarding the unit in which the process is expressed. The company surveyed expresses the offset printing, die stamping and die cutting process in printing sheets, while the folding process with gluing is expressed in smaller parts so-called final items. The final item is several times smaller than the printing sheet used, so several final items will be printed simultaneously on one sheet. The problem of product multiplication can occur in many manufacturing systems. The C/T method of processes does not take into account the problem described earlier in view of this, an adjustment is needed to remove this obstacle. In order to identify the bottleneck by means of C/T of the processes in the production process under study, it is necessary to assume the same unit in all processes, i.e. the printing sheet. The following is a calculations to determine the common unit. In the first step, C/T expressed on final item was calculated.

C/T on final item

In order to determine C/T on final item, the company's data (process volume and production time) was analyzed considering the same time horizon (one typical month). The results of the analysis are presented in Table 2.

Table 2
Cycle Times of process on one final item

Process	Volume [final item]	Production time [hr.]	Cycle time [sec]
Folding with gluing	37 540 000	1034	0,1

Source: own elaboration based on company data.

Analyzing the data in Table 2, the C/T of the folding with gluing process expressed for one final item is 0.1 seconds. However, before attempting to solve the problem of product multiplication, i.e., expressing each process in a unit of printing sheet, a certain assumption must be made. An analysis of the surveyed company's orders showed that 90% of the output of the die cutting process goes to the next process, which is folding with gluing. The remaining 10% of products in flat form reach the customer. Making this assumption will make it possible to calculate the average number of final items per one printing sheet, which will consequently make it possible to determine the C/T of the folding process with gluing in the same unit as the other processes. The results of the analysis are presented in Table 3.

Table 3
Determination of the cycle time of the folding with gluing process

90% of the monthly output of the die-cutting process [printing sheet]	5 229 535
Monthly output of folding and gluing process [final item]	37 540 000
Average number of final items per printing sheet	8
Cycle time of the folding with gluing process [sec]	0,8

Source: own elaboration based on company data.

Table 3 shows that on average there are 8 final items per printing sheet. Then, the C/T of the folding with gluing process expressed per printing sheet is 0.8 seconds (8 final items x 0.1 sec.). Analyzing the C/T of all production processes (Table 1 and Table 3), it should be noted that these values vary, which means that the performance of each process is different. Figure 2 shows the hourly productivity of each production process calculated from the obtained C/T values of the processes.

As shown in Figure 2, the most efficient process is offset printing, while the lowest efficiency has the die stamping process. This process limits the capacity of the entire production system therefore it can be considered a bottleneck.

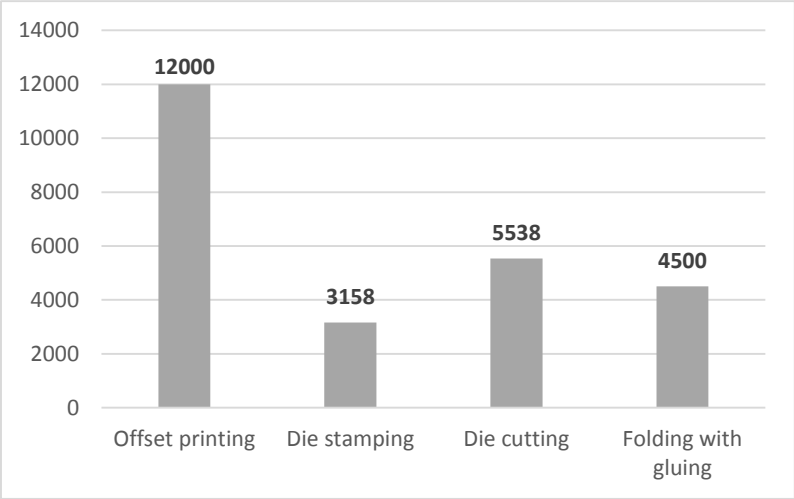

Figure 2. Hourly productivity of production processes [printing sheet/hour].
Source: own elaboration based on company data.

C/T taking into account production losses

Manufacturing companies face casual shutdowns or lengthy changeovers during production. Each casual workstation stoppage causes losses for the company. Therefore, in order to identify the bottleneck in the production system under study, another method was used, which is the determination of C/T taking into account production losses. Production losses should be understood as lost opportunities to produce products, such as machine or process waits, as well as the inability to produce a product due to breakdowns, changeovers or casual downtime. Accounting for production losses to the C/T value of processes is an important element that affects the final result. Table 4 shows the identified production losses of production processes that occurred in the month under review.

Analyzing the company's data, seven production losses were identified, i.e. products not meeting quality standards, changeover time, machine cleaning, machine technical failure, waiting for the graphic department, waiting for approval and input material issues. However, as Table 4 shows, not all production losses occur in every manufacturing process.

Table 4.
Production losses occurring in processes

Production losses	Process			
	Offset printing	Die stamping	Die cutting	Folding with gluing
	[hr.]			
Products not meeting quality standards	5	0,2	1	8
Changeover time	695	190	897	841
Machine cleaning	130,5	6,5	20,5	186
Machine technical failure	48,5	2	21,5	16
Waiting for the graphic department	28	-	-	-
Waiting for approval	18	0,3	0,3	-
Input material issues	40	0,2	0,2	-
Total	965	199,2	940,5	1051

Source: own elaboration based on company data.

Waiting for the graphics department only occurs in the offset printing. Whereas, waiting for approval and problems with the product at the process input do not occur in the folding with gluing process. The Table 4 shows, that in a typical month, the largest share of production loss time occurs in the folding with gluing process (1051 hr.), and the smallest in the die stamping process (199.2 hr.).

With knowledge of production time, production loss time and number of products of each process produced (volume), it is possible to calculate the C/T taking into account production losses. The resulting C/T values are presented in Table 5.

Table 5.
Process cycle time taking into production losses

Process	Production time [hr.]	Production losses [hr.]	Volume [printing sheet]	C/T with over time of production losses [sec]
Offset printing	483	965	5 832 065	0,89
Die stamping	836	199,2	2 648 156	1,40
Die cutting	1048	940,5	5 810 595	1,23
Folding with gluing	1034	1051	5 229 535	1,44

Source: own elaboration based on company data.

Analyzing the data in Table 5, it can be seen that the C/T values of all processes that take into account production loss time differ from each other, and their values are greater than the C/T obtained by the previous method. Figure 3 shows the hourly productivity of each production process taking into account the new C/T values of processes.

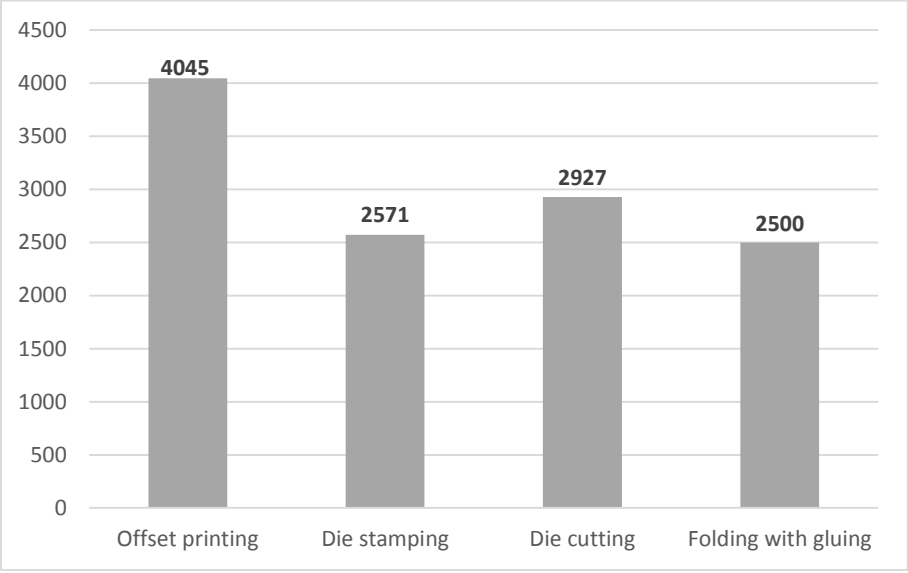

Figure 3. Hourly productivity of production processes including production loss time [printing sheet/hour].

Source: own elaboration based on company data.

According to the data presented in Figure 3, the offset printing process has the highest hourly productivity, while the folding with gluing process has the lowest productivity (and not the die stamping process as shown in the previous bottleneck identification method). This process should be considered the bottleneck of the production system under study.

C/T corrected by process engagement in production

A characteristic feature of the production system under study is the wide variety of products offered. Depending on the customer's requirements and the specifics of the order, the manufactured products cover the company's production processes to varying degrees. The lack of continuity of the product flow through the production process leads to different engagement of individual production processes. For such characteristics of the production system under study, the corrected C/T method developed by Urban (2019) was used to identify the bottleneck. To calculate process engagement, the volume of products produced on each process is compared with the total number of products produced, which is derived from production orders. Table 1 and Table 3 show the C/T values of the processes, which are adjusted using the engagement of each process. The obtained results of the corrected C/T are presented in Table 6.

Table 6.
Process engagement and corrected cycle time

Process	Engagement	Corrected C/T [sec.]
Offset printing	100%	0,3
Die stamping	60%	0,68
Die cutting	100%	0,65
Folding with gluing	90%	0,72

Source: own elaboration based on company data.

Analysis of the data in Table 6 shows that the offset printing and die cutting processes are fully involved in the production of all manufactured products. The other processes are involved with varying degrees of intensity. The individual engagement of each process makes it possible to calculate the corrected C/T. For example, the die stamping process is engagement in 60% of the volume of the total production. Since the actual C/T is 1.14 sec (see Table 1), the corrected C/T value is equal to 0.68 sec. According to Urban (2019), the corrected C/T value symbolically reflects the time it takes to produce a product that serializes through all processes. Figure 4 shows the hourly productivity of each production process calculated from the resulting corrected C/T values of the processes.

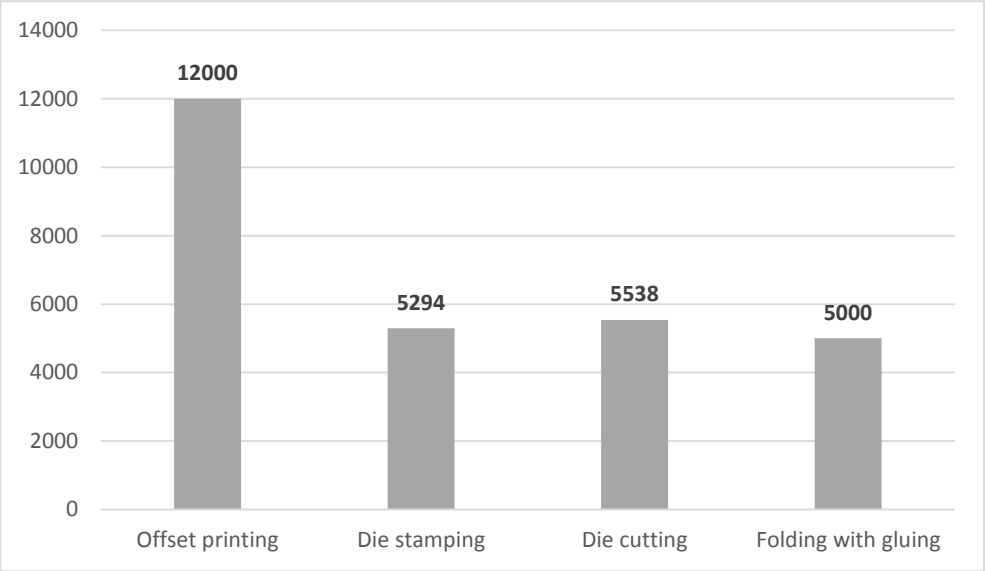

Figure 4. Hourly productivity of production processes with corrected C/T [printing sheet/hour].
Source: own elaboration based on company data.

According to the data presented in Figure 4, the highest hourly productivity is from the offset printing process. On the other hand, the most important information from Figure 4 is the hourly productivity of the folding with gluing process, which is the lowest compared to the other production processes, so this process should be considered the bottleneck of the production system under study.

6. Discussion

In TOC, identifying the bottleneck is the first step seeking to improve the production system. This is a crucial step because it is at this stage that the actual bottleneck should be found. Focusing on other constraints will not achieve the desired result of increasing the throughput of the entire production system. Consequently, failure to identify the true bottleneck can lead to inefficient operations and investments, as well as the persistence of constraints in the production system. There are many bottleneck identifying methods in the literature. The article focuses on three selected methods, namely: Cycle Time of a process (C/T), C/T taking into account production losses and C/T corrected by process engagement in production of the entire range. The first C/T based method used indicated that the bottleneck was the die stamping process. Further calculations showed that the real bottleneck of the system under study is another process, specifically the folding with gluing process. The production system under study is characterized by a wide variety of products, as well as uneven process engagement in the production stream. Comparing the hourly productivity of production processes calculated on the basis of C/T is not a correct approach for such characteristics of the

production system, in which the product stream does not flow through all processes. The C/T method's indication of other bottleneck (than the other two methods) may be due to the fact that it only considers the direct execution time of the process, and does not take into account other important factors affecting production efficiency, for example, changeover time, waiting time, failures that occur, or the engagement of processes in the production of the entire range. In order to identify the bottleneck, it is necessary to consider additional factors affecting the process and analyze the characteristics of the production system under study. The case study conducted shows that the first step of TOC, i.e. identifying constraints, is not a simple task. This step should be considered important, requiring further research and the determination of practical guidelines.

7. Conclusions

TOC is used in many manufacturing companies. According to Goldratt, every enterprise has at least one bottleneck that effectively limits the use of its full potential. The study was conducted using the case study method. This allowed for a deeper understanding and analysis of the problem of identifying the bottleneck. Referring to the practical use of TOC, specifically its first step, a bottleneck was identified that determines the capabilities of the entire production system. In the case studied, the bottleneck is the folding with gluing process. Three selected methods based on C/T of the processes were used to detect the bottleneck. The study shows that identifying the bottleneck is not a simple and obvious task. There are a number of methods available in the literature that can be used at this stage. However, not every method can pinpoint the same bottleneck. Therefore, it is important to individual approach to determine the specifics and circumstances of the production system. In summary, the first course of action should be to study how the production system under study actually works and what factors affect it. Then, in order to identify the bottleneck, a suitable method should be selected that takes into account the characteristics of the production system in question. In the case under review, the C/T method of processes was not the correct solution, as this method does not take into account a number of factors affecting the production system under study.

Acknowledgements

This research was funded by a grant from the Ministry of Education and Science received by the Bialystok University of Technology, grant number WZ/WIZ-INZ/3/2022.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

OBJECTIVES AND EFFECTS OF INNOVATIVE ACTIVITIES OF ENTERPRISES – A THEORETICAL AND EMPIRICAL APPROACH IN THE CONTEXT OF THE COVID-19 PANDEMIC

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Purpose: The purpose of the study is to present the objectives and potential effects of innovative activities of enterprises - in qualitative and quantitative terms, as well as to analyze and evaluate selected effects of innovative activities of small, medium-sized, and large enterprises in Poland in the years 2018-2021, including - in the critical year 2020.
Design/methodology/approach: A thesis was formulated, assuming that the COVID-19 pandemic became a catalyst for a short-term increase in the effects of innovative activities in the population of small, medium-sized, and large enterprises in Poland, as measured by the share of enterprises that introduced at least one innovation. The author's considerations are based on literature studies and a review of the results of selected secondary research. The basic research method is desk research (analysis of existing data).
Findings: The author presented the objectives and effects of innovative activities in qualitative and quantitative terms. Analysis of the results of selected existing studies allowed the author to confirm the thesis.
Research limitations/ implications: The limitation of the study is the exclusion of micro-enterprises. Further research should also address the effects of innovative activities of this group of companies.
Practical implications: Research results lead to recommendations for managers. Innovative activities should not be undertaken incidentally, but systematically. This requires the adoption of a strategic approach in the pursuit of innovative maturity of enterprises.
Social implications: The inclusion of recommendations by leaders/managers should have a positive impact on the effects of innovative activities of enterprises.
Originality/value: The results of analysis have cognitive value for the development of knowledge in the studied area. Strategic management factors were recommended to managers striving to achieve innovative maturity of enterprises. The author pointed out the advisability of further research in this area.

Keywords: innovation, innovative activity, objectives and effects of innovative activities of enterprises, COVID-19 pandemic.

Category of the paper: general review; research paper.

1. Introduction

The innovativeness of the Polish economy has been assessed as relatively low for many years. Poland belongs to the group of so-called “emerging innovators”, ranking fourth from the bottom among the 27 European countries (European Commission, 2022). Within a set of factors taken into account when assessing the innovativeness of economies, significant importance is assigned to the level of innovativeness of enterprises. Innovativeness, as the ability to seek, generate and implement innovations, as well as to absorb them, is a recognized factor in the competitiveness of enterprises and economies (Dachs et al., 2017; Gundolf et al., 2019).

The innovative activity of enterprises is the subject of systematic research, and in recent years it has become a particularly interesting area of research interest, due to the conditions that occurred as a result of the COVID-19 pandemic.

The pandemic, which began in 2020, caused numerous problems and losses in many areas of life. It paralyzed the national and global economy and significantly influenced the functioning of enterprises, forcing companies to undertake activities enabling adaptation to new conditions (Danielak, 2021; Diekhof et al., 2021). Researchers emphasize that the COVID-19 pandemic forced many organizations to introduce innovations by changing the purpose of their business activity, changing the product offer, or introducing materials preventing the spread of the virus (Wojnicka-Sycz et al., 2022).

The purpose of this study is to present examples of objectives and effects of innovative activities of enterprises - in qualitative and quantitative terms, as well as to identify, analyze and evaluate selected effects of innovative activities of small, medium-sized, and large enterprises in Poland in the years 2018-2021, including - in the critical year 2020. The research problem focuses on the question of whether the unexpected external event, i.e., the COVID-19 pandemic, had a positive impact on selected effects of innovative activities of enterprises. A thesis was formulated, assuming that the COVID-19 pandemic became a catalyst for a short-term increase in certain effects of innovative activities in the population of small, medium-sized, and large enterprises in Poland, as measured by the share of enterprises that introduced at least one innovation.

The author's considerations are based on literature studies and a review of the results of selected secondary research. The basic research method used in the study is desk research (analysis of existing data). The analysis is aimed at confirming the thesis.

In the conclusion of the study the author presents her own approach to the problem, leading to recommendations for managers interested in the survival and growth of their enterprises in the contemporary economy. Recommendations for further research and analyses are also included.

2. Innovation. Innovative activities of enterprises

J.A. Schumpeter introduced the concept of innovation to economic studies and defined it as new combinations of factors of production, including the introduction into practice of a new solution – in terms of products, production methods, markets, sources of raw materials or semi-finished products, organization of production (1960). Innovation – in a narrow sense – was understood by the creator of this concept as a novelty for the market, in contrast to imitation.

Today, innovation can also be defined in a broad sense. For example, according to the *Oslo Manual 2018* – a business innovation is a new or improved product (product or service) or business process (or combination thereof) that differs significantly from previous products or business processes, and that has been placed on the market or brought into use by an enterprise (OECD/Eurostat, 2018).

Innovative activities include all activities of a developmental, financial, and commercial nature undertaken by an enterprise, the intended purpose of which is innovation. Some of these activities are of innovative nature, while others are not novel, but are necessary for the implementation of innovation. Innovative activities also include research and development (R&D) activities that are not directly related to the creation of a specific innovation (Statistics Poland, 2020). In research conducted in Poland, a distinction is currently made – on the basis of the Oslo Manual 2018 – between product innovation and business process innovation. Business processes include all the basic activities of a company related to the manufacture of products and all activities of ancillary and supportive nature. Innovations in business processes include the following functional categories: manufacture of products and provision of services, distribution and logistics, marketing and sales, information and communication systems, administration, and management (Statistics Poland, 2023). Product and business process innovations do not have to be new to the market in which the enterprise operates, but they must be new at least to the enterprise itself. This approach is adopted by Statistics Poland (i.e. the Polish Central Statistical Office) in the conducted research, the results of which are published, among others, in the reports from the series *Innovation activities of enterprises*.

The development of an enterprise based on innovation requires the undertaking and effective implementation of innovative processes. In a simplified form – an innovative process includes the following stages: search; selection; implementation and discounting (of the benefits of innovation) (Tidd, Bessant, 2013). Innovative processes evolve, from linear process models through interactive models, all the way to the *Open Innovation* model – including centripetal, centrifugal, and mixed processes (Gassmann, Enkel, 2004). Making rational decisions concerning the selection of innovative ideas involves activity in the scope of utilizing internal and external sources of innovation (Rojek, 2021). The efforts of researchers have resulted in the development of classifications of the sources of innovative ideas and solutions.

However, in general terms - a source of innovation is "everything that inspires a person to the process of change" (Pomykalski, 2001, p. 34), thus becoming an impulse for change. In light of the adopted objective of the study, it's worth emphasizing that P.F. Drucker mentions "an unexpected external event" among the impulses for innovation (Figure 1).

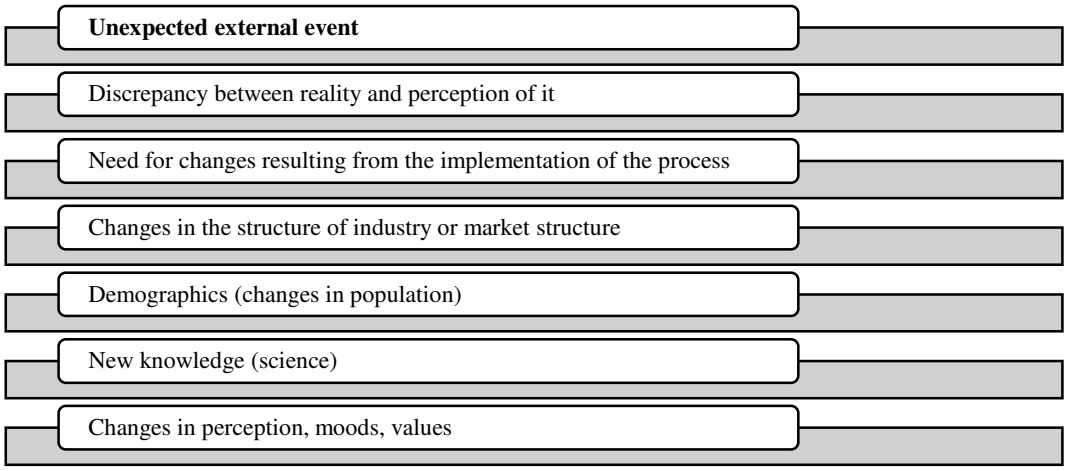

Figure 1. Impulses for innovation.

Source: own compilation on the basis of: Drucker, 2002.

Other authors also list among the sources of discontinuation "events that no one could have foreseen" or "unimaginable events, and thus ones for which it was impossible to prepare, and which – sometimes fundamentally – change the world and redefine the rules of the game" (Tidd, Bessant, 2013, p. 66). According to the cited researchers, a significant breach of the existing framework, or a change in the rules, often implies new approaches and innovative solutions.

The COVID-19 pandemic was a phenomenon that can be categorized as the so-called black swan, a phenomenon at the third level of uncertainty - the occurrence of which cannot be fully predicted; it affected the performance of all management functions, such as planning, organizing, personnel management, leading and controlling (Wolniak, 2022). Difficulties in running a business caused by the COVD-19 pandemic forced enterprises to look for innovative solutions. Research conducted PAIR (Partnership for Australia-Indonesia Research) stated that with the COVID-19 pandemic, companies are increasingly aware of an opportunity in a crisis and adapt to the events that occur by innovating (Sudjatmoko et al., 2023). Examples include collaborating interorganizationally (Haneberg, 2021), business model innovation (Seetharaman, 2020), and to accelerate digitization (Barnes, 2020).

3. Objectives and effects of innovative activities of enterprises

The objectives of innovative activities of enterprises – if achieved – may constitute the effects of this activity. The observed effects may also be unintended, different than the objectives set, which can be demonstrated as a result a carried assessment of the effects of innovation implementation. The objectives and effects of the activity can be formulated both in qualitative and quantitative terms – using the adopted indicators.

3.1. Objectives and effects of innovative activities of enterprises – in qualitative terms

Examples of objectives of the innovative activities of enterprises, in qualitative terms, relate both to the enterprise's interior and to the external environment, including the protection of the environment (Table 1).

Table 1.
Objectives of innovative activities of enterprises

AREA: Markets for the company's products
Upgrading of products (goods or services). Expansion of the product range.
Creation of new markets. Entry into new markets.
Adaptation of existing products to new markets.
Increasing or maintaining market share.
Increase in reputation, brand awareness, or visibility of goods or services.
Compliance with market regulations. Adoption of standards and accreditation.
AREA: Production and delivery
Upgrading of outdated process technologies or methods.
Improvement in product quality .
Improved flexibility for producing goods or services.
Increased speed of producing goods.
Reduction of labor costs per unit of output.
Reduction of material and energy costs or operating costs per unit of output.
Reduced time to market.
AREA: Organization of the enterprise's operation
Improved capabilities for absorbing, processing, and analyzing knowledge.
Improved sharing or transfer of knowledge with other organizations.
Improved efficiency or function of the enterprise’s value chain.
Improved communication within the company.
Improvement or development of new relationships with external entities.
Increase in the resilience of enterprises and their adaptability to change.
Improvement in the working conditions, health, or safety of the firm’s personnel.
Implementation of a new business model.
Contribution to the development of standards.
AREA: Economy, society, or environment
Reduction of negative environmental impact.
Delivery of Environmental Benefits.
Improvement of public health, safety, or defense.
Improvement in the scope of social inclusion. Improvement in the scope of gender equality.
Improvement in the quality of life or well-being.
Compliance with mandatory regulations Compliance with voluntary standards.

Source: own compilation on the basis of: OECD/Eurostat, 2018.

The following are selected results of existing surveys carried out in Poland, indicating the effects of innovative activities of enterprises in qualitative terms. For example, the results of surveys conducted among 442 industrial enterprises in the years 2009-2012 (Dzikowski, 2013) show that the most often achieved effects of innovative activities include: an increase in production range and an improvement in product quality (63% of indications). Other significant effects indicated include: increase in production capacity (32% of indications), entry into new markets (22.4% of indications) and reduction in unit labor costs (21% of indications).

In turn, the results of innovative activities indicated in 2021 in a study covering 1488 innovative enterprises, are presented in Table 2.

Table 2.
Effects of innovative activities mentioned by enterprises (N = 1488)

EFFECT	SHARE OF INDICATIONS **Strongly agree or *Agree (%)***
Overall development of the company	90.8
Improvement in the quality of services and products	83.6
Increased work efficiency	83.4
Improved work organization and working conditions	75.3
Improved quality of customer service	71.1
Increase in sales	69.6
Increasing market share	66.0
Better adaptation to customer requirements	63.5
Reducing the costs	05.3

Source: own compilation on the basis of: PARP, 2022.

It should be noted that among the objectives and effects of innovative activities – based on the results of selected studies – the improvement of product quality was considered as an important effect.

3.2. Objectives and effects of innovative activities of enterprises – in quantitative terms

Both the objectives and the effects of the innovative activities of enterprises - in quantitative terms - can be determined by means of indicators, i.e. measures that enable comparative analysis and diagnosis of the existing state.

In the literature on the subject, we encounter various measures of the effects of innovative activities of enterprises that are used in scientific research or proposed by the authors for use. These indicators are also used in the assessment of the innovativeness of enterprises, alongside other indicators, such as expenditure on innovation. Selected indicators of the effects of innovative activities of enterprises are presented in Table 3.

The number of innovations implemented in an enterprise during the assumed period is a frequently used way of measuring the effects of innovative activities of enterprises. To this end the studies consider the introduction of at least one innovation over a three-year period (OECD/Eurostat, 2018), or the introduction of two or, for example, three innovations over a five-year period (Bhaskaran, 2006). The measures of intellectual property refer to the number

of inventions for which patent applications were filed, the number of obtained patents, industrial design registration rights or protective rights for utility models. One universal measure of the effects of innovative activities of enterprises is the **percentage of sales** generated by new or significantly improved products in total sales.

Table 3.
Selected metrics of the effects of innovative activities of enterprises (review of selected items in the literature)

INDICATOR	SOURCE
Indicators (measures) of intellectual property	M. Pichlak (2012)
Number of innovations implemented within the assumed period	
Rate of return on research and development (R&D) expenditures	
Number of innovations adapted within the assumed period	
The value of sales of new or significantly improved products within the assumed period	
The value of sales of implemented innovations in relation to previous years	L. Białoń (2010)
Value of profits obtained from the sales of product innovations	
Level of savings resulting from process innovations	
Increase in the share of sales on domestic and foreign markets	
Number of patent applications or obtained patents.	
Number of innovations implemented within a three-year period	OECD/Eurostat (2018)
Share of sales generated thanks to new or significantly improved products in the total sales	
Share of sales generated thanks to new or significantly improved products – new to the market – in the total sales	
Share of sales generated thanks to new or significantly improved products – new to the company – in the total sales	
Measures of Intellectual Property	
Percentage of employees directly affected by business process innovation during the observation period	
Customer Satisfaction Indicator (share of customers who are usually satisfied with the product or service)	

Source: own compilation on the basis of: Pichlak, 2012; Białoń, 2010; OECD/Eurostat, 2018.

It should be noted that in the literature of the subject there are attempts to develop an aggregated indicator of the effects of innovative activities of enterprises, which would take into account selected measures of effects in this area. For example, selected researchers adopted as key measures of effects the indicators presented in Table 4.

Table 4.
Metrics of the effects of innovative activities of enterprises (key metrics - according to researchers)

INDICATOR	SOURCE
Number of new product categories introduced in the reported year	A.V. Trachuk, N.V. Linder
Number of patents and other intangible assets based on the results of R&D work received in the reporting period and the previous two years	
Economic effects of R&D work and innovation	
Percentage of employees trained in the area of innovation	
Volume of financing of innovative projects, including R&D works, with own funds, as a percentage of the company's revenues for services	

Source: own compilation on the basis of: Trachuk, Linder, 2019.

Research on the innovative activities of enterprises in Poland conducted by Statistics Poland utilizes measures of effects considered to be the most important among those recommended in the Oslo Manual 2018 (OECD and Eurostat, 2018).

The indicators for measuring the effects of innovative activities presented above can be used both as part of an individual assessment of a single enterprise and in relation to a selected population of enterprises.

3. Selected effects of innovative activities of enterprises in Poland in 2018-2021 – In light of the research carried out by Statistics Poland

The chapter focuses on the analysis of existing data in order to confirm the formulated thesis. The author used selected results of surveys conducted by Statistics Poland on small, medium-sized, and large enterprises operating in Poland in the period 2018-2021.

In these studies, it was assumed, that an "innovative enterprise" is one which introduced at least one product innovation or business process innovation within the studied period. Selected effects of innovative activities of enterprises, determined with the use of selected indicators, and related to small, medium-sized, and large enterprises in Poland, are presented in Table 5.

The pace of changes between the years 2019 and 2018 indicates a decrease in the studied shares of innovative industrial and service enterprises in the overall enterprise population. On the other hand, a comparison between 2020 and 2019 shows a clear increase in the share of innovative enterprises in the total number of enterprises, both in the case of industrial enterprises (+12.5 p.p.) and services-sector enterprises (+18.9 p.p.). In 2020 innovative enterprises accounted for nearly one third of each of the surveyed groups of enterprises. An increase is also observed in the total number of enterprises (both industrial and services-sector enterprises) – in terms of new or improved products; in the total number of enterprises – in terms of new products or products improved for the market; in the total number of industrial enterprises – in terms of new or improved business processes.

The highest growth was recorded in the latter case. Meanwhile, a comparison between 2021 and 2020 shows a decrease in each of the above indicators.

The results of the Central Statistical Office surveys, analyzed in the study, enable the confirmation of the thesis assuming that the COVID-19 pandemic became a catalyst for a short-term increase in the effects of innovative activities in the population of small, medium-sized, and large enterprises in Poland, as measured by the share of enterprises that introduced at least one innovation. Due to the decrease in the surveyed shares of innovative enterprises in 2021, the growth observed in 2020 can be considered significant, but short-lived.

Table 5.
Selected effects of the innovative activities of small, medium-sized, and large industrial and services-sector enterprises in Poland in the years 2018-2021

SPECIFICATION	2018	2019	CHANGE 2019/2018	2020	CHANGE 2020/2019	2021	CHANGE 2021/2020
	%	%	pp.	%	pp.	%	pp.
Industrial companies							
Share of innovative enterprises in the total number of industrial enterprises	24.0	18.9	- 6.1	31.4	**+ 12,5**	22.0	- 9.4
Share of innovative enterprises in the total number of industrial enterprises – new or improved products	16.8	13.6	- 3.2	18.4	**+ 4,8**	13.1	- 5.3
Share of innovative enterprises in the total number of industrial enterprises – new products or products improved for the market	7.5	6.1	- 1.4	7.8	**+ 1,7**	6.0	- 1.8
Share of innovative enterprises in the total number of industrial enterprises – new or improved business processes	19.9	15.3	- 4.5	26.3	**+11.0**	18.00	- 8.3
Services-sector companies							
Share of innovative enterprises in the total number of services-sector enterprises	19.6	11.9	-7.7	30.8	**+ 18,9**	19.7	- 11.1
Share of innovative enterprises in the total number of services-sector enterprises – new or improved products	9.6	6.3	- 3.3	12.1	**+ 5,8**	6.8	- 5.3
Share of innovative enterprises in the total number of services-sector enterprises – new products or products improved for the market	4.2	2.8	-1.4	4.4	**+1.6**	3.2	-1.2
Share of innovative enterprises in the total number of services-sector enterprises – new or improved business processes	17.5	10.3	- 7.2	27.6	**+ 17,3**	18.1	- 9.5

Source: own compilation on the basis of: Statistics Poland, Bank Danych Lokalnych [Local Data Bank]; Statistics Poland, 2020; Statistics Poland, 2021; Statistics Poland, 2022.

The limitation of the study is the exclusion of micro-enterprises.

Conclusions

The examples of the objectives and observed effects of innovative activities of enterprises, presented in the article in qualitative and quantitative terms, point to the complexity and multidimensionality of this phenomenon. On the other hand, the examples presented show the suitability of these objectives and effects for the purpose of analysis and diagnosis of innovative

activities - both as part of an individual assessment of a single enterprise and in relation to a selected population of enterprises.

In the empirical part, as a result of analysis of the existing data the author confirmed the formulated thesis assuming that the COVID-19 pandemic became a catalyst for a short-term increase in selected effects of innovative activities in the population of small, medium-sized, and large enterprises in Poland, as measured by the share of enterprises that introduced at least one innovation. The COVID-19 pandemic – as an unexpected external event – affected the process of undertaking of innovative activities resulting in the implementation of innovations in 2020 by a larger number of enterprises than in the previous year. The considerations lead to a confirmation of a clear, albeit short-lived effect (as the shares of innovative enterprises are already lower in 2021).

Intentional innovative activity by enterprises is always desirable, but it's not enough for it to be undertaken on a small scale and incidentally. An enterprise that has demonstrated effects in the form of innovation in products or business processes should not give up on the adopted direction leading to innovation-based development.

It is therefore important to strive to achieve so-called **innovation maturity**. M. Romanowska indicates that innovatively mature enterprises conduct multilateral, systematic activities focused on many aspects of the company's operation, and innovative activities are an important element of their development and competition strategies and an important factor of financial success (2016).

According to her, in conditions of constant change in the company's environment, it is particularly worthy for modern managers to take up the above challenge. Innovation management requires a strategic approach, including the search for strategic factors of innovation as those that have the most significant positive impact on the ability to create and implement innovations, and thus on the results of innovative activities of enterprises. In light of the results of the author's own research – strategic factors in the area of management concern, on the one hand, managerial competences of the executives in the implementation of a development strategy based on innovation, as well as the effective use of workers' key competences, motivating and inspiring to seek new solutions, building relationships based on trust. On the other hand, these factors are related to the openness of innovation processes, based on the *Open Innovation* model (Rojek, 2022).

Contemporary circumstances for the development of enterprises in conditions of a changing environment, inspire further research efforts to identify strategic factors that positively affect the ability to create and implement innovations, leading to increases in the effects of innovative activities and increases in the level of innovative maturity of enterprises. Further research should also address the effects of innovation activities of micro-enterprises.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

WOMEN DIRECTORS ON THE BOARDS OF POLISH FIRMS LISTED WITHIN THE ALTERNATIVE TRADING SYSTEM

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Purpose: There were two main goals for the paper. The first concerned showing the representation of women on the executive boards (EBs) and supervisory boards (SBs) of companies quoted on the NewConnect market (Poland). The presence of women directors on company boards was considered through the prism of potential benefits for companies, which were identified from the literature review. The second objective examined the relationships between the amount of women in EB of NewConnect companies and: the amount of men in EB; the amount of EB members; the amount of men in SB; the amount of women in SB; the amount of employees in the company. The relationships between the amount of women in SB of NewConnect companies and: the amount of men in SB; the amount of SB members; the amount of employees were also investigated.
Design/methodology/approach: Descriptive statistics were used to describe the population structure of the number of women and their participation in the bodies of NewConnect companies. Relationships between variables were examined using spread charts and correlation matrixes.
Findings: The analysis of the mean measures shows that women were more represented in the SBs of NewConnect companies than in the EBs. The representation of women on company boards was low. The potential benefits of a higher presence of female non-executive directors were mainly seen in the area of monitoring. On the basis of analyses of interdependencies between variables, four statistically significant relationships were identified between: the amount of women in EB and the amount of men in EB (weak negative correlation); the amount of women in EB and the amount of EB members (moderate positive correlation); the amount of women in EB and the amount a company employs (weak positive correlation); the amount of women in SB and the amount of men in SB (strong negative correlation).
Originality/value: The issue of the presence of female members on the boards of companies listed on NewConnect has not yet been adequately explored. Study results are addressed to management theoreticians as well as practitioners and to shareholders of NewConnect quoted companies.

Keywords: women directors, women's participation in boards, NewConnect quoted companies.

Category of the paper: Research paper.

Abbreviations used in the paper: EB – executive board; EB (W) - executive board (number of women); EB (Ws) - executive board (women's share); EB (M) - executive board (number of men); EB (T) - executive board (number of members); SB – supervisory board; SB (W) - supervisory board (number of women); SB (Ws) - supervisory board (women's share); SB (M) - supervisory board (number of men); SB (T) - supervisory board (number of members); NoE - number of employees; SME – small and medium enterprises.

1. Introduction

Nowadays, the complexity of the corporate environment is accompanied by a high degree of volatility. This poses completely new challenges for managers. They arise not only from the need to adapt enterprises to the changes taking place, but also from the need to anticipate changes and to take advantage of the opportunities the changes generate. In such a defined environment, a gender-balanced composition of executive boards (EBs) and supervisory boards (SBs) may prove to be a source of market success for businesses and the building of sustainable competitive advantages for companies, sectors and the economy as a whole. Still, the participation of women in firm boards is insufficient. This observation applies not only to large enterprises, but also, and perhaps especially, to businesses in the small and medium-sized enterprise sector (SME).

In this context, the following research questions may be formulated:

- What benefits can a company derive from gender diversity on the firm's board(s)?
- What does the representation of women on business boards depend on?
- What limits the gender diversity of business boards and why?
- What is the presence and participation of women in the EBs and SBs of companies quoted on NewConnect?
- Are there correlations in NewConnect companies between the amount of women in EB (EB (W)) and: the amount of men in EB (EB (M)); the amount of members in EB (EB (T)); the amount of men in SB (SB (M)); the amount of women in SB (SB (W)); the amount of employees (NoE)?
- Are there correlations in NewConnect companies between SB (W) and: SB (M); the amount of members in SB (SB (T)); NoE?
- Whether, and to what extent, the results of international research on the representation of women on boards can be applied to the situation in companies quoted on the NewConnect?

The NewConnect market (Poland) mainly lists companies from the SME sector.

In addressing the benefits of women's presence on company boards, the determinants of this presence and the barriers to gender balance of boards, it is important to look at reports from studies conducted in different geographical areas. This will allow the problem of the low

presence of women on company boards to be assessed in a broader perspective. Such an approach will also provide an opportunity for a deeper analysis of the situation of women directors in the companies under study and allow for the formulation of future research areas.

Different approaches to the issue of women on company boards can be distinguished in the literature (Terjesen, Sealy, Singh, 2009). This issue is considered at the individual level, at the board level, at the company level and at the level of its surroundings (Terjesen et al., 2009). Further considerations will also be made in these perspectives.

Burke (2003) believes that there should be an increase in the proportion of women on company boards of directors. The benefits of having women on boards are seen in their qualifications, experience, commitment and knowledge (Burke, 1997; 2003). Women directors enhance the board's perspective, influence board discussions in an objective manner and act as mediators (Joecks, Pull, Scharfenkamp, 2019). Women directors also attach great importance to the management of conflict at work. This trait is particularly evident in the case of women board chairs (Furlotti, Mazza, Tibiletti, Triani, 2019). The presence of women on company boards affects the social capital and human capital of the boards (Dang, Bender, Scotto, 2014). Nielsen and Huse (2010) find that presence of female directors on company boards increases their effectiveness. Women reduce the level of conflict. They also contribute to increasing the quality of the board's development activities (Nielsen, Huse, 2010). Women's presence on boards also allows for the creation of a board dynamic that contributes to the diversification of capacities, skills and knowledge (Slomka-Golebiowska, De Masi, Paci, 2023). Gender diversity on boards can also contribute to strengthening the link between a company's entrepreneurial orientation and its performance. Gender diversity on the board also strengthens the strategic commitment of the board (Arzubiaga, Iturralde, Maseda, Kotlar, 2018). When a company is threatened by poor performance, women directors inhibit strategic change. In the opposite situation, women directors are the impetus for strategic change (Triana, Miller, Trzebiatowski, 2014). Women's representation on boards of Norwegian companies at a level of at least three (critical mass) contributes to greater innovation (Torchia, Calabrò, Huse, 2011). The presence of women directors representing employees and shareholders reinforces the innovation of German companies (Joecks, Pull, Scharfenkamp, 2023). Al-Matari and Alosaimi (2022) sought to find a link with the presence of female directors in companies and the market success of the business. The researchers identified a moderately positive relationship (Al-Matari, Alosaimi, 2022). The presence of women directors on company boards promotes better monitoring, more ethical business practices and improved stakeholder relations (Galbreath, 2011).

Conversely, when answering the question of what the presence of women on company boards depends on, it is first necessary to look at the benefits to company boards, companies as a whole and the economy. In recent years, the gender-balancing policy of (mainly European) regulators on firm boards has been crucial for the presence of women on corporate boards. Carbone and Dagnes (2019), based on the experiences of women directors of Italian listed

companies, concluded that discrimination against women is multidimensional and gender quotas in corporate boards are essential. However, women's perceptions of discrimination depend on personal experiences and individual career paths (Carbone, Dagnes, 2019). Huang, Diehl and Paterlini (2020) find that male corporate elites pursue homophily within boards by not including women. In contrast, women behave differently, whose presence on supervisory boards promotes gender diversity on boards. They also point to the effectiveness of quota policies in the gender differentiation of boards in Germany (Huang, Diehl, Paterlini, 2020). Barnes, Lewis, Yarker and Whiley (2019) noted that the growth in the amount of women directors on boards is mainly linked to the increase in non-executive directors. In their view, public attention should now shift from non-executive directors to executive directors and the development of management talent among women (Barnes, Lewis, Yarker, Whiley, 2019). Kim and Kim (2023) concluded, based on the Korean experience, that a greater female presence on company boards promotes a bigger share of women executives, but also blocks other women aspiring to the business board (Kim, Kim, 2023). Similar findings have emerged from UK-based research. It was noted that the greater presence of women on boards is important for gender differentiation in senior management positions (Biswas, Chapple, Roberts, Stainback, 2023). However, the relationship is two-sided. Thus, a key factor that determines women's participation in the boards of Danish companies is the greater number of women in top management positions (Smith, Parrotta, 2018). Skaggs, Stainback and Duncan (2012) surveyed 81 Fortune 1000 corporations on the gender diversity of managers employed by these companies. Their study also concluded that the greater presence of women in corporate leadership positions leads to a greater presence of females on the boards of these companies. In addition, other factors such as the number of female employees in a given company, the company's size, and the length of time the company has been in business also affect the gender mix of boards (Skaggs, Stainback, Duncan, 2012). Burke (1999) came to a similar conclusion. In his view, the female presence on corporate boards is determined by board size and the company (Burke, 1999). Nekhili and Gatfaoui (2013) find that the female presence in French listed companies is also related to the company or board size, but also to family ownership, to their skills and to their network connections. They also recognised the phenomenon of the 'double glass ceiling'. In addition, they pointed out that demographic characteristics are important when appointing women to senior positions (Nekhili, Gatfaoui, 2013). Dimovski, Lombardi and Cooper (2013) found, based on the experience of Australian investment trusts, that female directors were more likely to be employed on boards of directors in larger entities and in entities with larger boards. The presence of women directors on boards was also determined by the location of the entity. In this case it was Sydney (Dimovski, Lombardi, Cooper, 2013). Singh, Vinnicombe and Johnson (2001) studied the representation of women on the boards of UK companies in the FTSE 100 index and concluded that greater diversity in the gender mix of boards of directors can improve company performance. Indeed, more female directors can be found in companies with more employees and higher turnover

and profits (Singh, Vinnicombe, Johnson, 2001). de Jonge (2014) characterised women directors on the boards of listed companies in China and India. The study found that women directors perform above average well in companies operating in the financial services sector as well as in companies with large numbers of employees. In addition, gender diversity on boards in state-owned companies is slightly higher in India than in China (de Jonge, 2014). Terjesen, Aguilera and Lorenz (2015), based on a study of countries that have introduced gender quotas in companies, identified the institutional factors behind gender equality policies. These are: legal arrangements that address gender welfare, the female labour market and left-leaning government coalitions (Terjesen, Aguilera, Lorenz, 2015).

Thus, when considering the reasons that limit the gender balance of boards in companies, it is important to look first at the cultural determinants that translate into legal solutions and business practices. Foppiano-Vilo, Matus-Castillo, Cornejo-Améstica (2022) identified a number of cultural barriers to career advancement for women. These include gender stereotyping, social assignment of specific roles, and masculinised work environments (Foppiano-Vilo, Matus-Castillo, Cornejo-Améstica, 2022). It is the cultural differences between countries that account for the different representation of women on boards of directors in companies - issues of masculinity, uncertainty avoidance, power distance (Gallego, Briones, Barbadillo, 2011). Attention should also be paid to the occurrence of the 'glass ceiling' phenomenon (Bakken et al., 2023; Nekhili, Gatfaoui, 2013). In many companies, women are promoted to a certain level, above which promotion becomes impossible. Very often, women's promotion is also determined by their demographic characteristics (Nekhili, Gatfaoui, 2013). In the case of women directors, there is also the phenomenon of 'ornamental directors'. Furthermore, the reasons for the low representation of women directors on company boards are attributed to both structural problems and the low dissemination of knowledge about the successes of many women directors (signalling problem) (Rowley, Lee, Lan, 2015).

In this backround, it is relevant to refer to women's representation in EBs and SBs of companies quoted on NewConnect.

2. Research method

The subject of the study is therefore the female representation on the governing bodies of companies quoted in the alternative trading system NewConnect (Poland) (‘NewConnect - Lista Spółek’, n.d.).

Descriptive statistics were used to describe the population structure of the number of women and their participation in the boards of NewConnect companies (Holmes, Illowsky, Dean, 2018; Kassyk-Rokicka, 1997; Peck, Olsen, Devore, 2008; Rabiej, 2012; Sheskin, 2000; Sobczyk, 1997; Starzyńska, 2012; StatSoft, n.d.; TIBCO Software Inc., 2017; Wierzbiński, 2008).

The analysis of the properties of the distributions of EB (W), EB women's share (EB (Ws)), SB (W), SB women's share (SB (Ws)) is carried out across measures of mean, measures of dispersion, measures of asymmetry and measures of concentration (Sobczyk, 1997).

Relationships between variables were examined using spread charts and a correlation matrix. A relationship analysis was carried out between variables such as: EB (M), EB (W), EB (T), SB (M), SB (W), SB (T), NoE. The linear correlation coefficient was calculated to determine the direction and strength of the correlation (Holmes et al., 2018; Peck et al., 2008; Rabiej, 2012; Sheskin, 2000; Śmigielski, 2021; Sobczyk, 1997; Starzyńska, 2012; StatSoft, n.d.; TIBCO Software Inc., 2017). The linear correlation coefficient is assumed to be statistically significantly different from 0 when the significance level p for the t-statistic is below 0.05 (Rabiej, 2012, p. 221).

The study verified the veracity of eight null hypotheses[1]:

1. Null hypothesis: There is not statistically meaningful linear correlation among EB (W) and EB (M).
Alternative hypothesis: There is a statistically meaningful linear correlation among EB (W) and EB (M).
2. Null hypothesis: There is not statistically meaningful linear correlation among EB (W) and EB (T).
Alternative hypothesis: There is a statistically meaningful linear correlation among EB (W) and EB (T).
3. Null hypothesis: There is not statistically meaningful linear correlation among EB (W) and SB (M).
Alternative hypothesis: There is a statistically meaningful linear correlation among EB (W) and SB (M).
4. Null hypothesis: There is not statistically meaningful linear correlation among EB (W) and SB (W).
Alternative hypothesis: There is a statistically meaningful linear correlation among EB (W) and SB (W).
5. Null hypothesis: There is not statistically meaningful linear correlation among EB (W) and NoE.
Alternative hypothesis: There is a statistically meaningful linear correlation among EB (W) and NoE.
6. Null hypothesis: There is not statistically meaningful linear correlation among SB (W) and SB (M).
Alternative hypothesis: There is a statistically meaningful linear correlation among SB (W) and SB (M).

[1] Hypotheses were formulated using the textbook: Holmes, A.B., Illowsky, B., Dean, S.L. (2018). *Introductory business statistics*. OpenStax. Houston: Texas Rice University.

7. Null hypothesis: There is not statistically meaningful linear correlation among SB (W) and SB (T).
Alternative hypothesis: There is a statistically meaningful linear correlation among SB (W) and SB (T).
8. Null hypothesis: There is not statistically meaningful linear correlation among SB (W) and NoE.
Alternative hypothesis: There is a statistically meaningful linear correlation among SB (W) and NoE.

Data on EBs and SBs members of individual companies was obtained from the Notoria Serwis information service (https://ir.notoria.pl/) (‘Notoria Serwis S.A.’, n.d.) and the Krs-Pobierz service (https://krs-pobierz.pl/) (‘Krs-pobierz. Wszystkie informacje z KRS’, n.d.). The data on NoE in each company was established based on the Notoria Service information service (https://ir.notoria.pl/) (‘Notoria Serwis S.A.’, n.d.). Data on companies was obtained between 15 March and 19 March 2023. Companies with fewer than 249 employees were included in the research and data on executive and supervisory boards were complete.

For the clarity of further argumentation, the concept of the NewConnect market and the rules of joint-stock companies in Poland need to be clarified. NewConnect is an organised share market operated over the counter. It is operated by the Warsaw Stock Exchange (Poland). This market is intended for SME (‘NewConnect - O Rynku’, n.d.). Companies listed on this market are mainly organised in the joint-stock company form. Polish joint-stock companies have a dual-tier governance system. The company's affairs are conducted by the EB. The EB consists of one or a greater amount of members. EB members are appointed and also dismissed by the SB (the company's articles of association may provide otherwise). The SB's primary task is the ongoing supervision of all areas of the company's business. In public companies, the SB has at least five members. The members of the SB are established and recalled by the shareholders' general meeting (ISAP, n.d.).

3. Research findings

When describing the structure of the EB (W), EB (Ws), SB (W), SB (Ws) populations, I will first refer to measures of mean. A comparison of the arithmetic mean, median and mode shows that the empirical distributions are right asymmetric (Table 1). The median and the mode for EB (W) and SB (W) are lower than the mean. This is also the case for EB (Ws) and SB (Ws). In the distribution of EB (W) and in the distribution of EB (Ws), the most frequent value is 0. This is the case for 286 companies out of 356 surveyed. Furthermore, for EB (W) and EB (Ws), the lower quartile, median and upper quartile were all at 0. In the SB (W) distribution and in the SB (Ws) distribution, the modal values were also at 0. The number of

the modal values was 126. This means that 126 companies had no females in the SB. The median (second quartile) for SB (W) was 1. This shows that there was no less than 1 woman in half of the SBs companies. The remaining half of SBs companies had no more than 1 woman. The bottom quartile of SB (W) was 0, the top quartile was 2. The bottom quartile (first) divides the empirical distribution in the proportion of one-quarter and three-quarters and the top quartile (third) in the proportion of three-quarters and one-quarter (Holmes et al., 2018; Kassyk-Rokicka, 1997; Peck et al., 2008; Sobczyk, 1997; Wierzbiński, 2008). The median SB (Ws) was 0.20, the lower quartile 0 and the upper quartile 0.40.

The analysis of the dispersion measures of the compared EB (W) and SB (W) populations and of the EB (Ws) and SB (Ws) distributions begins with a comparison of the empirical area of variation measured by the range. The range for EB (W) was 3 and for SB (W) 5. For EB (Ws) and SB (Ws) distributions, the range was 1. The quarterly deviation for EB (W) and EB (Ws) was 0. For SB (W) and SB (Ws) distributions, the quarterly deviation was 1 and 0.20 respectively. The standard deviation for EB (W) was 0.51 and for EB (Ws) 0.25. For SB (W), the standard deviation was 1.07 and for SB (Ws) 0.21. The coefficient of variation for EB (W) was 219.94 and for SB (W) 98.96. For EB (Ws) and SB (Ws), the coefficients of variation were 222.16 and 97.87, respectively.

The analysis of the measures of asymmetry in the compared populations shows that the empirical distributions are right-asymmetric, positive in nature. At the same time, the skewness coefficient is significantly higher for the EB (W) and EB (Ws) populations (2.41 and 2.26, respectively) than for the SB (W) and SB (Ws) populations (0.95 and 0.88, respectively). This demonstrates the greater asymmetry of the empirical distributions of two of the first set of populations discussed.

The analysis of concentration measures in the compared populations shows that the empirical distributions have a leptokurtic character. For the data sets under consideration, the kurtosis was above 0. For the EB (W) set, the kurtosis was 6.46; for the EB (Ws) set, the kurtosis was 4.38; for the SB (W) set, the kurtosis was 0.53 and for the SB (Ws) set, 0.42.

Table 1.
Number of women and their participation in NewConnect company boards - descriptive statistics

Variable	EB (W)	EB (Ws)	SB (W)	SB (Ws)
N valid	356.00	356.00	356.00	356.00
Mean	0.23	0.11	1.08	0.21
Median	0.00	0.00	1.00	0.20
Moda	0.00	0.00	0.00	0.00
Count (Modes)	286.00	286.00	126.00	126.00
Minimum	0.00	0.00	0.00	0.00
Maximum	3.00	1.00	5.00	1.00
Lower (Quartile.)	0.00	0.00	0.00	0.00
Upper (Quartile.)	0.00	0.00	2.00	0.40
Range	3.00	1.00	5.00	1.00

Cont. table 1.

Quartile. (Range)	0.00	0.00	2.00	0.40
Variance	0.26	0.06	1.15	0.04
Standard deviation	0.51	0.25	1.07	0.21
Coefficient of variation	219.94	222.16	98.96	97.82
Skewness	2.41	2.26	0.95	0.88
Kurtosis	6.46	4.38	0.53	0.42

Note. Calculations were done using Statistica software (TIBCO Software Inc., 2017). Data for the analyses was obtained from the Notoria Serwis information service (https://ir.notoria.pl/) ('Notoria Serwis S.A.', n.d.) and Krs-Pobierz information service (https://krs-pobierz.pl/) ('Krs-pobierz. Wszystkie informacje z KRS', n.d.).

Eight null hypotheses were verified as being true in the studies on correlation analyses between variables:

1. There is not statistically meaningful linear correlation among EB (W) and EB (M).
2. There is not statistically meaningful linear correlation among EB (W) and EB (T).
3. There is not statistically meaningful linear correlation among EB (W) and SB (M).
4. There is not statistically meaningful linear correlation among EB (W) and SB (W).
5. There is not statistically meaningful linear correlation among EB (W) and NoE.
6. There is not statistically meaningful linear correlation among SB (W) and SB (M).
7. There is not statistically meaningful linear correlation among SB (W) and SB (T).
8. There is not statistically meaningful linear correlation among SB (W) and NoE.

The calculated significance level p is less than 0.05 for hypotheses 1, 2, 5 and 6 (Table 2). This means that these hypotheses should be rejected. For hypotheses 3, 4, 7, 8, the calculated significance level p is greater than 0.05. This means that there are no bases to reject the accepted hypotheses.

Thus, from the analyses of interdependencies between variables, it appears that there are relationships between:

- EB (W) and EB (M),
- EB (W) and EB (T),
- EB (W) and NoE,
- SB (W) and SB (M).

A statistically significant linear correlation exists between these variables. For the correlation occurring between EB (W) and EB (M), the correlation is blurred with a negative value (- 0.1701) (Table 2). The strength of the correlation occurring between EB (W) and EB (T) is medium and its direction is positive (0.4607). There is an indistinct positive relationship between EB (W) and NoE (0.1483). As for the relationship between SB (W) and SB (M), it is clear with a negative direction (-0.8486).

Table 2.
Correlation matrix

	Marked correlation coefficients are significant with p < .05000 N=355 (Missing data were removed by chance)						
Variable	EB (M)	EB (W)	EB (T)	SB (M)	SB (W)	SB (T)	NoE
EB (M)	1.0000	-.1701	.7962	.0235	-.0083	.0302	.2879
	p= ---	p=.001	p=0.00	p=.659	p=.876	p=.571	p=.000
EB (W)	-.1701	1.0000	.4607	-.0227	.0524	.0460	.1483
	p=.001	p= ---	p=0.00	p=.670	p=.325	p=.388	p=.005
EB (T)	.7962	.4607	1.0000	.0072	.0247	.0554	.3504
	p=0.00	p=0.00	p= ---	p=.892	p=.643	p=.298	p=.000
SB (M)	.0235	-.0227	.0072	1.0000	-.8486	.4463	.0032
	p=.659	p=.670	p=.892	p= ---	p=0.00	p=.000	p=.952
SB (W)	-.0083	.0524	.0247	-.8486	1.0000	.0947	.0489
	p=.876	p=.325	p=.643	p=0.00	p= ---	p=.075	p=.358
SB (T)	.0302	.0460	.0554	.4463	.0947	1.0000	.0888
	p=.571	p=.388	p=.298	p=.000	p=.075	p= ---	p=.095
NoE	.2879	.1483	.3504	.0032	.0489	.0888	1.0000
	p=.000	p=.005	p=.000	p=.952	p=.358	p=.095	p= ---

Note. Calculations were done using Statistica software (TIBCO Software Inc., 2017). Data for the analyses was obtained from the Notoria Serwis information service (https://ir.notoria.pl/) ('Notoria Serwis S.A.', n.d.) and Krs-Pobierz information service (https://krs-pobierz.pl/) ('Krs-pobierz. Wszystkie informacje z KRS', n.d.).

4. Discussion

The issue of women's presence on company boards was considered at four levels, i.e. individual, board, company and surrounding environment (Terjesen et al., 2009). At each of these levels, the benefits of greater gender diversity in company boards have been identified. At the individual level, these are related to women's qualifications, experience and knowledge (Burke, 1997; 2003). At the company board level, gender diversity leads to improved social and human capital for boards (Dang et al., 2014), increases the efficiency of the boards (Nielsen, Huse, 2010), and improves their dynamics (Slomka-Golebiowska et al., 2023) and strengthens the strategic commitment (Arzubiaga et al., 2018). At the company level, the gender diversity of boards can contribute to initiating strategic change (Triana et al., 2014), greater innovation (Joecks et al., 2023; Torchia et al., 2011), or improving the performance (Singh et al., 2001). Also promotes better monitoring of different areas of the company's operations (Galbreath, 2011). At the level of the company environment, the benefits of greater gender diversity of the councils are related to improved ethical business practices or stakeholder relations (Galbreath, 2011). Gender diversity of corporate boards can also strengthen a company's market success (Al-Matari, Alosaimi, 2022).

In this context, the question should be asked whether and to what extent the results of international research on the benefits of the presence of women on corporate boards can be applied to the situation in companies listed on the NewConnect market? It is first appropriate to refer to the very presence of women in the EBs and SBs of NewConnect companies, and then

to consider the potential benefits. It is important to highlight at this point, however, that a company can only benefit from the existence of women in the EB and SB if this presence exists and is significant. This is because it is essential to note here the concept of "critical mass" (Torchia et al., 2011). After all, the critical mass is related to the minimum number of women on the company's board, which is the source of positive change. In the case of NewConnect companies, as many as 286 companies out of 356 surveyed had no women on the EBs of companies at all, and the position of CEO ('president') was held by women in only 27 companies. A total of 82 women sat on the EBs of 70 companies, with more than one woman in 10 companies and more than two women in 2 companies. In the case of the SBs, the situation regarding the representation of women on boards looked slightly better. There were no women in the SBs in 126 companies out of 356 surveyed. The function of SB chairperson was held by women in 38 companies[2]. In total, there were 385 women on the SBs of 230 companies, with more than one woman in 106 companies and more than two women in 35 companies. Statistics on the representation of women on the EBs and SBs of NewConnect companies show that boards have a low level of gender diversity. There are particularly few female executive directors. The picture is somewhat better for women non-executive directors. So what conclusions can be drawn from this. Potential benefits can be seen primarily in the area of monitoring, for which SBs are responsible. On the other hand, the very low degree of gender diversity of EBs does not allow for an analysis of potential benefits. Instead, the reasons why the boards of NewConnect companies have such a low degree of gender diversity require in-depth research. Further research should also consider the corporate determinants of women's advancement in NewConnect companies. Gender quotas in NewConnect companies do not apply.

International research shows that male corporate elites, unlike women, do not favour gender diversity on boards (Huang et al., 2020). The representation of female directors on company boards is also determined by the board's size or the greater amount of employees in the firm (Burke, 1999; Dimovski et al., 2013; Singh et al., 2001). A study was therefore made of the relationships in NewConnect companies between EB (W) and: EB (M); EB (T); SB (M); SB (W); NoE. Also examined were the relationships occurring between SB (W) and: SB (M); SB (T); NoE. Statistically significant linear correlations were found for the relationships occurring between: EB (W) and EB (M); EB (W) and EB (T), EB (W) and NoE and SB (W) and SB (M). There is a moderately strong correlation with a positive direction between EB (W) and EB (T). This means that more female directors are found in EBs with more members. In contrast, a strong linear correlation with a negative direction occurs between SB (W) and SB (M). This means that an increase in the female share of the SB is accompanied by a decrease in the male share. In the other two cases, the strength of the linear correlation was weak.

[2] Data on the gender of the chairperson of the supervisory board was only available for 65% of the companies surveyed.

5. Conclusions

In summary, the analysis of the average measures shows that women are more represented in the SBs of NewConnect companies than in the EBs. However, the share of women in the companies' boards is very low. The analyses of correlations between variables show that there are correlations occurring between:

- EB (W) and EB (M) (unclear correlation with a negative value),
- EB (W) and EB (T) (moderate positive correlation),
- EB (W) a NoE (unclear positive correlation),
- SB (W) a SB (M) (strong correlation with negative value).

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

FACTORS SHAPING ORGANIZATIONAL LEADERSHIP IN INDUSTRY 4.0 CONDITIONS

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Purpose: The main objective of the study is to identify the factors shaping organizational leadership in Industry 4.0 conditions.
Design/methodology/approach: The research is conducted based on an extensive and thorough analysis of literature from open-access platforms such as Google Scholar, ResearchGate, Scopus, and Sciencedirect. The literature search primarily involved using keywords such as "Leadership", "Leadership 4.0", and "Industry 4.0".
Findings: The article discusses the factors shaping organizational leadership in the context of Industry 4.0. The lack of a unified and precise definition of leadership has led to various interpretations in scientific literature, resulting in subjectivity among researchers and discrepancies in understanding the concept. Conducting an in-depth literature review allowed for the identification of four areas that shape organizational leadership in Industry 4.0, namely the pillars of Industry 4.0, leader attributes, leadership styles, and leader functions. Breaking down these areas into smaller elements provides a foundation for further research, enabling the exploration of correlations between individual factors and their impact on Leadership 4.0.
Originality/value: Identification of factors shaping organizational leadership in the context of Industry 4.0, which can serve as a foundation for conducting further research.

Keywords: Industry 4.0. Leadership 4.0, Digital Transformation, Technology in Business.

Category of the paper: Literature Review.

1. Introduction

Leadership in organizations is a complex and significant issue, occupying a crucial place in the field of contemporary organizational science and management (Mrówka, 2009). Despite intensive research, a complete description of this concept and phenomenon remains incomplete, opening perspectives for further research, interpretations, and the creation of new theories and models (Dartey-Baah, 2009; Tokar, 2010; Mrówka, 2010; 2021; Podgórska, 2014; Mazurkiewicz, 2015; Soliński, 2023; Dębicka, 2023). Leadership is a multidimensional

phenomenon, encompassing various psychological, social, and organizational aspects (Pichlak, 2011; Malinowski, 2013). Effectively understood and utilized leadership can play a crucial role in shaping an organization's success. In Industry 4.0, where innovations and technological transformations are key to success, organizational leadership plays a vital role in achieving strategic goals and maintaining a competitive market position. Factors shaping leadership in these modern conditions are immensely important for ensuring smooth organizational functioning and effective management strategies implementation.

The main objective of this study is to identify the factors shaping organizational leadership in Industry 4.0 conditions based on a literature review in the fields of leadership, Industry 4.0, and Leadership 4.0. Such an approach will help pinpoint the key factors influencing effective organizational management in the era of Industry 4.0, which is crucial for ensuring their smooth functioning and achieving strategic goals while maintaining a competitive market position.

2. Definition of leadership

Reviewing the literature, it is impossible to find one specific definition of leadership (Dartey-Baah, 2009; Tokar, 2010; Mrówka, 2010; 2021; Podgórska, 2014; Mazurkiewicz, 2015; Soliński, 2023; Dębicka, 2023). This is evidenced by research conducted by J.C. Rost, who, while reviewing literature from 1900 to 1990, found 200 different definitions of leadership, confirming the multitude of interpretations of such a statement (Rost, 1991; Northouse, 2021). Table 1 presents examples of several leadership definitions from the 20th and 21st centuries in chronological order.

Table 1.
Definitions of leadership in the 20th and 21st centuries

Definition	Year
Leadership is the ability to impress the will of the leader upon those who are led and evoke obedience, respect, loyalty, and cooperation.	1927
Leadership is any activity that influences the attitude of a group.	1959
Power means every opportunity that someone's will, even despite resistance, will be enforced within a social relationship, regardless of what this chance concerns.	1972
Leadership is the ability to take certain actions or generate ideas within a specific group (organization, society) that attract and focus the members of that group over the long term.	1987
Leadership is the ability to influence or wield power within social communities.	1988
Leadership involves using influence without resorting to coercive means.	1989
Leadership is the power of one or several individuals to influence a group and shape its own policies.	1993
Leadership is the perceived willingness by other members of the organization to exert or self-exert influence on the thoughts, feelings, and actions of its members in line with the organization's goals.	1996
Leadership is the process of influencing a group to achieve common goals through motivation, inspiration, and mobilization.	2002

Cont. table 1.

Leadership is the process of influencing a group to achieve common goals through coordination, motivation, and mobilization.	2009
Leadership is skillfully influencing individuals by tapping into their potential, enabling them to strive for greater good.	2021

Source: Own elaboration based on: (Moore, 1927; Morris, 1959; Weber, 1972; Gleick, 1987; Abercrombie, 1988; Yukl, 1989; Bogdanor, 1993; Smith, 1996; Yukl, 2002; Adair, 2009; Mrówka, 2010; Blanchard, 2021).

Definicja The definition of leadership largely depends on the point of view, leading to the development of various theoretical concepts (Karwowski, 2009). The most popular concept of leadership posits the existence of four leadership styles: autocratic, participative, democratic, and laissez-faire (Bucurean, 2016; Żuchowski, 2018).

- An autocratic leader is an individual who exercises power in an absolute manner and concentrates immense authority in their hands. This type of leadership is characterized by the leader making decisions independently without consulting the group. The leader employs strict control and supervision methods, demanding obedience and execution of orders without discussion. Such a leader prioritizes efficiency and achieving results, but it may lead to a loss of engagement, motivation, and innovation within the team (Kwiatkowski, 2011; Żuchowski, 2018; Chukwusa, 2018);
- A participative leader is someone who emphasizes collaboration, engages employees, and considers their opinions in the decision-making process. Such a leader creates an atmosphere of trust and openness, encouraging team members to share ideas, suggestions, and constructive criticism. The participative leader actively listens, appreciates diverse perspectives, and facilitates collective reflection on issues and solutions (Brahim, 2015; Wang, 2022; Khassawneh, 2022);
- A democratic leader in an organization is an individual who emphasizes a balance between employee participation and decision-making. Such a leader involves team members in the decision-making process, listens to their opinions, and considers diverse perspectives. The democratic leader promotes open communication, collaboration, and knowledge sharing, enabling team members to participate in making key organizational decisions. This approach contributes to a greater sense of engagement, motivation, and trust among employees (Gastil, 1994; Sharma, 2012);
- A laissez-faire leader in an organization is an individual who exhibits minimal intervention in the daily operations and decisions of their team. Such a leader delegates responsibility to team members, giving them freedom in decision-making and task execution. The laissez-faire leader creates an environment in which employees have autonomy and independence in their actions, while the leader plays a supportive role and provides necessary resources. In such an environment, team members can develop their skills, creativity, and initiative (Chaudhry, 2012; Robert, 2021; Iqbal, 2021).

Other styles into which leadership can be decomposed are transactional and transformational (Birasnav, 2014; Deichmann, 2015; Klein, 2023; Abbas, 2023).

- Transactional leadership in an organization refers to a leadership style where the leader focuses on exchanging rewards and punishments in return for the completion of specific tasks by subordinates. It is based on the principle of transactions between the leader and team members, where rewards are offered for achieving goals, and punishments are applied in case of non-compliance with expectations;
- Transformational leadership in an organization is a leadership style that focuses on creating profound and lasting changes through inspiration, motivation, and the development of team members. The transformational leader aims to transform both themselves and others by creating a vision, strengthening commitment, and mobilizing collective efforts to achieve higher goals together.

To gain a better understanding of the essence of leadership, it is worth familiarizing oneself with the functions that a leader fulfills. By delving into these functions, it will be possible to grasp the full scope of responsibility and role that leadership plays in effectively guiding a group or organization. Conducting a literature review, the functions of a leader can be decomposed as follows (Steele, 2022):

- Performance assessment and providing feedback;
- Planning, coordinating, and monitoring;
- Challenging assumptions;
- Distributing rewards and recognizing achievements;
- Developing team members;
- Scanning and sensing the environment;
- Setting and clarifying goals;
- Securing and allocating resources;
- Providing autonomy;
- Managing social relationships.

Table 2 presents the assigned statements to specific leadership functions.

Table 2.
The functions of the leader in the development of specific statements

Group	Statement
Performance assessment and providing feedback	The leader gives feedback comments to employees after a task is completed.
	The leader performs inspections according to the relevant inspection procedures.
	The leader informs employees about performance standards.
	The leader monitors the team's performance.
	The leader identifies performance gaps.

Cont. table 2.

Planning, coordinating, and monitoring	The leader defines the balance of needs.
	The leader makes cyclical observations of progress toward goals.
	The leader acts according to a program to achieve specific goals.
	The leader formulates the organization's strategy.
	The leader coordinates activities so that they are the next steps in the strategy.
	The leader shapes the image and the right attitudes toward the organization.
	The leader imposes a strategy for change in the organization.
	The leader periodically controls the adopted management system of the organization.
	The leader plans activities that are included in the organization's mission.
	The leader focuses on improving the organization's operations.
	The leader synchronizes the activities of all levels of the organization.
	The leader skillfully manages time.
	The leader implements actions to improve performance.
	The leader chooses appropriate methods to achieve goals.
	The leader chooses the fundamental direction of the organization.
	The leader uses interactive visual aids of the planning process.
	The leader sets performance standards.
Challenging assumptions	The leader challenges assumptions made by members of the organization.
	The leader encourages open debate among employees.
	The leader stimulates employees' intellectual curiosity.
	The leader challenges assumptions in a way that respects employees.
	The leader is open to different perspectives.
Distributing rewards and recognizing achievements	The leader tailors the incentive system to the needs and requirements of employees.
	The leader gets to know the individual needs and expectations of the employees.
	The leader makes demands on the employee tailored to him.
	The leader has implemented a system to motivate employees for well and poorly performed tasks.
	The leader positively influences employees' loyalty and integrity to the organization.
Developing team members	The leader voluntarily communicates his knowledge.
	The leader makes open communication.
	The leader inspires and stimulates action.
	The leader is a role model.
	The leader gives direction to accelerate the adaptation of new employees.
	The leader helps members of the organization reach a common understanding.
	The leader stimulates employees for personal development.
	The leader supports employees in pursuing career paths.
	The leader encourages employees to be creative.
	The leader encourages employees to develop.
	The leader provides employees with expertise.
	The leader provides employees with training to develop competencies.
Scanning and sensing the environment	The leader analyzes potential threats.
	The leader analyzes regional and global relationships.
	The leader identifies opportunities and threats to the organization.
	The leader is a creator of creative ideas.
	The leader focuses on the organization's environment.
	The leader creates the future.
	The leader monitors opportunities and threats arising in the organization.
	The leader observes macroeconomic changes.
	The leader forecasts potential losses.
	The leader makes changes faster to be implemented and accepted by employees.

Cont. table 2.

Setting and clarifying goals	The leader creates an appropriate vision for the organization.
	The leader gives the organization direction.
	The leader sets specific goals for the organization.
	The leader leads the company to achieve success.
	The leader communicates and clarifies goals to the various levels of the organization.
	The leader stimulates employees to perform actions that are in line with the organization's goals.
	The leader establishes a course of action.
	The leader aligns activities to achieve the goal.
	The leader sets tasks in accordance with the law.
Securing and allocating resources	The leader creates conditions for effective work.
	The leader provides employees with appropriate equipment.
	The leader provides employees with adequate information.
Providing autonomy	A leader empowers employees to take action freely.
	The leader delegates authority.
	The leader allows employees to undertake risky ventures.
	A leader disseminates a vision of development to the organization.
Managing social relationships	The leader involves all employees of the organization.
	The leader takes into account the opinion of employees.
	The leader ensures a positive work atmosphere.
	The leader aligns the organization's activities with others to achieve goals that are impossible to achieve individually.
	The leader is an authority for other employees.
	The leader carries out activities aimed at uniting social groups.
	The leader creates positive relationships among employees.
	The leader manages the flows and dependencies between activities.
	The leader meets the needs of the group.

Source: Own elaboration based on: (Jeżak, 1990; Malone, 1994; Grant, 1996; Ziębicki, 2000; Peters, 2001; Sitkin, 2005; Antoszkiewicz, 2007; Karaszewski, 2008; Oleksyn, 2008; Gołębiewski, 2009; Lumpkin, 2009; Williams, 2009; Olausson, 2010; Penc, 2010; Kisielnicki, 2012; Janasz, 2013; Skoczylas, 2013; Carnall, 2014; Hysa, 2014; Mesjasz, 2014; Kania, 2015; Smolarek, 2015; Karpacz, 2016; Łużniak, 2016; Karna, 2017; Verburg, 2017; Sienkiewicz, 2018; Zheng, 2019; Steele, 2022).

This division of leadership functions encompasses both management and team development aspects. The leader is responsible for formulating strategies, motivating team members, maintaining harmonious relationships, and ensuring that resources are well-managed. The leader should also challenge existing assumptions, be aware of the environment, and anticipate changes to make appropriate decisions. Developing team members is crucial for ensuring long-term success and organizational growth.

3. Leadership in Industry 4.0

The dynamics of the context, rapid technological transformations, and intense global competition compel organizations to continually search for new strategic solutions that will enable them to gain a competitive advantage (Rogozińska-Pawełczyk, 2022). This has led to the emergence of the term Industry 4.0, referring to the fourth industrial revolution (Davies, 2015; Bendkowski, 2017; Skórnóg, 2023), which is a result of the development of information

technology and robotics (Cellary, 2019). Industry 4.0 promotes production efficiency through intelligent data aggregation, making sound decisions, and their reliable implementation. The use of cutting-edge technologies allows simplifying the processes of data collection and interpretation. Interoperability serves as a strategic bridge, enabling the establishment of a reliable production environment within Industry 4.0 (Qin, 2016; Rupp, 2021). Based on the concepts of Tay (2018) and Vinitha (2020), a literature review decomposed Industry 4.0 into the following pillars:

- Big Data - a collection of complex data that cannot be processed using conventional applications. The main idea behind this concept is to enable real-time data analysis. This task is not easy as data often have an unstructured format, which, combined with a large influx of data, leads to an increased demand for computational power. To avoid constant investments in better machines, horizontal scaling has been introduced, which involves adding more machines (Racka, 2016; Wang, 2023; Jahani, 2023);
- Simulations - a method of analyzing processes or systems using real-time data to support decision-making. It enables forecasting outcomes and optimizing machine settings in a virtual environment. This shortens machine configuration time and improves quality. A modern approach involves modeling production systems using virtual factories (Rodič, 2017; Moraes, 2023; Cimino, 2023);
- Internet of Services - plays a crucial role as an essential element in the automotive industry. Processes are initiated through data transfer in information technology, aiming to provide daily mobility in a safe, simpler, and enjoyable manner. It enables the delivery of on-demand services through the internet based on various types of digital services (Buxmann, 2009; Khodadadi, 2017; Reis, 2018; Anrijs, 2023);
- Augmented Reality - is a technology that blurs the boundaries between the virtual and real world. It enables the implementation of new capabilities and efficiencies in processes. This technology supports work by reducing the time needed for its execution and minimizing the chance of potential errors using goggles that provide the operator with necessary information in real-time (Carmigniani, 2011; Bottani, 2019; Jayawardena, 2023; Yin, 2023);
- Cyber-Physical System - This term refers to the new generation of systems that combine integrated capabilities and computational power, enabling interaction with humans through computation, communication, and control. It is a key factor facilitating future technological advancements (Krogh, 2008; Baheti, 2011; Lee, 2015);
- Additive Manufacturing, also known as 3D printing, is a production process based on layer-by-layer deposition of material to create three-dimensional objects. This method utilizes various techniques such as sintering, bonding, or curing to gradually build the object's structure. Additive manufacturing is characterized by several benefits, including the ability to create custom shapes, reduce production time, and minimize waste

generation. It finds applications in various fields, including prototyping, spare part production, medicine, and architecture. In the context of Industry 4.0, additive manufacturing plays a key role, contributing to the flexibility, customization, and efficiency of production processes (Siemiński, 2015; Dilberoglu, 2017; Dodziuk, 2019; Calignano, 2023);

- Internet of Things (IoT) - a concept in which objects are interconnected in a communication network. IoT devices collect, process, and share data. It enables monitoring, control, and process optimization. Integrating IoT with Industry 4.0 supports dynamic response and efficient information exchange while generating vast amounts of data that, with proper analysis, can support decision-making processes (Mukhopadhyay, 2014; Rose, 2015; Kosik, 2019; Balicka, 2023; Zdun, 2023; Nalajala, 2023);
- Cloud Computing - is a component that enables smooth digital transformation. Through the network, it allows the delivery of computing resources such as servers, databases, applications, or storage. These resources are provided on-demand based on central management by the cloud service provider. This technology enables remote access and resource sharing efficiently and flexibly. It is characterized by scalability, reliability, and fault tolerance through the distribution of resources across multiple physical servers (Krok, 2017; Srivastava, 2018; Abdullayeva, 2023; Al-Jumaili, 2023);
- Autonomous Robots - are robots capable of performing tasks and making decisions independently, without the need for constant human supervision. They are equipped with sensors such as cameras, touch sensors, or navigation systems that enable them to gather information about their surroundings. Using this data, autonomous robots analyze and interpret the environment, taking appropriate actions. They can autonomously plan routes, avoid obstacles, manipulate objects, or collaborate with other robots. Autonomous robots find applications in various fields, performing complex tasks efficiently and independently from humans (Fahimi, 2009; Ardito, 2012; Gajdzik, 2019; Goel, 2020; Rose, 2023).

The increasing aspirations of organizations to pursue development determine a growing demand for employees who possess competencies enabling the organization to be directed towards success (Gajdzik, 2021; Rogozińska-Pawełczyk, 2022). This process has led to the emergence of the first concepts of Leadership 4.0. In Industry 4.0, leadership plays a significant role due to the need for making decisions on an organizational scale (Kasapoglu, 2018). Leadership in Industry 4.0 is defined as *the ability to quickly adapt and engage empowered, networked teams with clarity of goals and solutions focused on their achievement* (Rogozińska-Pawełczyk, 2022). A leader should possess the appropriate knowledge, digital skills, vision, understanding of customers, risk-taking ability, and collaborate with others (Bawany, 2019; Dabic, 2023). The literature does not describe the attributes of Leadership 4.0 in a fully specified manner (Kim, 2005; Mdluli, 2017; Bolte, 2018; Oberer, 2018; Kelly, 2018;

Rogozińska-Pawełczyk, 2022). One concept decomposes leadership for the blue ocean attributes such as vision, courage, passion, strategic thinking, planning, focus, collaboration, innovation, readiness for change, and communication (Rogozińska-Pawełczyk, 2022). Another division includes attributes such as responsibility, systemic leadership, adaptive leadership, and shaping society (Rogozińska-Pawełczyk, 2022). Meanwhile, F. Herder-Wynne identified seven attributes of leadership: engagement capability, trust, authenticity, networked team, fast adaptation, transparency, and agility (Herder-Wynne, 2017; Rogozińska-Pawełczyk, 2022). All of the mentioned attributes are necessary predispositions that enable a person to fulfill the role of a leader within Industry 4.0.

4. Factors shaping organizational leadership in Industry 4.0

Based on the literature review described in earlier chapters, a model was developed, as shown in Figure 1.

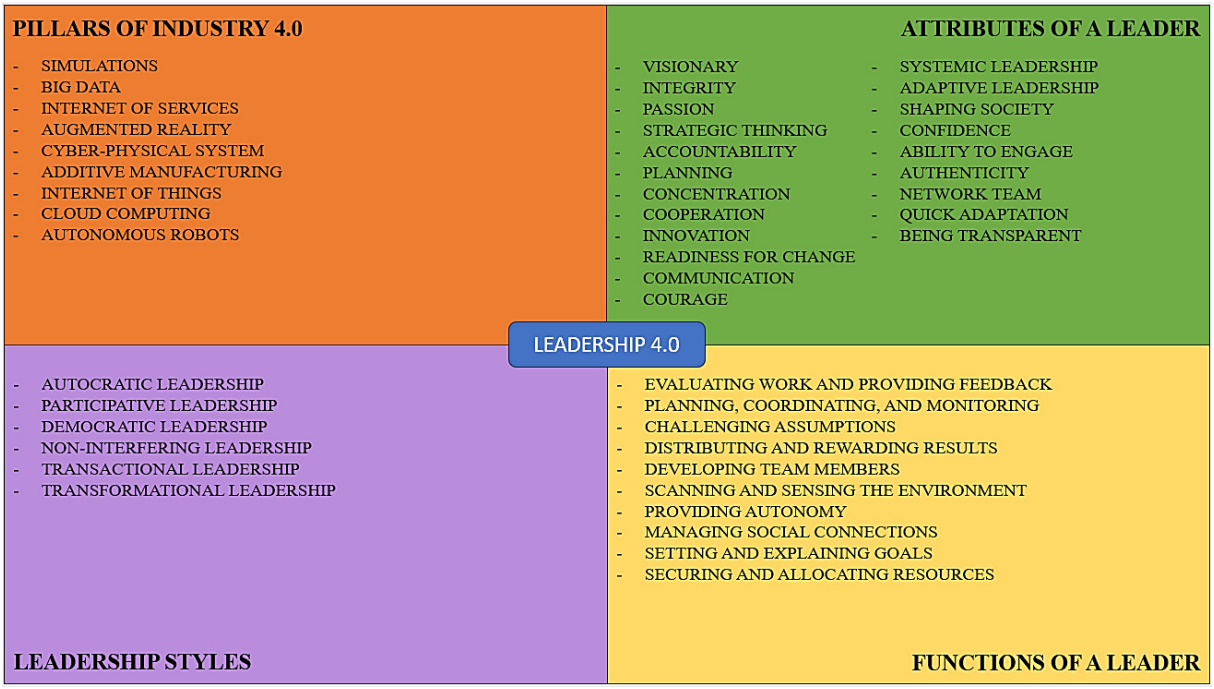

Figure 1. Factors shaping Leadership 4.0.

Source: Own elaboration.

Leadership in the context of Industry 4.0 is a complex process shaped by various factors. Figure 1 illustrates four groups of factors influencing Leadership 4.0. These include the pillars of Industry 4.0, leader attributes, leader functions, and leadership styles.

The first group is "Pillars of Industry 4.0," which includes key technologies and elements characteristic of this industrial revolution. Among them, we can include simulations, big data, Internet of services, augmented reality, cyber-physical systems, additive manufacturing,

Internet of things, cloud computing, and autonomous robots. Implementing the pillars of Industry 4.0 implies diverse requirements placed on the leader, arising from the individual characteristics of each pillar.

The second group is "Leader Attributes," which are crucial for effective leadership in Industry 4.0. Among these characteristics are vision, agility (the ability to respond flexibly to changes), passion, strategic thinking, responsibility, planning, focus, collaboration skills, innovation, adaptability, effective communication, courage, systemic leadership, the ability to shape society, building trust, engagement, authenticity, and the ability to create networked teams.

The third group is "Leadership Styles," which differ in their approach to managing and motivating teams. In the context of Industry 4.0, several leadership styles are distinguished: autocratic leadership, where decisions are made centrally; participative leadership, which involves employees in the decision-making process; democratic leadership, which is based on cooperation and consensus; laissez-faire leadership, which provides employees with autonomy; transactional leadership, which is based on rewards and punishments; and transformational leadership, which focuses on motivating and inspiring the team towards achieving higher goals.

The fourth group is "Leader Functions," which determine the various tasks and roles that a leader must fulfill in the Industry 4.0 environment. These functions include performance evaluation and providing feedback, planning, coordinating, and monitoring actions, challenging assumptions, distributing and rewarding outcomes, developing team members, analyzing the environment and taking appropriate actions, ensuring autonomy in work, managing social relationships, setting and clarifying goals, and effectively managing and allocating resources.

5. Conclusion

This study focused on the multi-faceted nature of leadership and its evolution in the context of technological advancements, particularly in the Industry 4.0 era. The analysis of the literature review allowed for the identification of key factors shaping organizational leadership in the Industry 4.0 environment.

The research results showed that a significant aspect of leadership is its impact on the group. Valuable insights were also derived from the identification of four main groups of factors influencing leadership in Industry 4.0: the pillars of Industry 4.0, leader attributes, leader functions, and leadership styles.

Decomposing these areas into smaller elements provides a basis for further research, which can explore the correlations between individual factors and their impact on Leadership 4.0. Such research can contribute to a deeper understanding of the complex nature of leadership in

the Industry 4.0 era and may provide guidance for organizations in effectively managing and achieving strategic goals.

The study conducted based on the literature review has its limitations, which may affect the generalization of the conclusions. Primarily, due to the nature of the literature review, there is no possibility to conduct personal measurements and observations on a live sample. This limitation may impact the completeness and accuracy of available data and the ability to detect hidden dependencies. Despite the careful selection of articles for analysis, there is a risk that some key studies or results may have been overlooked, which could affect the completeness of the analysis. Therefore, there is a need for further research, which should be conducted on larger population samples, considering empirical studies to expand the findings. Research using empirical data would allow for a more precise understanding of the relationship between factors shaping leadership in Industry 4.0 and actual behaviors and outcomes in organizations.

Despite the limitations, this work represents a significant step towards understanding and defining leadership in the Industry 4.0 era, which could positively impact the effectiveness of managing organizations in the modern industrial environment.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

THE AMBIDEXTROUS UNIVERSITY CONCEPT: BALANCING EXPLOITATION AND EXPLORATION IN HIGHER EDUCATION

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Purpose: The purpose of this study is to evaluate the potential of ambidexterity as a strategy for the development of public universities. The study aims to identify the benefits of adopting ambidexterity in public universities and highlight the importance of integrated management concepts and methods in the transformation of traditional universities into ambidextrous organizations.
Design/methodology/approach: To achieve the study's objective, a bibliometric analysis and literature review were conducted to examine previous research on ambidexterity and its relevance to public universities. Additionally, a review and discussion of selected organizational system models were undertaken to outline the concept of an ambidextrous system functioning. This study focuses on seven areas of integration, which are crucial for ambidexterity in organizations.
Findings: The results of the study suggest that implementing the concept of ambidexterity can significantly contribute to the development of public universities. The study finds that the design and implementation of integrated management concepts and methods are viewed as a game changer in management. In the context of transforming traditional universities into ambidextrous organizations, integrated management concepts can play a critical role in ensuring a balanced exploration and exploitation of new opportunities.
Originality/value: This paper provides insights into the benefits of adopting ambidexterity as a strategy for public universities. The study highlights the importance of a systemic model review and discussion, which is the most useful in ambidextrous organization. This research can help public universities improve their management strategies and achieve their long-term goals in a rapidly changing environment. The study's originality lies in its focus on identifying the benefits of adopting ambidexterity in public universities and highlighting the importance of integrated management concepts and methods in the transformation of traditional universities into ambidextrous organizations.

Keywords: ambidexterity, ambidextrous university, ambidextrous structure, process and project orientation, process-project organization.

Category of the paper: Conceptual paper.

1. Introduction

The activity of contemporary public universities, both in the areas of teaching and research and development processes as well as scientific project implementation, constitute an important part of the economic environment and should serve as a driver of civilizational development. Universities are facing a rapidly changing environment, driven by technological advancements and increasing competition, which requires them to constantly adapt and innovate (Cakmak. Uzunboylu, 2018). In recent years, there has been a growing recognition of the need to move away from traditional university models towards more entrepreneurial and innovative models that better respond to the needs of the modern society (Kasavin, 2021).

From the perspective of university stakeholders, the expectation is first and foremost to increase knowledge, but also to generate a system state in which they can discount the benefits of scientific development. However, achieving these goals requires universities to balance the need for both exploitation of existing knowledge and exploration of new knowledge (March, 1991). The tension existing between these two activities can be relevant not only to companies, but to public organizations as well, including public universities. One possible solution to this challenge can entail implementation of ambidexterity concept. The activities of ambidextrous organizations can be oriented towards both exploitation of the existing profit-generating opportunities as well as exploration and discovery of new opportunities for organizational development (O'Reilly, Tushman, 2004). Research on ambidextrous organizations focuses on the organizational level, taking the antecedents and consequences of exploratory and exploitative activities into account (O'Reilly, Tushman, 2013). One important aspect of research in this area also entails the impact of individual organizational participants on the organization's capacity to balance exploitative and exploratory activities (Zhang et al., 2022).

As a result of the theoretical study carried out for the purpose of this article, a cognitive gap has been identified, consisting in the paucity of publications presenting the implementation of the assumptions of ambidexterity concept, with particular emphasis on universities. This should be discerned as a research frontier allowing exploration and design of integrated system formulas for organizational management in the public sector exists. The challenges faced by contemporary public universities, as well as the cognitive gap identified, highlight the need for further research on the implementation of ambidexterity in universities.

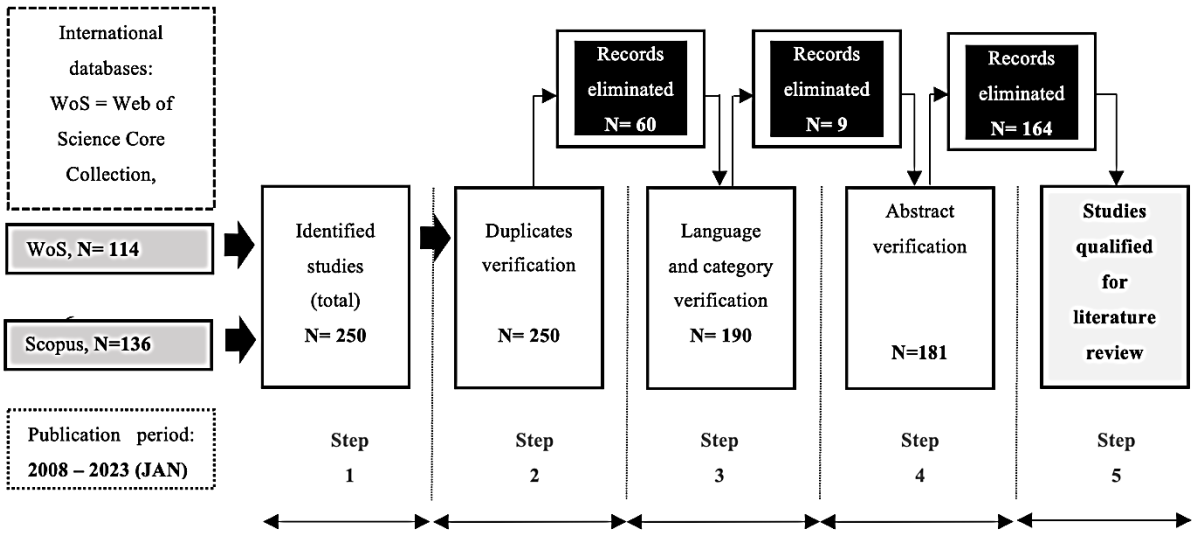
Therefore, the main objective of this paper is to identify, based on literature studies and a participatory observation of the activities aimed at process optimization at a public university, the factors supporting and limiting the implementation of the ambidexterity assumptions as a strategy for university development. In pursuit of the main objective, the following sub-objectives were formulated:SO1: Assessment of the current state of knowledge regarding the implementation of ambidexterity concept at universities. SO2: Overview of the system models supporting the implementation of the ambidextrous organization assumptions.

SO3: Conceptualization of a university system model, adopting the assumptions of the ambidexterity organization concepts.

This paper is a conceptual and theoretical study that aims to identify the factors that support and limit the implementation of an integrative approach in the management of public universities, with a particular emphasis on the ambidexterity concept.

2. Research design

To identify the current state of knowledge regarding the implementation of the assumptions of the described ambidexterity concept within university settings, a theoretical study was carried out. Such research methods as bibliometric analysis and literature review were used. The search for relevant publications involved the use of the raw data generated in two knowledge databases, Web of Science Core Collection and Scopus, which were then subjected to selection, extraction, analysis and synthesis (Tranfield et al., 2003). A publication selection approach was used, entailing a database search, extended in the methodology adopted to include publication titles, abstracts and keywords (Crossan, Apaydin, 2010). The temporal scope of the study covers the years 2008-2023, which is the period outlying the framework of the study, i.e., from the first publication identified in the Web of Science and Scopus databases to the year of the study. The five-step process of identifying the works qualifying for the literature review is shown in Figure 1.



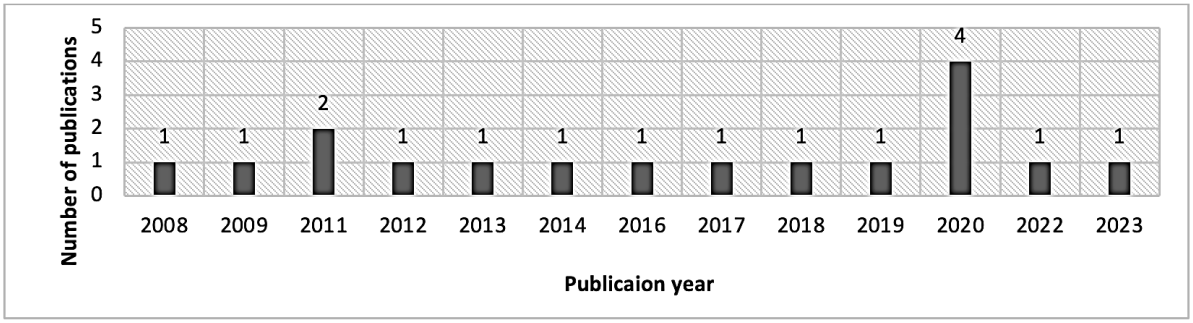
* Query: (‘ambidexterity’ OR ‘ambidextrous’) AND (‘university’ OR ‘college’ OR ‘higher education’ OR ‘polytechnic’ OR ‘institution of higher learning’ OR ‘technical university’).
** Knowledge base search criteria: WoS: topic, Scopus: title, topic, keywords.
*** Only documents such as articles, proceeding papers and book chapters were included in the study.

Figure 1. The process of identifying documents qualifying for literature review.

Source: Authors’ elaboration based on Web of Science Core Collection and Scopus, 25.01.2023.

As Figure 1 shows, based on the search query formulated, only 17 documents, out of the 250 identified, were qualified for the literature review. During the selection process, articles under database categories other than management, business, operations research management science (WoS), as well as business, management and accounting (Scopus), including papers written in languages other than English, were eliminated from the study. At the stage of abstract evaluation, documents addressing the issue of ambidexterity in the academic dimension, yet dealing not with the areas of strategy, system and organizational structure, but with, inter alia, the use of ambidexterity in teaching processes (Rezende et al., 2016), HR ambidextrous systems (Yasmeen et al., 2022), IT ambidexterity (Taleb, Pheniqi, 2022), tactics of ambidextrous model building for university lifelong learning (Zuo et al., 2014) or inclusion of ambidexterity at the level of academics (Kobarg et al., 2017), were additionally excluded from the sample.

The extracted collection of 17 publications allowed for the review of the literature on the subject, and therefore achievement of the theoretical objective of the article involving assessment of the current state of knowledge at the interface between the concepts of ambidexterity and university management. As a result of the elimination process, researchers focus on the growing interest in the concept of ambidexterity has been noted. Kassotaki (2021), in a review of 122 articles published since 1991, highlighted that researchers have studied ambidexterity from various angles, under different literature streams. Helbin (2019), Helbin and Van Looy (2021) note in their work that ambidexterity is a nascent emerging concept, capable of supporting business and public entities in business-process management and innovation under the conditions of global hypercompetition, both incrementally and disruptively. Guerrero (2021), in turn, notes that research on organizational ambidexterity has been exponentially rising, pointing out that "the proliferation of papers represents a consolidation stage of any phenomenon. Therefore, in this development cycle, the two possibilities maybe its decline or re-focus along new lines". It is worth noting here, however, that the subject of ambidexterity, in conjunction with such buzzwords as ‘university’, inter alia, is characterized by a small number of publications (Figure 2).



*Year of publication as per the WoS and Scopus indexing.
**Year 2023 – up to 25.01.2023.

Figure 2. The process of identifying studies qualifying for literature review, N = 17.

Source: Authors’ elaboration based on Web of Science Core Collection and Scopus, 25.01.2023.

3. Theoretical background

3.1. Ambidextrous university

Within the scope of the publications identified, the researchers' voicing, highlighting the changes taking place in terms of the approach to the management of a contemporary university, is quite discernible. In the implementation of modern university management system solutions, it is worth emphasizing the transfer of the management concepts used in enterprises (Tahar et al., 2011). Exemplary university management solutions include such concepts as entrepreneurial university, engaged university (Thomas, 2023), or ambidextrous university, which, according to Tahar et al. (2011), entails a promising orientation of university development. Against this background, it is also important to note the role of universities in the innovation creation ecosystem, articulated in the assumptions of the triple helix model (Etzkowitz, Leydesdorff, 1995), the quadruple helix model (Carayannis, Campbell, 2009), or the extensions of the basic model - the quintuple helix model, in which it is indicative that 'government-industry-universities' behave as the real actuators in the generation of knowledge and innovation, while the society and environment experience the changes (Maruccia et al., 2019). Over the past decade, universities have increasingly become ambidextrous organizations, conciliating the academic and commercial missions (Huyghe et al., 2014). The literature recognizes the intertwining of the assumptions of an entrepreneurial university with those of ambidexterity (See: Thomas, 2023; Centobelli et al., 2019a). The developing new model of a multidextrous university, in which universities fulfill both the economic and social missions through teaching, research and engagement (Thomas, 2023), is also worth noting.

Ambidextrous universities refer to those which have the ability to explore the potential opportunities and to improve the learning process (Centobelli et al., 2019a). The main components of the ambidextrous university approach, based on the publications identified, include knowledge transfer and innovation generation. Many works highlight the aspect of knowledge management, with particular emphasis on the processes of knowledge management and knowledge transfer in an organization (Cabeza-Pullés et al., 2020). According to Cabeza-Pullés et al. (2020), based on a survey of a sample of 249 public university research group directors, only knowledge absorption has a positive and significant impact on innovation ambidexterity. This should be understood to mean that the development of knowledge absorption processes stimulates innovation ambidexterity in universities. The aspect of the innovation generated by the exploratory layer, in turn, has been signaled in the works (Cabeza-Pullés et al, 2020; Thomas, 2023).

In the context of balancing the exploitative and exploratory activities, a debate has been ongoing in the literature on whether the processes of exploration and exploitation occur sequentially or simultaneously (Tushman, O'Reilly, 1996). Consideration, in terms of the issue under elaboration, of an attempt to study two approaches to ambidextrousness achievement:

structural and contextual, is particularly noteworthy. As a result of an empirical investigation, on the example of 474 academic patents originated in Taiwan, Chang et al. (2009) concluded that the advantage of contextual ambidexterity over structural ambidexterity is primarily manifested in the support of university start-ups' equity participation. Another study, in contrast, has shown that the University of Indonesia reflects both structural and contextual ambidexterity (Kusumastuti et al., 2016). The two ways of achieving ambidexterity were also indicated by Centobelli et al. (2019a).

As a result of the literature review, it has been found that the researchers describing ambidexterity at higher education institutions have the same understanding of the need to balance exploitation and exploration. Most of the works devoted to both entrepreneurial and ambidextrous universities deal with exploitative processes (issues related to the internal university organization), rather than with exploratory ones (relational, environmental and political issues) (Centobelli et al., 2019a). It should be noted, however, that in the examined body of publications, a different perspective on exploitation and exploration at universities is discernible. While in the work of Olk (2020), ambidexterity applies to educational programs (traditional vs. new academic programs and activities), in the work by Baumann and Leišytė, (2021), ambidexterity, within the sphere of the issue under discussion, is understood as the balancing of teaching and research activities. Other researchers, by contrast, emphasize the aspect of bridging the scientific areas with commercialization (Huyghe et al., 2014; Chang et al., 2009; Ambos et al., 2008). According to Thomas (2023), in the context of viewing universities as ambidextrous organizations, tensions between teaching and research have been recognized in the literature (Thomas, 2023). The view of Ambos et al., (2008), according to whom the tension between the academic and commercial demands is more apparent at the level of individual researchers than at the level of organizations, constitutes an important thread in the discussion. Universities show that they are able to deal with the tension between the academic and commercial demands, by creating dual structures, for instance. On the flip side, at the individual level, the tensions are more acute, and those who deliver commercial results differ from those who are used to delivering academic results. Researchers have hypothesized that, at the individual level, scientists typically follow either a traditional academic publishing career, or a trajectory that was more open to producing commercial outputs, but not both, in order to follow the assumptions of ambidexterity (to become ambidextrous). Research results show that this is a more complex phenomenon, as the 'embeddedness' of the principal investigator in academia (in terms of his/her seniority and years in the profession) is significantly and negatively associated with the likelihood of a project generating a commercial output, but the scientific excellence of the principal investigator (in terms of citations of his/her work) was positively and significantly associated with the generation of commercial outputs. (Ambos et al., 2008).

According to Centobelli et al., (2019a), in terms of the issue at hand, exploitation is defined as "the management of internal knowledge, resources and capabilities for research, teaching and entrepreneurial university activities", while exploration is identified as "the management of external knowledge, resources and capabilities to support university traditional activities, research commercialization and other entrepreneurial outcomes".

In this paper, the authors focus on an approach in which ambidexterity is understood as a management concept involving dynamic balancing, at a systemic and structural level, of the teaching processes (exploitation) with research processes and scientific projects (exploration).

3.2. Overview of system models supporting implementation of ambidexterity

The business environment in the VUCA world changes constantly, becoming more dynamic and less predictable (Papulova, Gazova, 2016), the more emphasized the role of such success factors as flexibility (particularly the flexibility of thinking and behavioral flexibility, which contribute to making adequate managerial decisions, and the flexibility of corporate visions, missions and development strategies) (Popova, Shynkarenko, 2016) and adaptability (Minciu et al., 2019), becomes. The above considerations implicate the search for a systemic model of an organization that would proactively allow the transformation of universities into organizations capable of meeting the challenges posed by the VUCA conditions. Selected models of systemic organization are presented in Table 1.

Table 1.
Selected organizational system models supporting implementation of ambidextrous organization

Area of integration	Selected organizational models		
	VSM	**EFQM**	**SGMM**
Environment	Viable systems are those which are able to maintain separate existence. If they are to survive, they need not only the capacity to respond to familiar events, such as customer orders, but the potential to respond to unexpected events as well. They have the capacity to evolve and adapt to changing environments.	Organizations are able to achieve the best results, in conjunction with high customer and employee satisfaction, good public reception and strong leadership.	Environment is the space of the possibilities and expectations specifically relevant to an organization. Environmental spheres (society, nature, technology, economy) are the key fields of reference for organizational value creation. The environmental spheres particularly important for an organization must be continuously analyzed, to identify important changes and trends.

Cont. table 1.

Technology and its significance	Both technology and resources contribute to organizational processes.	Not included	Technology is one of the environmental spheres and is closely linked to another environmental sphere – economy.
Organizational structure	Structure influences the design of communication and information systems.	It has not been addressed directly in the model. The model is focused on the pursuit of organizational excellence, which translates into the search for process improvement opportunities.	An organization's configuration provides information on the basic criteria according to which task and value creation activities are bundled as well as on who is responsible for those criteria.
Strategy	Not included	It represents one of the elements of the model.	The SGMM practice perspective focuses on the demand creation and the decision-making processes underlying the development of strategic orientation. The SGMM links the strategy to questions and tasks regarding the securing of the organization's long-term future.
Organizational culture	Not included	Not included	Organizational culture refers to an organization's entire 'way of life' and practice. Organizational culture is illustrated with the image of an iceberg. This image is not meant to suggest that an organization's culture is neither visible nor influenceable. Rather, it is precisely those managers to whom employees attribute major influence and power, whose behavior and symbolic actions may decisively affect the development of organizational culture.
Processes	An organization's structure is viewed as a network of stable 'real life' on-going communication, or organizational processes, as opposed to static formal reporting relations.	In the capability part of the model, organizations should design, manage and improve their processes, in order to fully meet the needs of and provide increasing value to customers and other stakeholders. The 'results' part of the model assumes that the manner in which processes are executed has a direct impact on customer satisfaction and thus on key business outcomes.	A process-oriented design of organizational value creation is decisively supported by suitable application of modern information and communication technologies. An organization's processes do not end at their boundaries. They couple the organization with its specific environment by manifold involvement of the stakeholders in organizational value creation.

Cont. table 1.

Stakeholder relations	A viable system is co-evolving with a range of agents. The environment is largely beyond the knowledge and control of the people within the viable system.	The model assumes that organizations develop and manage their relationships with customers, as well as design and provide products and services based on customer needs and expectations.	To shape the environment entrepreneurially, organizations need to develop robust relationships with specific stakeholders (target groups). An organization creates value through active engagement with diverse stakeholders. An organization's stakeholders are individuals, communities or organizations participating in or affected by the organization's value creation.

Source: Beer, 1981, 1985; Espejo, 1990; Rüegg-Stürm, Grand, 2019; Waterman, 1982.

The first of these models is the Viable System Model (VSM). As Espejo (1990) emphasizes, most of the approaches used in the designing or restructuring of organizations are focused on improving the value chain processes, without a clear understanding of how these business processes interact with the myriad of the organizational processes jointly creating the emergent organization. It is primarily a tool to observe institutions and support connectivity in the quest for the desirable transformation, as well as steer interactions in directions producing effective structural mechanisms. VSM serves as a holistic framework for linking business and organizational processes as well as local and global processes (Espejo, 1990).

The EFQM Model, by contrast, is a tool creating a framework for improvement, enabling organizations to assess where they stand on the road to excellence. The EFQM recommends that organizations conduct self-assessments, as a strategy to improve their overall efficiency (Hakes, 2007).

The third selected organizational model is new St. Gallen Management Model, which aims to open up the interplay of management practice and organizational values to close scrutiny. The SGMM holds that the key point of reference for management is to design and advance the organizational value creation. The SGMM distinguishes two perspectives of organizational value creation: task perspective and practice perspective. The task perspective assumes that an organization's value creation and its development can be influenced, unproblematically, from the outside, whereas from a task perspective, organizations are clearly identifiable entities consisting of tasks and problems capable of being systematically captured in analytical terms and processed rationally (Rüegg-Stürm, Grand, 2019).

The choice of the organization models presented (Table 1) was driven by the search for a systemic solution suitable for ambidextrous universities. It stemmed from the need to take a holistic approach to university functioning in the VUCA world, and therefore view it from the perspective of the relationship a university builds with the business ecosystem, including its attitude towards meeting the stakeholder expectations. In the exploitative layer of university activity, dissemination of new knowledge is of great significance, whereas in the exploratory

layer, the emphasis is on the research activities implemented in the form of projects. In the Authors' opinion, a model corresponding to the assumptions of an ambidextrous university should meet the demands of the overall system of university activities, i.e., exploitative and exploratory, not only in terms of mutual relations, but also in the relations with other areas of activity and, above all, in the activities of the university as a whole. In the context of the issue under consideration in the article, the required areas of integration such a model should meet have been outlined: environment, technology, organizational structure, strategy, organizational culture, processes and stakeholder relations (Table 1).

Having analyzed the criteria differentiating the organizational system models, the Authors have assessed that the St. Gallen Management Model represents a solution most conducive to the implementation of the ambidexterity concept assumptions into the concept of an ambidextrous university. This has been dictated by the fact that the Model takes an organization's relations with the different spheres of the environment into account, recognizing these relations as posing opportunities for creation of added value by, inter alia, establishment of relationships with diverse stakeholders (students, academia, business partners), as well as draws attention to the contractors' responsibility for tasks, emphasizing those which generate added value (business-university-government). Organizational process orientation is here supported by modern ICT solutions, and against this background, implementation of a long-term strategy focused, on the one hand, on strengthening the scientific potential of a university and centered around development and commercialization of innovative solutions, on the other, becomes possible.

4. Results

The concept of an ambidextrous university calls for a holistic, systemic and structural approach to the organization's activity, not only in terms of the interaction between processes and projects (Sliż, 2022), but also with regard to the activities of the university as a whole.

Table 2 outlines the structure of the factors supporting and limiting the application potential of both the process-project organization assumptions and the public university ambidexterity concept.

Table 2.
Set of factors supporting and limiting implementation of the ambidextrous organization assumptions at a public university

Area of integration	Supporting factors	Limiting factors
Environment	The concept of Quintuple Helix innovation can be viewed as a framework for interdisciplinary analysis and transdisciplinary problem-solving, as it has been developed on the understanding of knowledge generation (research) and knowledge application (innovation), both to be contextualized by the natural environment of society (Carayannis, Campbell, 2019). Stimulation of the dialogue between the university and society, through development of measures to fulfill the universities' triple mission (Compagnuccia, Spigarellib, 2020).	Industries' low or absent absorptive capacity, which gives rise to a cognitive distancing from the university - geographically close, yet cognitively apart, due to the maturity level gap (Pohlmann et al., 2022; Meijer et al. 2019; Forouhar et al. 2016;).
Technology and its significance	Emphasis on establishment of flagship research centers specializing in the subject of artificial intelligence.	Technologies generated in academic environment are at the early stage of maturity (Pohlmann et al., 2022; Bazan, 2019; Drivas, Panagopoulos, 2016). Technologies generated in academic environment need simplification, because they are too complex to be introduced on the market (Pohlmann et al., 2022; Meijer et al., 2019; Forouhar et al., 2016).
Organizational structure	Experience in simultaneous implementation of processes and projects using structural ambidexterity (spatial separation) (Benner, Tushman, 2003, Simsek, 2009) Establishment of dual structures within universities, as a factor for bridging the tensions between academic and commercial demands (Ambos et al., 2008)	In an atomized organizational arrangement of a university in particular, there are no multidisciplinary research centers bringing academic units and researchers together (Pohlmann et al., 2022). A clash of different attitudes in science and industry: in science – stable academic structure based on years of professional advancement – in industry: mobility, flexibility, commitment, and change (Mazurkiewicz, Poteralska, 2016). High structure hierarchy, the main object of organizational structure building is departments, rather than teams (Sliż, et al., 2022). Structure design based on the criterion of high specialization
Strategy	Formation of new ventures, such as inter-institutional merger in higher education (Ripkey, 2017), start-ups (Schmitt, Grassler, 2013) Development of strategic partnerships between universities and key agents of strong entrepreneurial innovation presence and global recognition (Klofsten et. al. 2019)	Lack of new ventures, such as spin-offs, start-ups (Pohlman et al., 2022; Alavi, Hąbek 2016). Too great focus on the advancement and dissemination of knowledge, e.g., making results public before the patenting thereof, which deeply collides with the industry demands (Hall et al., 2001).

Cont. table 2.

Organizational culture	Proactive, innovative, risk-taking culture and atmosphere may be enhanced by entrepreneurial orientation across university units and departments (Todorovic et al., 2011; Ziman, 2000)	Different approaches towards the results desired are taken by both the technology provider and the recipient. Usually, these include innovation-oriented vs. market-oriented approaches or focus on superior technologies vs. easily implemented technologies (Harder, Benke, 2005).
Processes	Transfer of business management concepts to higher education organizations (Tahar et al., 2011; Schubert, 2009). Expansion of a university's knowledge management activities (Cordero, Ferreira, 2019), increase in the impact of knowledge management models, tools and practices on universities (Centobelli et al., 2019b) Promotion of new educational programs (Olk, 2020), delivering entrepreneurship education focused on business start-up programs (Mason et al., 2020)	Lack of a measurement system for university processes (Sliż et al., 2022). Lack of a plan for the implementation of research results and ex-post analysis of implementation outcomes (Harder, Benke, 2005). Lack of identified management processes at a university (Sliż et al., 2022)
Stakeholder relations	Through adoption of an entrepreneurial orientation, internal stakeholders (administration, academic faculties, staff, students, alumni) are more likely to share a common vision, commitments, achievements and the key role in supporting the university's entrepreneurial agenda (Klofsten et al., 2019)	Lobbies or interest groups effectively impede changes and amelioration in the legal system, making technology transfer impossible or inefficient (Harder, Benke, 2005).

Source: own compilation based on the literature indicated.

Implementation of activities which are traditionally attributed to the scientific and didactic role of universities (i.e., efforts to ensure the quality of scientific research, through establishment of interdisciplinary research teams, and high quality education, through implementation of curricula reflecting the needs of employers), with simultaneous focus on activities arising from the implementation of the third mission (e.g., cooperation with the business environment for the benefit of internal and external stakeholders, efforts to intensify the innovative solution commercialization activities, or development of networks of relations between scientists and business representatives), enables universities to become the engines contributing to social, economic and cultural development of the regions in which they operate (Agasisti, et al., 2019).

The supporting factors listed in Table 2 should bring universities closer to implementing the assumptions of a ambidextrous organization and achieving the goals of the ambidextrous university concept. As Tahar et al. (2011) point out, the pursuit of organizational ambidexterity at a university should entail an overarching entity which simultaneously manages and meets the needs of many small, diverse, non-centralized knowledge-creating sub-units and few, but large, centralized sub-units focused on stability, routinization and efficiency, under the roof of a common mission, strategy and set of values. Ambidexterity at a university can also be achieved when traditional research-oriented, decentralized structures across faculties are

complemented by strong leadership and management capabilities, at the level of the university's board, and by centralized structures organized toward efficiency. The latter consist of technology platforms devoted to research and teaching, infrastructure, and resources for various units, as well as to general administrative functions, such as control, optimization, steering and strategy-making. These 'back offices' are dedicated to the efficient running of the university itself and provide support to the faculties, as the academic 'front-office'.

5. Conclusion

The concept of an ambidextrous university requires a holistic, systemic, and structural approach to the organization's activity. The supporting factors for the implementation of the ambidextrous organization assumptions at a public university include the use of the Quintuple Helix innovation framework, stimulation of the dialogue between the university and society, the emphasis on the establishment of flagship research centers specializing in artificial intelligence, and the experience in simultaneous implementation of processes and projects using structural ambidexterity. However, there are also limiting factors, such as the low or absent absorptive capacity of industries, the fact that technologies generated in academic environments are at the early stage of maturity and too complex to be introduced on the market, and the atomized organizational arrangement of universities, which lacks multidisciplinary research centers. Other limiting factors include the clash of different attitudes in science and industry, high structure hierarchy, and structure design based on high specialization. In addition, there is a lack of new ventures such as spin-offs and start-ups, too much focus on the advancement and dissemination of knowledge, and no measurement system for university processes. To overcome these limiting factors, the study suggests the formation of new ventures such as inter-institutional mergers in higher education, strategic partnerships between universities and key agents of strong entrepreneurial innovation presence and global recognition, and delivering entrepreneurship education focused on business start-up programs.The study also suggests that universities should adopt an entrepreneurial orientation, which can enhance proactive, innovative, risk-taking culture and atmosphere. However, interest groups can impede changes and amelioration in the legal system, making technology transfer impossible or inefficient.

Overall, this study provides insights into the complex nature of implementing an ambidextrous university and offers suggestions for addressing the challenges and maximizing the potential benefits. Further research is needed to continue exploring this topic and refining our understanding of the best practices for creating ambidextrous organizations in higher education.

Further research should aim to expand the investigation into the identification of the degree of ambidexterity implementation, different approaches to ambidexterity, and the presentation of results from comparative analysis between traditional universities, technical universities, as well as between public and private institutions. This would provide a comprehensive understanding of how various types of universities adopt and integrate ambidextrous practices and strategies.

Acknowledgements

This study was conducted as part of UGrants Start (533-Z000-GS25-23).

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SILESIAN UNIVERSITY OF TECHNOLOGYPUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIESNO. 177

ANALYSIS OF EXPENSES ON RESEARCH AND DEVELOPMENT ACTIVITY AS A STIMULANT OF COMPANY INNOVATIVENESS

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Purpose: The purpose of this paper is to model the expenses on research and development as a factor affecting the company innovativeness.
Design/methodology/approach: This article focuses on the analysis of the most frequently used indicators affecting the expenses on the research and development activity. The attempt to estimate these factors was performed in order to show their influence on R&D expenses. The independent part was decomposed to present the characteristics for a given country. The research was done on the annual data for years 2009-2021 for the European Union member states on the basis of data from the Eurostat base.
Findings: The performed analysis proves that the GBP percentage of expenses on research and development activity is still very low in our country (it is only 1.44% of GDP in Poland), the share of companies financing these expenses is also low. The test results show the less than proportional influence of the wealth of states measured with the GDP and human resources for science and technique on the value of R&D expenses. Although the impact of human resources is much lower, it is really important. The big differentiation of these factors indicates that the cooperation of states is necessary in the scope of innovations, which is consistent with the sustainable growth principles. The level of innovativeness in Poland is low in comparison to Sweden, Finland, Denmark, Belgium, Austria or Germany. Our country receives negative results in comparison to the EU and weakening of the reaction to the R&D expenses is noticed. It makes it possible to conclude that the innovativeness policy in Poland should be improved, in particular in the area of R&D financing, environment investments, cooperation of science and business or education.
Research limitations/implications: The discussed research may constitute the guidelines for further analyses in which it is necessary to use more variables in order to assess the impact of various factors (e.g. environmental, institutional ones) in the short and long-run in individual states. The access and reliability of data are the main limits of the research.
Practical implications: The information obtained from the presented analyses may help decision-makers manage the pro-innovative companies in an efficient way. The increase in R&D expenses generates the research and technological possibilities in the scope of innovations and improves the trustworthy of companies.
Originality/value: The analysis of expenses on research and development is significant in the aspect of creating innovation policy. Due to this fact the comparative analyses seem to be desired as they make it possible to indicate the countries the example of which Poland should follow to achieve the higher level of innovativeness. Thus, it will enable to manage the

innovation processes in Polish companies better and thanks to it contribute to their competitiveness in the European market.

Keywords: innovativeness of companies, human resource management for science and technique, space-time model.

Category of the paper: Research paper.

1. Introduction

The development of science and conducting research on innovative solutions in the state economy as well as in companies plays a significant role in determining the level of economic growth. It is connected with the fact that each company wants to be competitive because it provides it with high profit and recognition in the market (Osieczko, Stec, 2019; Agarwal, 2018). Despite the fact that at first new solutions created in e.g. a company contribute to this aspect, the ability to introduce them is also very important. In the subject literature these both phenomena are often connected as they often present the same information (Hee-Jae, Pucik, 2005). However, they may be also understood in a different way: the first one specified as innovations whereas the other one as innovativeness (Hilami et al., 2010). Nevertheless, it should be remembered that the mentioned ability is strongly stimulated by the state innovation policy (Alam, Arshad, Rajput, 2013), creating general conditions of the company operating in the fast changing surrounding (Yachmeneva, Vol's'ka, 2014). Thus, the appropriate level of funds assigned to the research and development activity is necessary so that the innovations could be created. So the state help is indispensable here as there is the need to "provide" strategic sectors with high technology and the companies are not able to cover all the expenditures connected with creating or introducing innovations. Thus, the governments should be interested in supporting companies in this scope as supporting innovativeness of companies contributes to the development of the whole economy and to the growth of its competitiveness (Wolniak, 2010).

Human resources are also a significant determinant of innovative potential as each new solution is a result of human work. Human capital usually adapts to the challenges of the changing reality being one of the significant conditions of fast economic growth. Thus, it is possible to say that human resources constitute an important part of the paradigm which is knowledge based economy (Wegrzyn, 2016; Pleśniarska, 2013). Taking it into consideration, it is possible to state that research and development institutions the work of which contributes to creativity and patent activity play a key role in the mentioned process. The workers' abilities, their knowledge and experience not only contribute to creating innovations but also, undoubtedly, affect the company market success (Durić, Ristić, Dragičević, 2021). Thus, human capital not only plays the role of innovation determinant but

also has a great impact on the product adaptation. As we can see, the whole R&D staff participates in the innovation process and it is the indication for innovation managers that they should cooperate with both research units and companies (Szajt, 2017).

Taking the above into consideration, it is possible to conclude that the proper "leading" of a new product plays the more and more significant role and the permanent growth of the innovation significance results from their positive influence on the organisational changes and being the important factor of state economic growth (Hammar, Belarbi, 2021). The programmes in the scope of research and innovations initiated by the European Union prove that the innovations are the engine of economies all over the world. There have been 9 such programmes since 1995. The last of them Programme Horizon Europe is assumed for years 2021-2027 and is the update of the programme Horizon 2020 in connection with the changing social, economic or ecological conditions. Among others, the segment for employers was developed in the newest programme, the counteraction of harmful effects of climate changes was emphasised and the instruments were proposed to equalise the chances of member states (European Commission, 2019). The Programme Horizon Europe shall contribute to the scientific development thanks to providing the support for the best scientists and innovators. It shall activate scientific excellence with the intermediary of *European Research Council* to enable the excellent scientists the development of science and knowledge borders as well as support the most talented young scientists in developing their knowledge or skills. Such an approach may help particular countries "enter the higher level of innovativeness" as at present the level of economic growth is impeded by assigning high amounts on R&D. Thus, the improvement of the position in the research and development area may cause that the countries will get more competitive in the European market.

Thus, it is important to perform comparative analyses of Poland and other member states concerning the research and development activity. Moreover, in connection with meeting the objectives of sustainable growth and proposing the ambitious programme of scientific and innovative research by the European Commission, it seems necessary to compare and monitor the factors affecting the innovativeness of individual economies and companies. In this context, it is justified to learn how GDP and human resources affect the expenses on research and development activity in Poland and EU states. Thus, the expenses are one of the determinants of innovation activity. Answering this question will be helpful to verify the hypothesis that the comparative analysis of expenses on research and development activity provides information being the benchmark of creating the pro-innovative activity of companies in each country.

Taking the above into consideration, the article is attempt to model the expenses on research and development depending on the economic growth meter (GDP) and human resources for science and technique.

2. Methods

R&D sector is often organised in a different way in various countries due to e.g. social or historic conditions. However, financial policy plays an important role in R&D in every state, especially now when the relations of this sector with the market is emphasised more and more often (Piekut, 2011).

In order to meet the article objective, it was tested how the determinants affecting the company innovativeness shape and the space-time analysis which makes it possible to comprehend the value how the both factors affect R&D in particular EU states was performed.

Due to the complexity of this issue, the research was performed in two parts. The first one was to monitor the stimulants of the expenses on research and development activity, the second – checking how GDP and resources for science and technique in the EU member states affect the considered expenses.

The intention to analyse the impact of these two determinants induced the author to observe shaping the expenses on research and development activity in the European union member states in the first stage and then to refer these levels to our country. The analysis was started with showing which percentage of GDP the states spent on R&D and presenting the medium-term pace of changes. Then the attention was paid on the structure of innovation financing sources. It was also stated how the human resources for science and technique are distributed in Poland and the EU member states as the element the quality and structure of which affects the level of economy and company innovativeness in a significant way. The second stage consisted in modelling the R&D expenses depending on GDP and human resources for science and technique. It was done to, among others, specify the characteristics for each EU member state.

The model was based on the cross-sectional and time data. In the model European Union member states were objects (i) and time (t) was covered years 2009-2021. The exponent form of the model was proposed after taking the logarithm of which we receive:

$$\ln\mathrm{WBR}_{it} = \alpha_0 + \alpha_1 \ln\mathrm{GDP}_{it} + \alpha_2 \ln\mathrm{ZL}_{it} + \varepsilon_{it} \quad (1)$$

where:

$\ln\mathrm{WBR}_{it}$ – ln of gross expenses on R&D activity per 1,000 people employed in R&D for country *i* in period *t* (according to PPP in fixed prices from 2009),

$\ln\mathrm{PKB}_{it}$ – ln of gross domestic product per 1,000 residents for country *i* in period *t* (according to PPP in fixed prices from 2009),

$\ln\mathrm{ZL}_{it}$ – ln of human resources for science and technique per 1,000 active people for country *i* in period *t*,

α_0, α_1,α_2, – structural parameters,

α_0 – decomposed independent part for individual states,

ε_{it}– random part for country *i* in period *t*.

The differences in the level of decomposed independent parts were presented to show the distance of Poland and other countries to the mean of the EU member states.

The data referring to WBR and GDP were given according to the purchasing power parity (PPP) and in calculation to the fixed prices from 2009 in order to compare them internationally. The necessity to use such a solution arises from the different purchasing power of currencies in individual states and the calculation of nominal values to so called real values. Moreover, it is necessary to show the values as the intensity indicators in which the current values refer to the number of residents employed in R&D or the number of active people.

The model was estimated with the use of the Least Square Method. The data base EUROSTAT was used in the research. Taking into consideration the time series coming from one source in this paper makes it possible to avoid differences in definitions and in the method of collecting information. The research covers the period of 13 years (years 2009-2021) and 27 countries so the research group covered 351 observations. The choice of these years was connected with the availability of data.

3. Results

The expenses on research and development activity presented as the percentage of GDP are the indicator assessing the situation of the R&D sector which is used in the international analyses the most often. Although it is assumed in the EU strategies that the level of expenses on the research and development in the national income should achieve the level of at least 3% of GDP, not all countries achieved such a factor. In fact, only four countries: Belgium, Germany, Austria and Sweden met this postulate to 2019.

Table 1.
GDP percentage spent on R&D activity in years 2009, 2015-2021

Item	2009	2015	2016	2017	2018	2019	2020	2021	Average rate of change
European Union - 27 countries	1.97	2.12	2.12	2.15	2.19	2.22	2.30	2.26	101.15
Average for old EU members	2.00	2.43	2.52	2.67	2.86	3.16	3.35	3.22	100.51
Average for new EU members	0.49	0.95	0.77	0.74	0.75	0.83	0.85	0.77	103.19
Poland	0.66	1.00	0.96	1.03	1.21	1.32	1.39	1.44	106.72

Source: Own study based on EUROSTAT data.

On the basis of the information in table 1 it is possible to talk about the permanent increase in the expenses on R&D in %GDP in the EU in years 2009 – 2021. On average this percentage increased by 1.15% every year but it is impossible to talk about the same direction of changes in all countries. Whereas it is possible to talk about the increase in this factor in 22 states (the biggest change in Greece, Poland, Slovakia or Cyprus – about 7.19%, 6.27%, 5.85%, 5.85%, respectively, the lowest in Portugal (0.41%) or Spain (0.42%)), the opposite direction may be observed in such countries as: Luxembourg, Ireland, Finland, Denmark and Sweden. This result is surprising as the Scandinavian countries have taken the highest positions concerning the innovativeness for years. It is confirmed by the fact that the Scandinavian countries have the highest (Sweden) or one of the highest (Finland, Denmark) levels of the considered factor. Thus, such location of Luxembourg, Ireland and other Scandinavian countries should be considered in the context of the dynamics of financing the expenses on R&D and should not be connected with the level of their innovativeness. Analysing the percentage of expenses on R&D in %of GDP in the EU member states, it is possible to notice quite big differentiation which is mainly connected with the level of economy wealth and the fact that companies use the economic calculations. In 2021 among the "old EU" states the lowest percentage was observed in Luxembourg (1.02%) and the highest in Sweden (3.36%) and among the countries belonging to the EU since 2004, the lowest level was observed in Romania (0.47%) and the highest in Slovenia (2.14%). In 2021 in the group of countries belonging to the old EU member states only three states had lower percentage of the expenses on R&D in GDP in comparison to Poland: Ireland and Luxembourg (since 2018) and in Spain (since 2019). Another situation may be noticed in the second group (new EU member states). Here as many as 8 countries have the indicators lower than in Poland and the analysed percentage is higher in such countries as the Czech Republic, Estonia, Hungary and Slovenia (approximately by 1.89% in 2021). However, taking into consideration the average growth rate in these countries in years 2009 – 2021, it is possible to notice that it is much lower – by about 3.26 percentage points (the Czech Republic, Hungary) and 5.07 percentage points (Estonia, Slovenia). In Poland we observe the increase in the expenses on R&D in % of GDP by on average 6.72% year by year in the whole research period (Table 1). It means that we are at a high position among the "new" countries.

Comparing the dynamics, it is possible to notice the change in the states that joined the EU after 2004 is much faster than in the states of so called old EU (Figure 1). The considered expenses increased on average by 0.51% in EU-14 and by 3.19% in EU-13 year by year in 2009-2021.

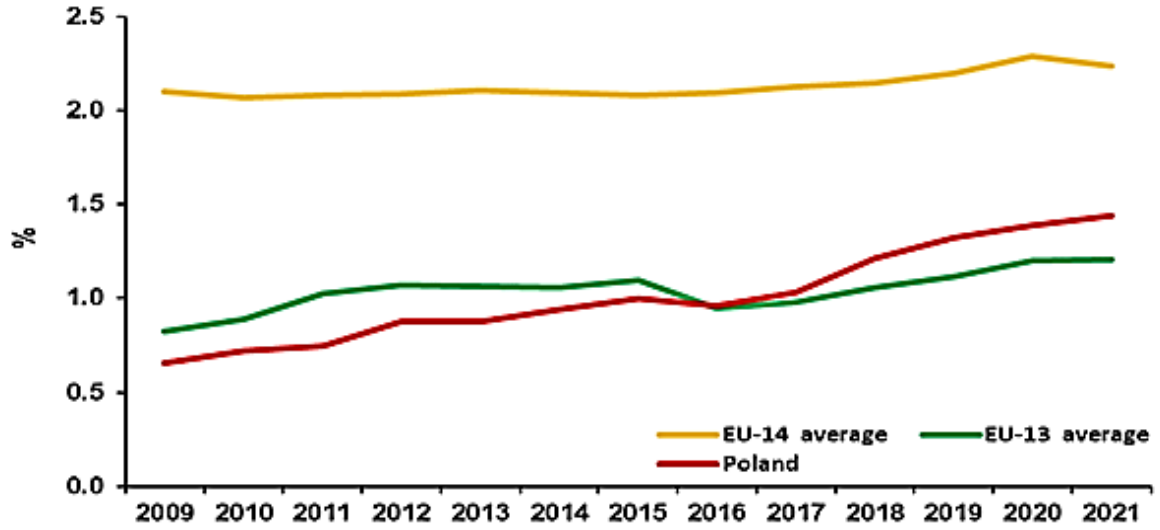

Figure 1. Expenses on R&D in the percentage of GDP in the EU in years 2009-2021.
Source: Own study based on EUROSTAT data.

However, it should be said that the level of the measured value is about twice bigger in the old EU member states than in the new EU member states. Poland is leading in the second group. In our country the % of GDP assigned for R&D was about 3.53 per cent points higher in the last year of research whereas in 2009 this difference amounted to 0.17 per cent points of the benefit of other countries.

The structure of sources of funds on research and development activity should also be considered while doing research on expenses on R&D. These sources include: government, companies, higher education and private non-commercial institutions. This distinction is important as the source of funds origin is also a factor contributing to the actions in the R&D sector. Considering the participation of the company sector in the EU and Poland, it is possible to notice the advantage of the states belonging the EU before 2004 (The exceptions are Portugal in 2019 and Austria in 2020) and the negative value for the majority of EU-13 states. Analysing the penultimate year of the research, the company expenses on R&D in the whole EU amount to about 57.9% and this percentage is lower in Poland (50.6%). In comparison to the EU, only in Germany the companies participate in the R&D financing in the higher rate than in Poland, taking into consideration the countries neighbouring with ours, by about 4.7 per cent point (Table 2).

Table 2.
Expenses on R&D activity according to the sources of financing in years 2019-2020

Item	Business sector		Government sector		Higher education sector		Non-profit institutions sector	
	2019	**2020**	**2019**	**2020**	**2019**	**2020**	**2019**	**2020**
European Union - 27 countries	59.0	57.9	29.4	30.2	1.2	1.2	1.1	-
	EU-14							
Belgium	64.3	-	17.8	-	2.6	-	0.6	-
Denmark	59.6	-	28.7	-	-	-	6.3	-

cont. table 2.

Germany	64.5	62.6	27.8	29.7	-	-	0.4	0.4
Ireland	62.8	-	22.6	-	0.6	-	0.6	-
Greece	41.4	39.9	41.1	42.7	2.2	2.6	0.6	0.4
Spain	49.1	49.2	37.9	38.5	4.2	3.8	0.7	0.8
France	56.7	56.8	31.4	31.5	2.9	2.9	0.9	1.1
Italy	55.9	52.8	32.3	33.7	0.7	0.8	1.4	1.4
Luxembourg	51.3	-	43.2	-	1.4	-	0.3	-
Netherlands	57.6	56.9	29.4	30.3	0.2	0.2	2.4	2.2
Austria	54.8	49.8	27.0	33.3	0.9	-	0.3	0.3
Portugal	48.3	52.2	40.2	37.3	3.5	2.9	1.2	1.2
Finland	54.3	56.0	27.8	27.7	0.7	0.6	1.7	1.7
Sweden	62.4	-	24.2	-	0.9	-	3.4	-
	EU-13							
Bulgaria	37.6	35.4	23.6	25.3	0.1	0.2	0.3	0.3
Czechia	38.2	35.6	33.7	34.0	1.0	1.2	0.1	0.1
Estonia	49.1	50.1	37.2	37.0	0.2	0.2	0.2	0.3
Croatia	36.6	37.6	39.1	36.9	4.4	4.2	0.1	0.0
Cyprus	36.4	38.0	35.4	35.5	4.1	3.5	1.3	1.9
Latvia	24.3	27.0	35.4	38.1	1.7	1.7	-	-
Lithuania	34,0	37.3	32.3	29.1	3.0	2.4	0.2	0.2
Hungary	52.9	50.2	33.3	32.5	0.2	0.2	0.5	0.4
Malta	58.7	60.2	31.2	30.3	1.0	0.7	0.4	0.5
Poland	50.7	50.6	38.8	39.0	3.0	2.7	0.5	0.5
Romania	54.6	55.6	34.4	32.9	0.4	0.6	0.1	0.0
Slovenia	61.5	49.5	24.7	25.1	0.5	0.7	0.0	0.1
Slovakia	46.8	43.7	40.5	39.6	1.8	2.0	0.3	0.4

Source: Own study based on EUROSTAT data.

In the case of the governmental sector it is: 30.2% (EU) and 39.0% (Poland). In comparison to these two economic sectors the participation of the higher education sector and non-commercial institutions is low. In the EU the participation of the first one is at the level of 1.2% and the second one about 1.1% (2019). The situation is different in Poland. The participation of the higher education is higher and the non-profit organisations is lower in comparison to 27 EU member states.

Apart from economic factors, also human resources should be considered, in particular, that they are the basis of company competitiveness and innovativeness and in a consequence, of the new paradigm of the economic growth.

Comparing the human resources for science and technique in companies internationally, they are usually presented in respect to the active population and are given in full-time equivalent (FTE). In years 2010-2021 this participation increased by 4.30% in the EU year by year and in Poland by 16.94%. It does not prove that the changes occur in the EU more slowly but rather that Poland is "chasing" it. It is probably connected with the change of innovation policy in our country and in the fact that education and training of current and future employees is more and more important. Although the difference between the EU and Poland fell from the level of 0.46 to the level 0.28, the employment was at a much lower level in Poland in the whole tested period (Figure 2). It should be emphasised that this analysis should be considered through the prism of individual EU member states as each state has a different long-term employment policy. Comparing the mean for EU-14 and EU-13 states, it has been possible to notice some

fluctuations in the group EU-13 and much bigger growth in EU-14 since 2020. Despite this fact, the changes in EU-13 were bigger that in EU-14 – by 3.69 per cent point. The participation of employment in R&D in companies in Poland has been higher than the mean for EU-13 states since 2017. It is lower only than in Slovenia, the Czech Republic and Hungary.

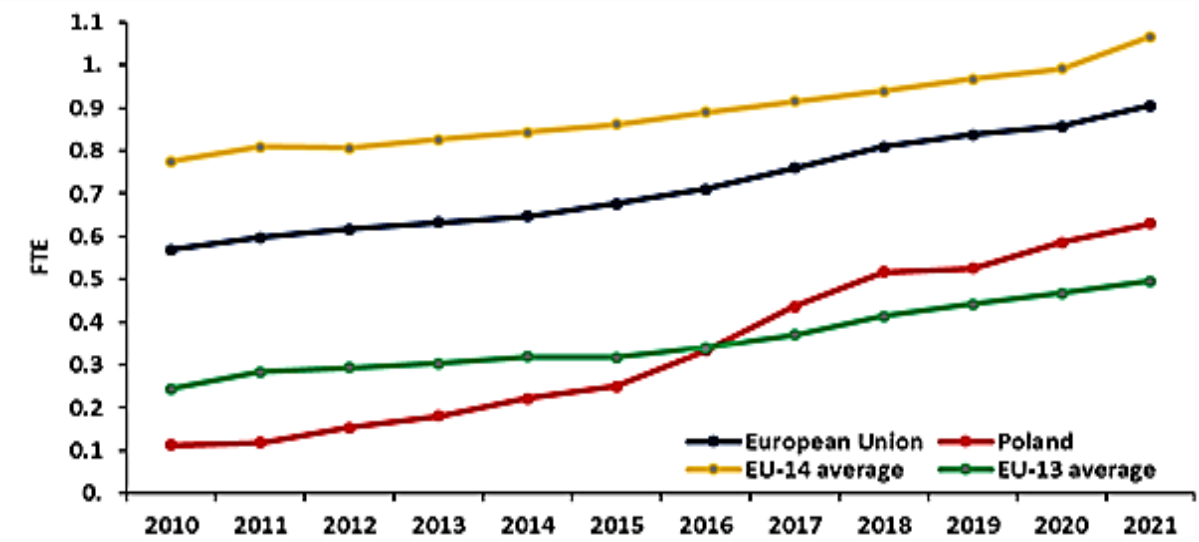

Figure 2. Employment in R&D in companies in respect to active population (in FTE) in years 2010-2021.

Source: Own study based on EUROSTAT data.

On the basis of the figure above it is possible to notice that there was a permanent growth in every case but the "starting point" is higher in the whole EU. What is interesting, whereas the higher level was noticed in all groups in Poland in 2010, in the last year of research only in two (EU and EU-14). The growth was noticed in 22 countries belonging to the European Union in years 2020/2021 and the fall of this indicator in 5 states: Ireland (5.47%), Luxembourg (5.24%), Malta (3.95%), Bulgaria (3.50%) and Denmark (1.80%). Some fluctuations are present in these countries for the whole period of research but they are not big. Thus, these changes may be regarded as the result of human resources instability or rather as the effect of demographic chances (society aging).

In other sectors the total employment measured in the full-time equivalent was at the level lower than 0.50 in the last year. The analysed percentage was higher in the EU (0.18) than in Poland by about 0.15 in the government sector in the last year of research whereas it was just the opposite in the case of higher education – there is 0.41 in the EU and 0.44 in Poland. We have the penultimate rank (only before Malta) in the first sector and the twelfth in second sector (after Austria, Latvia, France, Belgium, Lithuania, Luxembourg, Ireland, Greece, Portugal, Finland and Denmark).

The people directly engaged in creating concepts, new knowledge, products, methods and systems, i.e. the research ones should be considered among the R&D staff. Their participation in the group of all research and development staff in the EU fluctuated around 50% in the whole period of analysis (Figure 3).

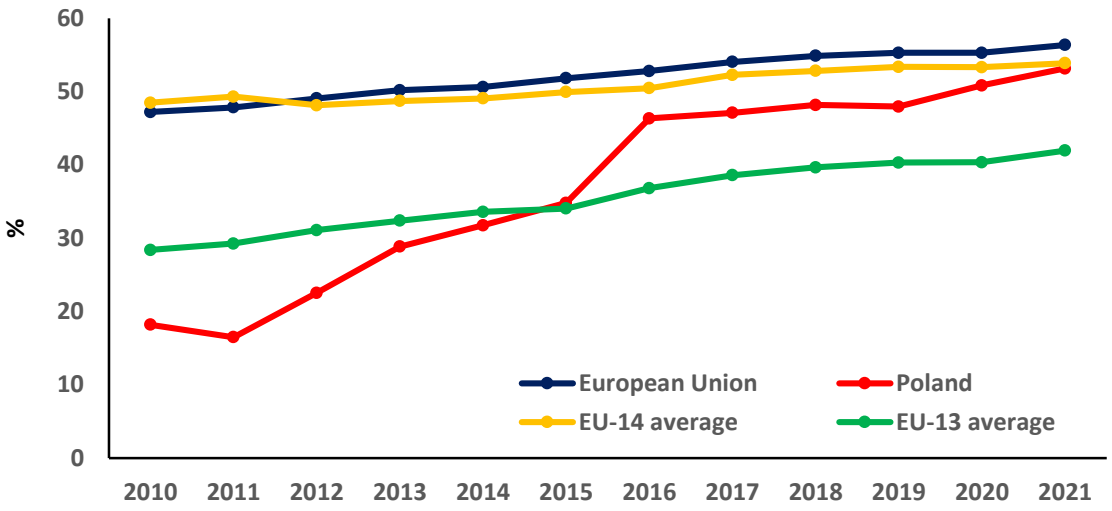

Figure 3. The percentage share of researchers in companies in respect to all people from this employment group in the EU and Poland in years 2010-2021.

Source: Own study based on EUROSTAT data.

On the basis of this figure it is possible to state that a big change in the number of researchers (measured in FTE) occurred in our country contrary to the EU. The advantage of the EU is visible in the whole period of analysis, but the difference between it and Poland decreased significantly. Whereas it amounted to 29.03 percentage points in 2010, it was only 3.20 points eleven years later. However, it must be remembered that the EU consists of 27 states and the number of researchers is differentiated in them. Nevertheless, despite these differences, the considered percentage is getting more and more similar in all the countries and in Poland. It is assumed that the distance will be getting smaller and smaller as a result of among others changes in the employment policy and economic instability of less developed countries. In the last year of the research such countries as: the Netherlands (70.15%), Belgium (64.27%), Austria (63.30%), France (61.76%) and Germany (60.13%) took the leading positions and Latvia (25.52%), Croatia (26.39%), Slovakia (27.16%), Greece (29.76%), Lithuania (30.86%), Luxembourg (31.56%), Romania (33.14%), Cyprus (35.38%) or Spain (39.17%) were at the other end of the ranking.

Considering the percentage share of researchers (measured in FTE) in the EU in the governmental sector, it was stated that it was the highest in Germany (28.42%) and the lowest in Cyprus (0.05%). This share amounts to about 1.61% in Poland. When it comes to higher education sector, Germany has the highest level (18.88%) and the lowest Malta (0.08%).

The next step was an attempt to present the impact of GDP and human resources for science and technique on the expenses on R&D with the use of the econometric model. The independent part was decomposed into part in order to examine the significance of these stimulants in each country. This let to comprehend the characteristics for the given country. Then the value of decomposed independent parts was “de-logarithmed”, which made it possible to interpret the differences between the countries (in the multiplicative approach). The results are presented in the table below:

Table 3.
Estimate of parameters in WBR model

Variable	Parameter estimate	Parameter error	T statistics	p-value	Parameter estimate (elasticity)
lnPKB	0.745	0.023	32.840	<0.0001	0.745
lnZL	0.241	0.065	3.736	0.0002	0.241
Belgium	0.769	0.052	14.910	<0.0001	2.157
Bulgaria	−0.354	0.051	−7.009	<0.0001	0.702
Czechia	0.505	0.050	10.130	<0.0001	1.657
Denmark	0.899	0.051	17.750	<0.0001	2.458
Germany	0.933	0.050	18.520	<0.0001	2.542
Greece	0.233	0.050	4.639	<0.0001	1.262
Spain	0.327	0.050	6.480	<0.0001	1.386
France	0.773	0.050	15.360	<0.0001	2.165
Italy	0.654	0.051	12.750	<0.0001	1.923
Ireland	0.217	0.050	4.302	<0.0001	1.242
Cyprus	−0.793	0.051	−15.600	<0.0001	0.452
Latvia	−0.675	0.052	−13.080	<0.0001	0.509
Lithuania	−0.330	0.053	−6.283	<0.0001	0.719
Luxembourg	0.095	0.051	1.852	0.0649	1.100
Hungary	0.397	0.050	8.006	<0.0001	1.488
Malta	−0.431	0.050	−8.647	<0.0001	0.650
Netherlands	0.465	0.051	9.095	<0.0001	1.591
Austria	1.033	0.050	20.610	<0.0001	2.811
Poland	−0.109	0.052	−2.089	0.0375	0.897
Portugal	0.682	0.053	12.900	<0.0001	1.977
Slovenia	0.599	0.051	11.770	<0.0001	1.821
Slovakia	−0.244	0.050	−4.927	<0.0001	0.783
Finland	0.946	0.051	18.620	<0.0001	2.576
Sweden	0.892	0.051	17.380	<0.0001	2.440

Source: Own study based on EUROSTAT data.

On the basis the information given in Table 3 it is possible to state that all variables turned out to be significant, the significance level is higher for Luxembourg and Poland. Moreover, the value of uncentered correlation coefficient and the F-test proves that the model matching degree is high (R^2_N = 0,999, F(26.235) = 114635.1with p = 0,000).

The research shows that the flexibility coefficients were lower than one for six of the analysed countries, which means that the expenses on R&D increase in these countries but slower than their determinants. The short-term flexibilities turned out significant when it comes to both the employed in R&D sector and the gross domestic product. Similarly, as in the case of GDP, human resources also change in the same direction but this change is much smaller than in the case of economic wealth measured with GDP. The increase in GDP by 1% causes the increase in R&D expenses on average by 0.75% whereas the increase in human resources by 1% caused the considered expenses rise on average by about 0.24%. However, it should be taken into consideration that human resources are a significant determinant of expenses on research and development activity and they should not be omitted in the e.g. quantitative analyses. Much lower HR flexibility coefficient is mainly the result of not well-developed system of education of potential people dealing with creating and wide spreading innovations and in consequence low cooperation of science and companies.

Thus, it is possible to state (using the data included in Table 3) that more funds is designed for research and development activity and human resources for science and technique are more important in the short-term in the states regarded as powers in the area of innovation (Sweden, Finland, Denmark, Austria, Germany). The effect of the impact of GDP and HR on the tested expenses is much higher here.

Considering the level of expenses on research and development activity, we can say that they are below the average level of this value in Poland in comparison to the analysed EU member states (Figure 4). It is mainly affected by the innovation policy but also by the fact that the performance of innovation projects in companies meets a lot of difficulties mainly connected with obtaining funds.

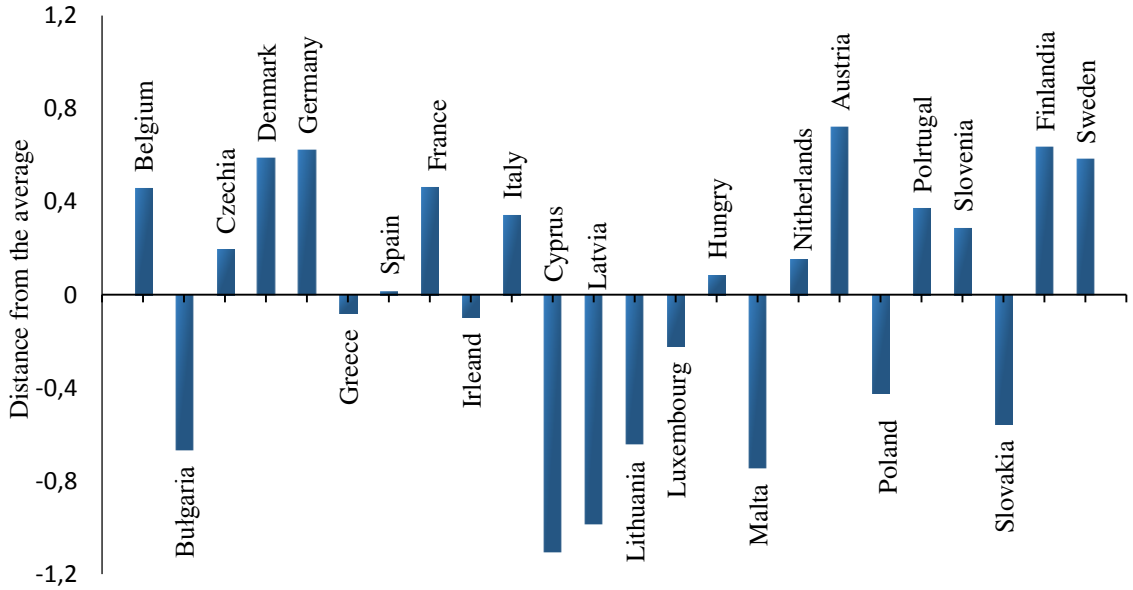

Figure 4. Differences in the levels of decomposed independent parts for WBR model.

Source: Own study.

The decomposed independent parts turned out to be significant in 24 out of 27 countries. Their values over one reinforce the aggregate effect arising from the impact of other variables, below one – weaken this effect. Such countries as Romania, Estonia and Croatia (the p-value was too high for them) do not show any significant impact on tested expenses but it cannot be said that it does not exist. When it comes to Poland, we notice its big difference from the average and it is negative. Although the situation in Poland is not good, we can improve it thanks to e.g. cooperation with Scandinavian companies which invest in new technologies and open research and development centres.

4. Discussion

The interest in the research and development activity increases with the growth of requirements which companies face in the era of open economy. Their willingness to be competitive in the market requires that the companies have to create and introduce newer and newer solutions. Moreover, innovations affect the economic growth or employment significantly and contribute to the improvement of life quality or also make it possible to deal with threats of fast changing surrounding (Atkinson, Ezell, 2014). However, it should be stressed that the opinions concerning the relation of competition and innovations are divided. Some think that companies are competitive because they offer new solutions (Tylżanowski, 2012; Szamrej-Baran, 2012; Stawasz, 2013; Robakiewicz, 2018; Fundeanua, Badele, 2014; Udriyaha, Thama, Azam, 2019), whereas the others claim that innovations are created in companies because there is a lot of competition in the market (Gryczka, 2016; Grossman, Helpman, 1990; Dodgson, Rothwell, 1994; Fagerberg et al. 2006). It is difficult to solve this dispute, especially that there is a feedback. Despite these disputes, it is possible to conclude that the innovation activity plays an important role in functioning of the company the productivity of which grows together with the involvement in the research and development activity (Medda, Piga, 2014).

The index of the synthetic economic growth, i.e. GDP is the most often used in the analyses to compare the company innovativeness (Al-Qudah, Al-Okaily, Alqudah, 2022). However, this index is referred to the number of residents to enable international comparisons. Nevertheless, it should be stressed that it is necessary to include the difference, while comparing Poland with other EU member states, which occurred due to a different starting position as the historical and political conditions not only contribute to the existence of big social and economic differentiation between countries but also decide (indirectly) about the national ability to run innovative activity (Andrijauskiene, Dumciuviene, Stundziene, 2021; Celli, Cerqua, Pellegrini, 2021). Despite these differences, Poland (but also other countries) has to focus on the improvement of its position in R&D activity if it wants to compete with the leading European states. It requires mainly intensified efforts of the companies but also of the state (Ziętek-Kwaśniewska, 2020). It is confirmed by the research on the impact of the political R&D support on the results of the company innovation activity (Grabowski, Staszewska-Bystrova, 2020; Czarnitzki, Hussinger, 2018; Szczygielski et al., 2017; Doh, Kim, 2014). Moreover, it is more and more important that the European Union emphasises the enhancement of the integration of industry and academic surrounding, which favours their mutual complementarity and global challenges (Kim, Yoo, 2019). The strict connection between the economy innovativeness and company innovativeness contributes to the introduction of various strategies both at the national and EU level, which may help to run pro-innovative politics taking into consideration the peculiarity of a given country (Głodek, 2011; Fedirko, O., Fedirko, N., 2021).

The structure of the innovation financing sources comprises another factor indicating the involvement in the development of research activities. Research and development activity is connected with high costs and due to this fact it requires the engagement of not only one economic sector. The companies mainly use their own funds and significantly less foreign capital to finance the innovation activity (Bednarczyk, Zapartowicz, 2019). Whereas the governmental sector, even though it assigns little funds on innovation projects in comparison to companies, is still a significant stimulant of economy and company innovation policy. Thus, it is necessary that the government supports the innovativeness, e.g. by providing appropriate environment for companies which are eager to invest and introduce innovations or by financing public research or encouraging to invest in research and innovations (Maradana et al., 2017; Bircan, Gençler, 2015; Balsalobre-Lorente et al., 2021). Although the percentage on expenses in GDP is growing, it can be said that expenses on R&D are still too small. Their level affects the patent activity indirectly, which is often limited due to the few expenses on e.g. modern equipment or purchase of new technologies. Thus, it is necessary to invest in the research and development activity as it contributes to the increase in work performance e.g. thanks to the facilitation of knowledge exchange between organisations (Audretsch, Belitski, 2020).

It confirms the significance of another sector – higher education sector. Due to the fact that creating and introducing innovations requires a lot of knowledge, the role of research institutions is undisputable in raising the level of innovativeness. The cooperation of business and science is really desired in this respect, especially at the commercialisation of the research results. In other words, the level of R&D expenses or cooperation between companies, companies and universities is important to perceive the company innovation abilities. As Gust-Bardon claims, the cooperation between scientific institutions and companies will make it possible to exchange knowledge and experiences, which may result in the creation of new technological or organisational solutions (Gust-Bardon, 2011). Thus, it is possible to say that human resources take a significant place in all innovation processes. Thanks to highly qualified employees, their motivation and work satisfaction, inventions in the scope of new technologies or a big number of patents may occur (Bircan, Gençler, 2015). As the research shows, the companies take advantage of their workers' knowledge to increase the management efficiency, organisation productivity and survival (Nonaka, von Krogh, 2009, Braunerhjelm et al., 2018; Alnoor, 2020). Due to this fact knowledge may be regarded as the basic strategic resource of companies wanting to develop their activity in the market (Durić, Ristić, Dragičević, 2021; Martínez-Sánchez, Vicente-Oliva, Pérez-Pérez, 2020; Myjak, 2018; Harasim, Dziwulski, Wyrwisz, 2020). Moreover, there is also an argument in favour of using human resources and it says that nowadays it is difficult to base the company development only on the possessed financial resources. Thus, investing in human resources and innovations is very important for the companies concerning their proper functioning and being competitive (Kearney, Meynhardt, 2016; Palos-Sáncheza et al., 2022). However, it should be remembered that the

effects which may be achieved thanks to investing in R&D are visible in the long-term (Kiraci, Celikay, Celikay, 2016). Thus, the companies are obliged to raise the quality of human resources and to introduce new management methods and techniques. It is especially important in the situation when the companies want to consider the rules of sustainable growth. Many entities see the necessity to connect their actions with the creative and participative use of human resources in the context of innovations and sustainable growth (Mroczko, 2020; Lenihan, McGuirk, Murphy, 2019).

Nevertheless, it is impossible to compare the countries uncritically and make conclusions from it. Analysing the company innovativeness, both the potential of a given country and its size and population should be remembered. It is much easier to manage the economy in the countries that have a small population than the ones in which the population is a few millions (Szajt, 2010). However, the level of innovativeness in a given country should not be explained with these issues. As it was mentioned before, the cooperation of states and regions and companies and research institutions are ones of the most important factors that affect the innovation and innovativeness. It is confirmed by the high innovation rates in such countries as: Austria, Sweden, Finland and Denmark in which the system of entrepreneurship and innovation support is well developed (Majkut, 2021; Miłek, Mistachowicz, 2019; Borrás, Schwaag Serger, 2022). In these countries the percentage of R&D expenses in GDP is one of the highest and the organisation of the educational system and institutional solutions facilitate functioning in the complex and variable conditions of the surrounding. The structure of innovation support consists of various organisations and measures supporting the development of innovations and business ideas from the concept stage to the introduction to the market. In other words, the suggested and used solutions contribute to the integration of scientific environment with entrepreneurs in a high rate. According to the European Innovation Scoreboard 2022 (EIS) the innovativeness level is not good in Poland. Our country is in the group of so called raising innovators and takes the fourth rank from the bottom in this scoreboard. With the result of 60.5% of the EU mean, we are only better than Latvia, Bulgaria and Romania (European Innovation Scoreboard, 2022). Although the difference between our country and the EU is getting smaller and smaller, the situation is still not good. Almost all factors considered in EIS worsened (among others investments in environmental technologies, expenses on research and development work, support of academic workers). Thus, the countries should mainly focus on the efficiency of investments in R&D sector as the conclusions from the assessment of the economic efficiency may indicate whether creating and introducing the innovative solutions is justified economically for the company or whether it does not bring any measurable profits.

5. Summary

The presented comparative analysis referring to the company innovativeness showed that there is a growing tendency in assigning public funds on research and development activity in the European Union member states (on average by 1.15%). However, due to the existence of vast differentiation in the economic level, the difference in the percentage of expenses on R&D in GDP in the "old" and "new" EU member states is clearly visible. This advantage is significant which is not a beneficial situation especially when it comes to the sustainable growth.

On the basis of the performed research it is possible to notice that % of GDP assigned on the innovation activity in Poland is not high in comparison to 15 EU member states (it is only 1.44% of GDP in Poland whereas in some UE member states almost 1.5-2 times bigger) and the achievement of 3% assumed by the UE is quite far. Of course, comparing the results of Poland and other states, their starting points and historic conditions should be remembered. However, if Poland wants to get the same level as the leading states in Europe in the area of innovations, it has to take steps to improve its position in the area of R&D activity. It is necessary to increase innovation financing, enhance the cooperation of business and science as well as increase the governmental efforts in order to meet this aim.

Although the permanent increase of employment in this sector is visible in the whole period of analysis, the lack of significant optimisation in workers' management is a big obstacle to improve the level of innovativeness and company productivity (especially in Romania, Croatia or Bulgaria). Thus, if it came to the change in human resources management and the employment tendency remained the same and funds increased significantly, the situation would be optimistic as it would be possible to expect the increase in patent activity. Monitoring these indexes strongly affects the creation and introduction of innovations in companies. Although the difference between the EU and Poland decreased, it does not provide changes in the education of the society in a visible way. Moreover, the systems of trainings are insufficient. The employers do not often finance these courses, which causes that the workers are not interested in them. It is not the case that the workers do not want to educate themselves and raise their competences but that they are not able to cover the costs.

Considering the structure of expenses on research and development activity, it is possible to notice that mainly the sector of companies affects the R&D expenses. Their high percentage in R&D financing may be noticed in the most industrialised countries such as: Belgium, Germany, Ireland, France or Sweden. However, regardless of the country, each company has to "learn" various types of innovations, efficient human and tangible resource management, to introduce and widespread new solutions as it is the basis of leading the efficient innovation policy in which the fast adaptation and widespread of new technologies is emphasised.

On the basis of the information from the model (the value of flexibility coefficients) it is possible to state that the economic wealth (measured in GDP) has greater influence on expenses on R&D than HR. It may be a sign of high sensitivity of analysed expenses on the current economic situation of the country. On the other hand, the lower impact of human resources may be connected with the instability or the shortage of staff including the technicians and research staff.

Contrary to the Scandinavian countries the situation referring to the international patents and cooperation of science and business is quite negative in Poland. It is consistent with the results of the European Innovation Scoreboard in which our country takes one of the last positions and it shows its low positions in the area of innovativeness. It is not good information for Poland. Thus, it is possible to say when it comes to it (but also to the states of South and East Europe) that it is necessary to verify innovation policy and structure of sources of innovation financing. It will be a long-term process and its results will surely depend on the level of economic growth and changes in the approach to human management. Although there was the increase in investments in our country including the transfer of new technologies, these changes are insufficient, especially when it comes to education or the participation in R&D financing by company and government sector.

The general conclusion from the analysis of the presented indicators is that the situation in so called new EU member states in not satisfying. Thus, it seems to be necessary to increase the funds on R&D and to intensify the actions so that the science and business could cooperate more strictly, which will contribute to the commercialisation of the results of the research and development work. It is important especially because a lot of companies finished their activity in the pandemic or limited it so the funds on research and development decreased. Thus, the cooperation between countries (especially with Scandinavian companies), proper human resource management and spending more money on innovations may affect the existence and innovativeness of companies in a positive way and at the same time may affect their competitiveness.

Summing up, it should be emphasised that the attention was paid on the influence of GDP and human resources for science and technique on the expenses on R&D in the article. The performed analyses can be the starting point for further research in the area of innovativeness which would include demographic changes, technological or organisational progress and the assessment of company innovative activity e.g. in the time of crisis.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANISATION AND MANAGEMENT SERIES NO. 177

DIGITALISATION IN THE MANAGEMENT OF A PUBLIC ORGANISATION

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Purpose: The purpose of the research conducted was to assess how managers of public organisations perceive the process of digitisation and the benefits it brings to the functioning of public organisations. In addition, using the Unified theory of acceptance and use of technology (UTAUT) concepts proposed by V. Venkatesh et al. variables influencing the intention to use modern technology among managers of public organisations were assessed.
Design/methodology/approach: Quantitative research methods were used. A questionnaire survey was conducted among managers of local government units - mayors, presidents, or their designees with the knowledge and competence to answer questions. The number of respondents 357.
Findings: The results obtained indicate that municipal managers have a positive perception of the digitalisation process in the public sector and see its benefits for relations with residents, cooperation with other public services or third sector organisations.
Research limitations/implications: Future research should focus on a broader identification of factors that favour or limit the use of modern technology in the management of a public organisation, also in other areas of public sector activity than municipal management.
Practical implications: The results obtained from the research indicate that there is potential to intensify the introduction of digital tools into the operation of public organisations due to its positive perception among managers of public organisations.
Originality/value: This article is addressed to researchers, but also to managers of public organisations. Its undoubted value lies in the presentation of research results based on a large group of respondents who are directly responsible for the implementation of modern technologies in the everyday functioning of the organisation.

Keywords: digitalization, public organization, public management.

Category of the paper: research paper.

1. Introduction

Observed social, political, economic and demographic changes are forcing public sector organisations to search for new ways to deliver public services efficiently and effectively (Kitsios et al., 2023; Adreoni, Mambretti, 2021). At the same time, the cultural changes taking place in the last decade of the twentieth century, resulting from the transition from an industrial civilisation to a knowledge civilisation (post-industrial, information or post-digital) and the dominance of *information-communications technologies (*ICTs) have fundamentally affected not only the scope and quality of interactions between people, but also the conditions under which organisations operate. The transformation from an analogue to a digital society has become so intense recently that it has been decided to distinguish it as a new era of socio-economic development and has been given the name of the fourth industrial revolution (Acsente, 2010), interchangeably Industry 4.0 (Industry 4.0). The characteristics of this era are (1) widespread digitalisation and the provision of technical capabilities for the continuous communication of people, people with devices and devices with each other; (2) the increasing implementation of so-called disruptive innovations that allow for leaps in productivity and efficiency of the socio-economic system; and (3) the development of machines in such a way that they acquire the ability to behave autonomously through the use of 'artificial intelligence' (AI) in their control process (Frączkiewicz-Wronka, Ziemba, 2022). Lately, we have seen a dynamic development of digitisation, which has been further accelerated by the global Covid-19 pandemic

The digitisation trend is supported by a number of European Union activities, including, among others, an increase in funds allocated to ICT development and the redefinition of objectives in the EU strategies in force for the Member States. The most recent strategy, Digital Compass 2030. The European Way in the Digital Decade, presented in 2021, focuses activities around creating conditions for achieving four main goals: (1) a digitally skilled society and highly skilled digital professionals; (2) secure, efficient and sustainable digital infrastructure; (3) digital transformation of businesses; and (4) digital transformation of public services. This article presents the results of a study on digitisation in the management of a public organisation. The purpose of the research conducted was to assess how managers of public organisations perceive the process of digitisation and the benefits it brings to the functioning of public organisations. In addition, using the Unified theory of acceptance and use of technology (UTAUT) concepts proposed by V. Venkatesh et al. variables influencing the intention to use modern technology among managers of public organisations were assessed. Quantitative research methods were used. A review of the literature indicates that local authorities' perceptions of the digitisation process have not yet been analysed.

2. Digitalisation in public management

The pressure to raise the quality and standard of life and the search for efficient ways of providing services has influenced the expansion of the areas of emanation of the Industry 4.0 concept, and the observed practice reveals many applications outside the context of the manufacturing industry in, for example, urban management, public and social services, and social and healthcare systems (Giulio, Vecchi, 2021; Chute, French, 2019). Regarding the public sector, the drive to improve operational efficiency through the use of modern technologies applies both to the actions of individual organisations that choose to do so, but also to entire areas of public service delivery through the implementation of relevant central or regional level programmes, thereby realising the drive to transform the public sector towards Government 4.0 (Naqvi Al, Munoz, 2020). The transition towards Government 4.0 is not a single and short-term implementation of a specific technology, but rather a long-term evolutionary process of transforming the government/public sector to focus on citizen services (Walencik, 2018). The evolution towards Government 4.0, following Janowski (2015), can be divided into four stages:

1. Digitalisation - implementing ICT to improve its internal processes and structures, e.g. launching websites.
2. Transformation – implementation of ICT with applied organisational and process transformation within the administration itself, without changes in stakeholder relations, e.g. e-government.
3. Engagement – the use of ICT to both support internal processes and to support the communication and relations of the public administration with stakeholders, e.g. e-processes, e-public services, e-governance.
4. Contextualisation - the impact of ICT use in public administration on the whole public sector and its stakeholders.

The use of modern technology in the public sector can help improve the delivery of public services and contribute to the best use of available resources. The benefits of using modern technology in the public sector (Väyrynen, Helander, Jalonen, 2023; Ziemba, Papaj, 2023; Naqvi Al, Munoz, 2020; Stern, Daub et al., 2018; Walencik, 2018) include. Identification of problems in real time and faster response to them; faster and more efficient decision-making and more accurate decisions; access to huge amounts of data, which allows improving the analysis carried out, provides new evidence for the design and adaptation of public policies to the new reality (*evidence-based public policies*); reduction of time in dealing with official matters, bureaucracy, more personalised service for citizens and business; cost reductions; increased efficiency of the administration; improved innovation in public service delivery; ICT enables the introduction of reforms relating to the way in which public organisations operate; increased transparency of public sector activities; increased quality of services; new channels of communication and, as a result, improved information flow and support for active citizen participation.

At the same time, reaping the full benefits of applying the technologies known as Industry 4.0 to the public sector requires overcoming emerging obstacles. Among them, we can point out (Kitsios et al., 2023;Kuhlmann, Heuberger, 2021; Naqvi Al, Munoz, 2020): (1) the often outdated information technology (IT) infrastructure in public organisations; (2) the lack of statistical awareness and the lack of tool experience of staff (especially relevant for Big Data analyses); (3) the problem of data access while protecting sensitive data; (4) the low quality of available data (e.g. incompleteness); (5) problem of bureaucratic internal procedures in the organisation; (6) lack of financial resources; (7) lack of trust of users (citizens) in new technological solutions; (8) resistance of employees of public organisations; (9) lack of specialists; (10) outdated regulations and working procedures; (11) administrative law.

The implementation of modern technology into the functioning of the public sector is a significant change in its operating principles and requires proper management of the change process. Müller and Abildgaard Skau (Muller, Abildgaard Skau, 2015), based on a literature review, identified six areas that need to be examined in the change process to increase the likelihood of success, viz:

- External environment (legislation, political and administrative reforms, socio-economic factors).
- Organisation (financial resources, organisational infrastructure, cooperation, stakeholders, organisational culture).
- Governance (commitment, strategy, project management).
- Employees (human resources, resistance to change, education and training).
- Citizens (digital exclusion, education and training, citizens' needs and trust).
- Technology (infrastructure, security, design, and access).

The areas of digitisation related to public management concern various spheres of socio-economic life. Digitisation, together with the dynamic development of increasingly sophisticated ICT, are becoming alternatives to or replacing existing solutions. The main domain of digitisation expansion in public institutions is the creation of public e-services as *front office* (supporting interaction between the customer and the public institution) and the implementation of IT systems as *back office* (supporting *back office* and internal processes in public institutions.

A discussion of strategic documents and activities relating to digitisation of the public sector can be found in Ziemba and Papaj's (2023) work. Digitisation is coordinated with the goals and tasks set by the eGovernment Action Plan and, above all, the closely related Operational Programme Digital Poland (POPC).

Table 1.
Digitisation of the public sector in operational programmes

Programme	Activities
Operational Programme Digital Poland 2014-2020	Priority axis II. E-government and open government, and within it four measures: Measure 2.1 High accessibility and quality of public e-services; Measure 2.2 Digitisation of *back-office* processes in government administration; Action 2.3 Digital accessibility and usability of public sector information; Measure 2.4 Creation of services and applications using eServices and public sector information.
European Funds for Digital Development 2021-2027	Continuation of projects implemented in POPC 2014-2020. Priority axis II. Advanced digital services activities are planned, such as: 2.1 High quality and accessibility of public e-services with emphasis on the improvement of e-State and e-Health services; 2.2 Strengthening the national cyber security system; 2.3 Digital accessibility and reuse of information; 2.4 Digital cross-sectoral cooperation (cooperation for digital solutions to socio-economic problems) with an emphasis on digitisation areas such as health, energy, environment, entrepreneurship, agriculture, maritime economy; 2.5 Support for digital skills, primarily advanced digital competences in data analytics and machine learning, robotics and sensors, e-commerce, cybersecurity, the Internet of Things, quantum computing or IT management and Industry 4.0.

Source: Own study based on Ziemba, Papaj, 2023.

As Ziemba and Papaj (2023) point out – the main objective of the planned programme for the following years *is to support the digital transformation of public management through the implementation of projects that will ensure efficient and user-friendly advanced public e-services, the effective operation of the national cyber security system, access to public information with significant potential for further use and support for the development of digital competences, as well as to develop, through digitisation, cross-sectoral cooperation for the solution of socio-economic problems*.

Digitisation serves various purposes and, above all, as indicated earlier, it is intended to improve the delivery of public services to citizens, better interactions of public institutions with business and citizens, empowerment of citizens through access to information or more efficient government management. Well-implemented digitisation enables citizens, businesses, and organisations to interact with public institutions more easily, quickly and cheaply (Loberg, 2023). Ziemba and Papaj (2023) identified four pillars of digitisation:

- *E-processes*, i.e. the use of ICT to improve and enhance internal processes in public entities.
- *e-public services*, i.e. the use of ICT for public services and the provision of public e-services to citizens, businesses and public institutions.
- *E-democracy*, or the use of ICT to enhance transparency, public participation and democratic decision-making in public institutions and public governance.
- *E-governance*, or the use of ICT for networking, establishing partnerships between public institutions and citizens, businesses and NGOs.

The use of ICT for service delivery by the public sector results in public e-services delivered to citizens and businesses, as well as for internal services within or between public institutions.

3. Research methodology

The analysis of the literature on the subject allowed the research team to prepare a questionnaire survey addressed to the managers of local government units at the commune level, i.e. to mayors and presidents. At the same time, it was allowed for the mayor to delegate the completion of the questionnaire to an appropriate office employee who is competent to answer the questions contained in the survey questionnaire. 357 units were surveyed. The territorial distribution of the respondent group is shown in Table 2.

Table 2.
Sample structure by province (percentage (%) and number (n))

Province	%	n
Lower Silesia	9.52%	34
kujawsko-pomorskie	5.60%	20
Lublin	7.28%	26
Lubuskie	3.08%	11
Lodz	7.84%	28
Małopolskie	7.28%	26
mazowieckie	12.32%	44
Opolskie	3.64%	13
Podkarpackie	5.32%	19
Podlaskie	3.92%	14
Pomeranian	4.76%	17
Silesia	6.44%	23
Świętokrzyskie	4.76%	17
Warminsko-Mazurskie	4.48%	16
Wielkopolskie	8.12%	29
zachodniopomorskie	5.60%	20
Total	100.00%	357

Source: Own study.

The largest percentage of municipalities were in the Mazowieckie voivodeship, followed by Dolnośląskie and Wielkopolskie. In terms of the type of municipality represented by the respondent, 21% (76 municipalities) were urban municipalities, 50% (177 municipalities) were rural municipalities and 29% (104) were rural-urban municipalities. By job position, among the 357 respondents – 79 (22%) held the position of mayor, 93 (26%) the position of mayor and 185 (52%) others. There were no mayors among the respondents. The vast majority of respondents (68%) were over 46 years of age. The gender structure of respondents was as follows – 53% of respondents were female, 47% male. The predominant education among respondents was tertiary education (99.4%). Respondents were asked to rate how much they agreed with the statements in the questionnaire. Ratings were made on a 5-point Likert scale: 5 – agree; 4 – rather agree, 3 – neither agree nor disagree, 2 – rather disagree, 1 – disagree.

The aim of the research conducted was to assess how managers of public organisations perceive the digitalisation process and the benefits it brings to the functioning of public organisations. Additionally, using the Unified theory of acceptance and use of technology (UTAUT) concepts proposed by Venkatesh et al. (2003, 2022), variables influencing the

intention to use modern technology among managers of public organisations were assessed. The unified theory of acceptance and use of technology (UTAUT) used in the study assumes the existence of four determinants influencing the intention to use a given technology. These are: performance expectancy, effort expectancy, social influence and facilitating conditions (Soltysik-Piorunkiewicz, Zdonek, 2015; Venkatesh et al., 2003). Performance expectancy is the belief that the use of a given technology will help to achieve benefits/higher performance in accomplishing important tasks. Effort expectancy is the degree of difficulty in using a given technology. Social influence is the degree of a person's belief that people important to them would also use the technology. facilitating conditions means the degree to which a person is convinced that the appropriate technical and organisational infrastructure exists to provide support during the difficulty of using the technology. These determinants influence users' intentions to use modern technology.

Research questions: (1) how managers of public organisations perceive the digitalisation process and the benefits it brings to the organisation, (2) how managers of public organisation perceive the factors that may influence their intentions to use modern technology.

4. Digitalization in local government units in Poland – research results

Table 3 shows the results regarding the evaluation of the digitisation process. The results indicate that managers have a positive perception of the digitisation process. The vast majority of the answers given were either agreed or rather agreed. Importantly, in practical terms, respondents agree that digitisation has an impact on improving the results of their work. What is particularly important is that the vast majority agree with statements that digitisation has improved the ability to consider the needs of residents, has tightened the relationship with them, and has made it easier to work with other public services/companies or third sector organisations. It is important to note that around 95% of respondents agree that digitisation has had an impact on improving working conditions in the public sector, but only around 70% agree with the statement that digitisation has had an impact on increasing wages in the public sector. At the same time, around 75% of respondents agreed with the statement that the new skills required by digitisation reduce job security, while opening up other employment opportunities (around 85%)

Table 3.
Structure of responses regarding digitization in public organizations (percentage, %)

	Answer				
Statement/Question	**1**	**2**	**3**	**4**	**5**
The digitalisation of work is having an impact on improving the results of your work.	0,0%	2,0%	5,3%	42,9%	49,9%
The digitalisation of work is having an impact on the functioning of society.	0,0%	1,1%	4,5%	44,0%	50,4%
The digitalisation of work has an impact on the quality of services provided by the public sector.	0,6%	0,6%	3,4%	46,5%	49,0%
The digitalisation of work has an impact on reducing inequality and discrimination.	1,1%	6,4%	16,0%	47,9%	28,6%
The digitalisation of work has an impact on improving social wellbeing.	1,1%	5,6%	8,7%	51,8%	32,8%
The digitalisation of work is having an impact on improving working conditions in the public sector.	0,8%	0,8%	3,1%	48,5%	46,8%
The digitalisation of work is having an impact on wage growth in the public sector.	5,0%	11,2%	12,9%	45,4%	25,5%
The digitalisation of work has implications for a better balance between personal/family life and civil servants' work.	5,3%	6,4%	9,8%	48,2%	30,3%
The new skills required by digitalisation are sufficiently considered when assessing your skills and career development.	0,8%	6,7%	7,0%	55,5%	30,0%
The new skills required by digitisation enrich your personal skills.	0,6%	4,2%	3,9%	49,9%	41,5%
The new skills required by digitisation open up other employment or career opportunities for you .	1,1%	7,0%	6,7%	52,9%	32,2%
The new skills required by digitalisation reduce future job security.	2,0%	8,4%	14,3%	51,5%	23,8%
The introduction of digital tools and working methods has contributed to you feeling more useful to residents because you now provide them with a better opportunity to take their needs into account.	0,6%	7,3%	6,4%	56,3%	29,4%
The introduction of digital tools and working methods has led to a closer relationship with your residents than before.	1,4%	7,8%	7,3%	56,3%	27,2%
The introduction of digital tools and working methods has led to you working better with other public services/businesses and third sector organisations.	0,3%	4,5%	5,9%	59,4%	30,0%
The introduction of digital tools and working methods has intensified performance monitoring in the office where I work.	0,3%	1,4%	2,5%	55,7%	40,1%

Source: Own study.

The results obtained in Table 4 show that the respondents are relatively positive about the indicated determinants. In terms of questions relating to performance expectancy, there is a clear predominance of “tend to agree” and “agree” ratings, also respondents feel that digitisation tools have a positive impact on the results of their work. Considering the seniority of the respondents in the public organisation, more than 80% of the respondents have more than 10 years of work experience, which allows them to assess their expected performance in the long term. The vast majority of respondents declare that, as supervisors, they support the introduction of a digitalisation tool in their office. The high rating for questions in effort expectancy indicates that the respondents have a high opinion of their digital competence and that they do not perceive the introduction of a digitalisation tool in their organisation as

a burden. The vast majority of respondents confirmed a facilitating conditions in terms of supporting the implementation and use of digitalisation tools.

Table 4.
Determinants of the use of modern technology in a public organisation (percentage, %)

		Answer				
Determinant	**Statement/Question**	**1**	**2**	**3**	**4**	**5**
Performance expectancy	The use of digitalisation tools at work has increased your productivity, i.e. the goods/services produced have more value than the inputs used to produce them.	0,6%	4,5%	6,2%	53,2%	35,6%
	By using digitalisation tools at work, you perform your tasks faster.	0,3%	1,7%	3,1%	45,1%	49,9%
	You believe that the use of digitalisation tools is essential for the effective resolution of residents' issues.	0,3%	4,2%	5,3%	55,5%	34,7%
	The use of digitalisation tools increases residents' satisfaction with your work.	0,8%	5,6%	5,6%	53,5%	34,5%
Social influence	Influencers at work think you should intensify your use of digitalisation tools in your work.	0,3%	9,8%	5,3%	56,6%	28,0%
	As a supervisor, you support the introduction of digitalisation tools in the office.	0,0%	1,1%	4,5%	58,8%	35,6%
	In your office, a large proportion of employees use digitalisation tools in their daily work.	0,0%	1,1%	2,2%	53,2%	43,4%
Effort expectancy	The digitalisation tools being introduced in the office are clear and understandable to you.	0,3%	0,8%	3,9%	54,1%	40,9%
	You assimilate new developments in the use of digitalisation tools at work with ease and without difficulty.	0,0%	2,2%	3,1%	57,7%	37,0%
	You find it easy and effortless to use digitalisation tools at work.	0,0%	2,0%	3,1%	50,1%	44,8%
	You are quick to learn and become proficient in the use of digitalisation tools.	0,0%	1,4%	3,4%	56,3%	38,9%
Facilitating conditions	You have been given the opportunity to gain knowledge and skills in using digitalisation tools in your office.	0,0%	0,3%	2,0%	61,9%	35,9%
	You have been provided with the resources necessary to use digitalisation tools (software and hardware).	0,3%	1,1%	4,8%	50,4%	43,4%
	There is an organisational unit/person in your office who can be contacted in case of problems with the use of digitalisation tools.	0,3%	0,6%	3,9%	53,2%	42,0%
	Your office supports (e.g. through training) the use of digitalisation tools by staff in their dealings with residents.	0,3%	0,6%	4,2%	61,1%	33,9%
Intentions to use modern technology	Given your current level of access to digitisation tools, you anticipate using them at your current level.	0,3%	1,7%	4,5%	61,6%	31,9%
	Assuming your current level of access to digitalisation tools, you intend to expand your competence in using such solutions.	0,3%	0,6%	2,8%	59,1%	37,3%
	In your work, it is important to expand your competence to use digitalisation tools.	0,3%	0,3%	1,4%	54,1%	44,0%

Source: Own study.

5. Discussion

It should also be pointed out that in a digital transformation environment, public organisations must fulfil three basic roles – facilitator, user, and regulator (Naqvi Al, Munoz, 2019). As a facilitator, public organisations should support the development and adaptation of modern technologies through, among other things, financial support and the creation of new entities. At the same time, public organisations must become active users of modern technologies (artificial intelligence, Big Data) in their daily activities to create new public policies more in line with the changing reality. As a regulator, public organisations or the public sector more broadly are responsible for the legislative process focusing on the ethical issues of using modern technologies and data security. As a limitation of the presented research results, it can be pointed out that only percentage results are presented for the evaluation of individual statements without testing hypotheses in which a relationship can be presumed between a given determinant and the intention to use modern technology.

6. Conclusion

The presented research results indicate that the digitisation process in public organisations is relatively well perceived by managers. At the same time, however, it notes that some digital tools are introduced into a public organisation in an obligatory manner, which necessitates further expansion of competences by managers and the development of conditions favourable for the users of new solutions. The process of digital transformation in the public sector is not a mission to be pursued only by managers because by providing better opportunities to consider the needs of residents or by building closer relationships with residents, it allows a shift from viewing the resident as a customer towards building partnerships and active participation in the delivery of public services (Kitsios et al., 2023; Bason, 2018). The active participation of residents in the provision or, more broadly, in the co-creation of public services using the tools of digitisation seems to be an interesting direction for future research.

Acknowledgements

Article funded by the research project Digital Economy - a model approach to supporting the inclusion of cyber-excluded older people in the use of social services provided in a post-pandemic world by public management entities with the use of ICT". Head: Prof. Dr. Aldona

Frączkiewicz-Wronka, project funded by the University of Economics in Katowice (Beyond Barriers competition).

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

ANALYSIS OF EMOTIONS IN IT PROJECTS IMPLEMENTED IN THE OPEN SOURCE FORMULA USING MACHINE LEARNING METHODS

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Purpose: The aim of this paper is to analyze possibilities of using automatic emotion analysis in project management.
Design/methodology/approach: The approach adopted involves literature review, analysis of data availability and availability of IT tools. Then, an attempt was made to adapt these elements for use in project management.
Findings: The paper discusses three fundamental research questions that arise in the context of using machine learning methods to analyze emotions in projects. The first of them concerned what data can be used for analysis. It was established that electronic communication in projects implemented in the open source formula is publicly available and susceptible to text analysis. The second question concerned the methods that can be used in the analysis of emotions. Here it was established that machine learning methods may be useful due to the problems described in the literature with the use of dictionary methods. The third question concerned the purposes for which the analysis of emotions can be useful. In response to this question, it was established that recognizing particularly destructive emotions, such as anger, can be useful in effective project management.
Research limitations/implications: The presented work is limited only to conceptual digressions on the possibility and usefulness of using methods of automatic emotion detection in project management. In future studies, these concepts should be verified on real data.
Originality/value: The novelty of paper is an attempt to define a framework for the use of known methods of automatic emotion detection in project management.

Keywords: project management; emotion recognition; natural language processing.

Category of the paper: Conceptual paper.

1. Introduction

Projects in the current economy face a unique set of challenges and opportunities. Some of the key issues related to project management in the context of the problem considered in this work are listed in the following paragraphs.

First one is Economic Uncertainty. The global economy is constantly evolving, and factors such as inflation rates, interest rates, and market volatility can impact project planning and execution. It's crucial to regularly monitor economic indicators and adjust project plans accordingly.

Next one is Remote Work and Virtual Collaboration. The COVID-19 pandemic has accelerated the adoption of remote work and virtual collaboration. Project teams may be distributed across different locations, requiring the use of digital tools and platforms for communication, project tracking, and collaboration.

Related with previous one is Technology and Digital Transformation. The rapid pace of technological advancements offers opportunities for innovation and efficiency improvements. Project managers should stay updated on emerging technologies relevant to their projects and explore how they can leverage them to enhance project outcomes.

Most important key parameter is Stakeholder Engagement. Engaging stakeholders, including customers, employees, investors, and regulators, is crucial for project success. Clear communication, managing expectations, and addressing stakeholder concerns are essential to maintain support and alignment throughout the project life cycle.

Taking these factors into account, we may try to use new elements in project management, such as, for example, sentiment or emotion analysis in electronic communication and to propose new tools for their use.

Electronic communication, based on emails, are especially susceptible to automatic analysis based on Natural Language Processing. Many computer methods of natural language processing (NLP) are currently being developed. They are methods of text and speech processing (Speech recognition, Word segmentation), Morphological analysis (Lemmatization, Stemming), Syntactic analysis (Parsing), Lexical semantics (Sentiment analysis with Emotion recognition, Terminology extraction) and many others like Automatic summarization and Machine translation. Sentiment analysis seems to be a particularly useful tool for analyzing communication in a project. Having such tools at our disposal, we can analyze the impact of external phenomena on IT projects implemented in the open-source format.

The aim of the study is to analyze possibilities of using automatic emotion analysis in project management. On the one hand, it is an exploration of the models used in psychological literature to describe human emotions as a complex phenomenon. On the other hand, it is an examination of the availability of data for later research. On the third hand, it is also an analysis of available IT tools that can be used in the automatic detection of emotions.

The work is divided into the following parts. The first section presents literature survey on topics of interest, namely open source projects, emotions models, automated emotion recognition and IT tools for emotions analysis. Next section formulating research questions that appear in the context of the problem under consideration. The third section contains discussions of the questions raised and presents some findings. The whole paper ends with a summary.

2. Literature survey

2.1. Open source projects

Nowadays, software development is a very complicated undertaking in which many specialist are involved. One of the most effective ways to develop software is the open-source formula. Open-source software (OSS) is computer software that is released under a license in which the copyright holder grants users the rights to use, study, change, and distribute the software and its source code to anyone and for any purpose (Laurent, Andrew, 2008).

Some organizations which are follows open-source formula are the Linux Foundation, the Eclipse Foundation, home of the Eclipse software development platform, the Debian Project, creators of Debian GNU/Linux distribution; the Mozilla Foundation, home of the Firefox web browser and finally the Apache Software Foundation.

Mailing lists are the core means of project communication in open source projects, where they are used during software development and maintenance to discuss technical issues, propose changes, report bugs, or ask how-to questions about configuration or any other parts of the product (Obaidi, Klünder, 2021). The idea of using open source project mailing list communication to analysis comes from Tourani et al., (2014).

2.2. Emotions models

Starting with the work of von Neumann and Morgenstern (1944), decision theory was based on rationality. Later work by Simon (1955) and Bertalanffy (1968) merely modified the basic assumption of rational decision-making. In the real world, the decision maker's emotional states strongly influence the decisions made. Stressful situations they evoke strong emotions that lead to wrong decisions.

Clarke (2010) was probably the first who notice that projects are emotional. Despite previous work on the significance of conflict in projects (Chen, 2006), and recognizing that conflict is a source of strong emotions (Barki, Hartwick, 2004), the topic of recognizing emotions in the project has not been considered in the literature on the subject. In mentioned paper Clark (2010) analyze how emotions can influence project manager behaviors and decisions in order to better understand why projects can often take very different directions to

those expected within the predominant rationalist paradigm. He interviewed PMs who took part in Emotional Intelligence training, so they were aware of the important role of emotions in decision making.

Virine et al. (2015) analyzed emotions in the context proposed by D. Goleman (Goleman, 2006) and adopted for project management by A. Mercino (Mercino, 2007) model of emotional intelligence. Proposed model analyse five domains: Self-awareness, Self-management, Social awareness, Relationship management and Team leadership. Virine et al. notice that not only negative emotions may cause wrong decisions but also positive ones may lead to mistakes. They propose some methods to deal with emotions but they first step is emotion recognition.

Human emotions are very complex phenomenon. For this reason, models of this phenomenon are considered in psychology. A fairly wide overview of the models can be found in (Nandwani, Verma, 2021). Most widely are used Ekman model (Ekman, 1992) and Plutchik Wheel of Emotions (Plutchik, 1980). Ekman model is categorical one, with six defined emotions: anger, disgust, fear, joy, sadness, surprise. Plutchik considered two types of emotions. Basic ones which include Ekman six emotions supplemented by trust and anticipation and mixed emotions which are made from the combination of basic emotions. Plutchik represent his emotions on a colored wheel. Plutchik model is also categorical one. Opposite type of models are Dimensional Emotion models (Nandwani, Verma, 2021). They are based on three parameters: Valence (positive, neutral, negative), Activation or Arousal (excited, neutral, calm) and Dominance or Power (weak, neutral, strong).

2.3. Automated emotion recognition

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. Very interesting directions of NLP development in the context of project management are the Sentiment Analysis (SA) and Emotion Analysis (EA) which leads to emotion recognition.

Sentiment Analysis (SA) and Emotion Analysis (EA) are sometimes equated, but there are important differences between them (Nandwani, Verma, 2021). Sentiment analysis is a means of assessing emotions are positive, negative, or neutral. In contrast, Emotion detection is a means of identifying complex human emotion like fear, love etc. As mention Yamini (2023), Emotion Analysis has also outperformed Sentiment Analysis in some ways. First it reveals

complex emotions. Then it provides deeply meaningful and relevant insights and at last it helps to turn insight into action.

Automated emotion recognition use various methods like electroencephalogram (EEG), facial, and speech signals, text analysis. Current overview of trends and future perspectives can be found in paper (Maithri et al., 2022).

By the nature of things, emotion detection from text will be used to analyze emotions in open source projects where almost all communication takes place via mailing lists. We are talking about emotion detection here, narrowing down the area of emotion analysis.

Many papers have been written in recent years devoted to this topic. Worth mentioning are (Shivhareand, Khethawat, 2012) where Word Ontology was used and (Minu, Ezhilarasi, 2012) which describes an English emotion ontology based on WordNet. Batbaatar have used novel neural network architecture, called SENN (Semantic-Emotion Neural Network) which can utilize both semantic/syntactic and emotional information by adopting pre-trained word representations (Batbaatar et al., 2019). Ho et al. (2020) have used to analyse other than English language namely Vietnamese. Most recent surveys on emotion detection from text can be found in paper (Nandwani, Verma, 2021) and also in two papers which present utilization of deep learning models (Uymaz, Metin, 2022; Chen, 2022).

2.4. Tools for emotion recognition

There are two general ways for dealing with automatic emotion detection: knowledge-based techniques and statistical methods (Emotion recognition, 2023). Knowledge-based techniques are referred to as lexicon-based techniques but also contain rule-based systems. Statistical methods are based on the use of different supervised machine learning algorithms.

Emotion lexicons are dictionaries that associate words or phrases with specific emotions. Tools that can be used for emotion recognition are:

- NRC Word-Emotion Association Lexicon (Mohammad and Turney, 2010; Mohammad and Turney, 2013).
- WordNet (Princeton University, 2010).
- EmotiNet (Balahur et al., 2012).

Example of rule based system is ANEW (Affective Norms for English Words) (Bradley, Lang, 1999).

Statistical methods based on supervised machine learning algorithms use such architecture as:

- Convolutional neural network (CNN) (Wang et al., 2016).
- Bidirectional Encoder Representations from Transformers (BERT) and Bi-directional Long Short-Term Memory (BiLSTM) (Chen, 2022).

There are also effective hybrid methods, an overview of which can be found in (Alswaidan, Menai, 2020).

3. Research questions

When starting research in the selected area, one should be aware that the proposed models will have to be verified based on data from the real world. The question arises about the availability of such data, hence the first research question was formulated:

RQ1: What data from real projects can research be based?

Another problem that needs to be faced is the availability of methods and tools for detecting emotions. Their spectrum is quite extensive as discussed in the previous section. However, another research question arises in the form of:

RQ2: What methods can be used to analyze emotions in project management?

The last question that arises in the context of the conducted considerations is what this knowledge can be used for in project management. If data for research are available, methods and tools will be selected, whether the ability to automatically detect emotions can be used in project management. Hence the next research question arise:

RQ3: For what purposes can emotion recognition be used in a project management?

A discussion of the presented research questions is presented in the next section.

4. Discussion and findings

4.1. Data selection

Due to the specificity of projects in which teams are focused on achieving goals, it is difficult to expect that during their implementation someone will have time to answer surveys or undergo EEG tests. In this case, there is also a question about the relevance of the results of the research conducted in this way. This is especially important in the context of the use of surveys that need to be developed. We also resign from the use of facial analysis methods. It seems that at the initial stage of research it will be beneficial to focus on the analysis of texts and communication carried out in this form.

Communication in the project takes place in defined communication channels and is usually confidential. Fortunately, in IT projects implemented in the open source formula, the projects communication is based on mailing lists and by nature are publicly available.

The mailing list of the Apache OpenOffice project, implemented in the open-line formula, was selected in this work. For this, project communication is publicly available at "https://openoffice.apache.org/mailing-lists.html". Mailing list is maintained since 2011 till today. Every month, several hundred messages appear on all sub lists together.

OpenOffice is an open-source office suite. It was an open-sourced version of the earlier StarOffice, which Sun Microsystems acquired in 1999 for internal use. Sun open-sourced the OpenOffice suite in July 2000 as a competitor to Microsoft Office. In 2011, Oracle Corporation, then the owner of Sun, announced that it would no longer offer a commercial version of the suite and donated the project to the Apache Foundation. Apache renamed the software to Apache OpenOffice. Today the most actively developed successor projects is LibreOffice (OpenOffice.org, 2022).

Apache OpenOffice is an office productivity suite providing six productivity applications (Writer, Calc, Impress, Draw, Math, Base) based around the OpenDocument Format (ODF). OpenOffice is released on Windows, OS X, Linux. It is available in 41 languages.

4.2. Methods selection

It seems that methods based on dictionaries and deep neural networks are particularly interesting. While the use of dictionary methods can be problematic, due to the problem mentioned by Tourani (Tourani et al., 2017), involving the use of specific IT slang in open source projects, the use of deep neural networks may be interesting. Another research problem arises as to whether these tools will be able to capture emotions from e-mail communication. It is also a question about the selectivity of these methods in detecting emotions.

4.3. The use of emotion recognition in project management

In the context of the latest views on the success of a project, according to which success is considered to be meeting the expectations of and stakeholders, their emotions may be important in the correct assessment of the project. We know that some negative emotions (such as anger) as well as positive ones (such as love) can affect the way we view the situation and the decisions we make. Hence, the ability to catch particularly bad emotions can be helpful in effectively managing stakeholder engagement. As a consequence, it can also have an impact on achieving project success more effectively.

For the above reasons, it seems justified to focus primarily on the detection of bad emotions, such as anger.

5. Summary

The presented work deals with the topic of using automatic emotion recognition in projects. On the one hand, there are effective tools for emotional analysis. On the other hand, there is a need to manage stakeholder engagement.

The available data for the analysis of emotions in projects was reviewed. It turned out that it would be beneficial to use publicly available communication in open source projects. It also implied the use of methods of emotional analysis in texts. In the course of the conducted analyses, effective methods of analyzing emotions from the text were also reviewed. Finally, an analysis of the possibility of using emotion recognition in project management was made. The most beneficial seems to be the use of the proposed methods to detect bad emotions that disturb the delay in project goals.

The presented work presents the concept of using emotion recognition in project management. The initial considerations carried out led to many further questions that need to be verified in empirical research. This will be the subject of further research.

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ORGANIZATION AND MANAGEMENT SERIES NO. 177

NARCISSISTIC ATTITUDES AMONG MANAGERS BUILDING A PERSONAL BRAND

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Purpose: The purpose of this article is to increase knowledge of managers' evaluation of the phenomenon of narcissism in contemporary organisations and their identification of both narcissistic manifestations among individuals managing organisations and personal branding activities of narcissistic nature.
Design/methodology/approach: The study was of a partial, ad hoc nature, and it was conducted in the form of a diagnostic poll, based on a self-constructed survey questionnaire.
Findings: The vast majority of managers surveyed agree that the internet and new media have reinforced the narcissistic traits of many individuals, inducing an eruption of egocentric behaviour in society, and that the human personality has become a commodity with a certain market value. More than 40 per cent felt that in companies, managers surround themselves with uncritical or dependent 'claqueurs' who uphold their idealised self-image, and that it is mainly those who are "glamorous" yet not necessarily effective in achieving business goals who get promoted. The most questionable statement for them was that in the company there is an organisational culture being shaped that emphasises norms and values which eliminate narcissistic attitudes and behaviours among employees. The main manifestations of narcissistic attitudes of organisational managers included striving to dominate others and devaluing others, thus indicating narcissistic competition. In their view, self-indulgence, inconsistency and distortion of reality, excessive social media presence, boasting and focusing attention solely on oneself are all narcissistic actions used when building a personal brand. More than half of them create themselves as they want to be perceived by others, and one in five respondents admitted that they focus on constantly monitoring themselves and their image, trying to guess "what others think of me".
Research limitations/implications: The empirical study was conducted using the purposive sampling method and the target group was managers - graduates of the postgraduate course "Manager's Academy". Due to the small research sample (68 responses), it is not possible to generalise the findings to the entire population. The findings obtained relate to the perception, subjective evaluation of the managers surveyed and are not based on methods known in the clinical field for measuring narcissism, which may be a certain limitation of this study.

Practical implications: The findings obtained from the study may be useful for business owners and managers of various levels interested in conscious and consistent personal branding and who want to know what manifestations of narcissistic attitudes of individuals managing organisations are and which personal branding activities bear the hallmarks of narcissism. The findings may also be of interest to human resource professionals responsible for shaping an organisational culture that emphasises norms and values that eliminate narcissistic attitudes and behaviours among employees.
Social implications: Raising awareness of narcissistic attitudes of managers who are building a personal brand as well as highlighting the phenomenon of narcissism in contemporary organisations.
Originality/value: The article is of cognitive value for the development of knowledge in management and quality sciences, in the area of human resource management.

Keywords: narcissism, personal branding, personal brand, manager, management, human resource management, organisation, work environment, organisational behaviour.

Category of the paper: Research paper.

1. Introduction

Personal branding is most often presented in the context of a career development tool (Dzieńdziora, Grzesiak, Wróbel, 2020), employability (Muszyńska, Fryczyńska, 2021), the CEO brand management process (Górska, 2021), diversity of methods (Wojtaszczyk, Maszewski, 2014), the relationship with employer-branding (Sidor-Rządkowska, 2016, 2019), comparative analyses (Grzesiak, 2015, 2017). In turn, the problem of narcissism is discussed in the context of employee relations, organisational behaviour, work environment, organisational culture, leadership, hypercompetitiveness and management dysfunction (see Braun, Aydin, Frey, Peus, 2018, pp. 725-741; Erkutlu, Chafra, 2017, pp. 146-162; Ingersoll, Glass, Cook, Olsen, 2019, pp. 893-907; Buchholz, Lopatta, Maas, 2020, pp. 663-686; Swid, Ragab, 2018, pp. 31-39; Erdal, Budak, 2021, pp. 139-155; Ali, Johl, 2020, pp. 1-18; Paltu, Brouwers, 2020, pp. 1-11; Saleem, Malik, Malik, 2021, pp. 1-16; Khan, Nazir, Shafi, 2021, pp. 87-110; Uppal, 2021, pp. 99-113; Yang, Chang, Li, Zhou, Tian, Zhang, 2021, pp. 137-154; Yao, Zhang, Liu, Zhang, Luo, 2020, pp. 543-563; Cote, 2018, pp. 42-65; Fehn, Schütz, 2021, pp. 549-566; Khan, Imran, Anwar, 2019, pp. 135-144; Latta, Withely, 2019, pp. 63-80; Choi, 2019, pp. 1-12; Lyons, Moorman, Mercado, 2019, pp. 369-380; Matherne, Credo, Gresch, Lanier, 2019, pp. 31-39; Harrison, Summers, Mennecke, 2018, pp. 53-77; Blair, Helland, Walton, 2017, pp. 333-346).

A systematic review of the management science literature and meta-analysis has shown that there is a lack of empirical research conducted among managers building a personal brand in order to diagnose the perception of their narcissistic attitudes (cf. Winnicka-Wejs, 2022). A systematic review of the literature has shown, for example, that narcissistic tendencies hold the potential to positively influence the success of a start-up in the early stages of the entrepreneurial journey, but that after a certain period of time the impact of narcissism on

success becomes mostly negative (see Burger, Kanbach, Kraus, 2022, pp. 1750-6204). In management science, it is emphasised that narcissism and hubris are unfavourable traits attributed to managers in the context of their strategic myopia (Czakon, 2020, p. 15). Issues related to managers' personality disorders affect intra-organisational and stakeholder relationships (Kutzner, Marcinkowski, 2020, pp. 147-161). There are specific difficulties in building relationships with a narcissistic person in the work environment (Dreżewska, Michniak-Szladerba, 2019, pp. 9-18), and narcissistic managers shape organisational cultures with a toxic work environment (see Stawiarska-Lietzau, Luzniak-Piecha, 2014, pp. 11-30).

Culturally and socially, the values currently promoted foster a selfish attitude and shape specific behaviours in social relations in work settings, resulting in an increased need for individualism, uniqueness and care for one's social and media image (Gawda, 2018, p. 70). It is important to note that narcissism can be regarded not only as a name for a personality disorder, but also as an attitude or a set of behaviours observed in healthy people who are dominated by an overly strong desire to become relevant, pushy self-promotion going hand in hand with a lack of capacity for critical self-reflection. Narcissistic attitudes of managers can be a source of dysfunction in organisational management (Moczydłowska, 2016, p. 259).

There is a scarcity of studies in the literature on the subject that link the topic of personal branding with narcissism. In the era of the 'narcissism epidemic', research on the links between this personality syndrome and various aspects of human functioning (also in organisations, in the workplace) seems not only justified, but also very desirable (cf. Łojan, 2021, pp. 20-29), especially when we realise that narcissism is a social and cultural phenomenon (Lasch, 2015, p. 62).

In view of the above, the following research questions were formulated:

1. Is the phenomenon of narcissism acknowledged in contemporary organisations by managers, and if so, to what extent?
2. What are the manifestations of narcissistic attitudes of individuals managing organisations?
3. Which personal branding activities are narcissistic in the opinion of the managers surveyed?

For the purpose of this article, an analysis of the literature on the subject and a survey among managers were conducted.

2. Description of the research methodology and characteristics of the managers surveyed

The aim of the empirical study was to survey managers (graduates of the postgraduate course 'Manager's Academy' - www 1) about the narcissistic manifestations of individuals managing organisations and personal branding activities of a narcissistic nature.

For the purposes of the study and on the basis of the analysed literature on the subject, a survey questionnaire was devised, consisting of 12 questions (6 - factual, 6 - metric). The questions were closed-ended, both single-choice and multiple-choice, and one question was open-ended, allowing the respondent to leave a comment. A link to the survey was made available via a Google form.

The survey was conducted using the purposive sampling method. The target group consisted of managers - graduates of the post-graduate course "Manager's Academy" at the University of Economics in Katowice, who form a closed Facebook group. The study was of a partial, ad hoc nature, conducted in the form of a diagnostic poll.

The pilot study, which aimed, among other things, to improve the tool in terms of content and technical aspects was carried out from 26.06.2023 to 30.06.2023. The survey proper took place between 01.07.2023 and 08.07.2023. A total of 68 persons took part in the survey. The questionnaires were completed correctly and all questions were answered, as a result of which no questionnaire had to be rejected. The structure of the survey respondents who took part in the survey is summarised in Table 1.

Table 1.
Structure of the managers surveyed by gender, year of birth, management level, length of service, company size, industry

Metric category		**Distribution of responses**
Gender	Female	47
	Male	21
Year of birth	1946-1964	1
	1965-1979	9
	1980-1989	39
	1990 and later	19
Management level	Lower	19
	Middle (director head of unit, department, for...)	44
	Top (president, director, owner, deputy)	5
Length of service	Less than 5 years	2
	5-10 years	26
	11-20 years	28
	Over 20 years	12
Company size	Sole trader	2
	Micro (up to 9 persons)	2
	Small (10-50 persons)	5
	Medium (51-250 persons)	15
	Large (more than 250 persons)	44

Cont. table 1.

Industry according to Polish Classification of Activities (PKD)	Agriculture, forestry, hunting and fishing	0
	Mining and quarrying	1
	Manufacturing	13
	Electricity, gas, steam and air conditioning supply	1
	Water supply; sewerage, waste management and remediation activities	3
	Construction	1
	Wholesale and retail trade; repair of motor vehicles and motorbikes	3
	Transport and storage	3
	Accommodation and food service activities	0
	Information and communication	2
	Financial and insurance activities	12
	Real estate activities	0
	Professional, scientific and technical activities	3
	Administrative services and support activities	2
	Public administration and defence; compulsory social security	8
	Education	2
	Human health and social work activities	5
	Arts, entertainment and recreation activities	1
	Other service activities	8
	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	0
	Extraterritorial organisations and bodies.	0

Source: own study based on own empirical survey.

Analysing the data in Table 1, it can be observed that 69.1% of women and 30.9% of men completed the questionnaire. More than half of the responses (57.4%) are from Generation Y (born 1980-1989), followed by Generation Z (born 1990 and later) with 27.9%. 13.2% of the respondents represent generation X (1965-1979). From the Baby Boomers generation, only one person completed the questionnaire.

Respondents are characterised by varying length of service: 41.2% ticked 11-20 years, 38.2% 5-10 years, 17.6% more than 20 years, 2.9% less than 5 years. Among the respondents, mid-level managers (67.4%) and the lower-level managers (27.9%) predominate. 7.4% were persons from top-level management (presidents, directors, owners).

Most of the surveyed managers work in large companies (64.7%) and medium-sized companies (22.1%). Most responses came from the following industries: manufacturing (19.1%), financial and insurance activities (17.6%), public administration and defence; compulsory social security (11.8%), other service activities (11.8%).

3. Findings of the empirical study and conclusions

The majority of respondents agreed with the statement that the human personality has become a commodity with a certain market value (cf. Table 2).

Table 2.

Structure of answers to the question "Do you agree with the statement that nowadays human personality has become a commodity with a certain market value? Please choose one answer."

Range of responses	Number of responses
Agree	32
Somewhat agree	27
Neither agree nor disagree	6
Somewhat disagree	1
Disagree	2

Source: own study based on own empirical survey.

The vast majority agreed with the quote that 'the internet and new media have reinforced the narcissistic traits of many individuals, inducing an eruption of egocentric behaviour in society' (Szpunar, 2016, p.12) (cf. Table 3).

Table 3.

Structure of responses to the question "Do you agree that 'the internet and new media have reinforced the narcissistic traits of many individuals, inducing an eruption of egocentric behaviour in society'? (Szpunar, 2016, p .12) Please choose one answer"

Range of responses	Number of responses
Agree	40
Somewhat agree	25
Neither agree nor disagree	2
Somewhat disagree	1
Disagree	0

Source: own study based on own empirical survey.

In their work to date, respondents have encountered specific manifestations of narcissistic attitudes among individuals managing organisations, mainly in the form of 'dominating others', 'devaluing others' and 'grandiose fantasies'. Table 4 shows the detailed distribution of responses.

Table 4.

Structure of responses to the question "Which manifestations of narcissistic attitudes of organisational managers have you encountered in your work so far? Please select the appropriate answers"

Range of responses	Number of responses
Striving for uniqueness	16
Grandiose fantasies	34
Devaluing others	37
Striving to dominate others	46
Other	6

Source: own study based on own empirical survey.

Other responses (cf. Table 4) included: "Social media addiction", "Maintaining a relationship of dependence, infantilising subordinates, Parent-Child relationship according to transactional analysis", "Crediting oneself with significant achievements that have not occurred", "Intimidation of subordinates by virtue of the empowering position held", "I am the only person who is right", "A sense of uniqueness, depreciating the achievements of other members of the organisation".

In the next question, the surveyed managers were asked to respond to statements that referred to their organisation and organisational culture being conducive to narcissism (cf. Table 5).

Table 5.
Respondent managers' attitudes towards specific statements

Statements	Number of responses				
	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree
In the company where I work, self-promotion, creating a buzz around oneself, the ability to attract attention is valued more than finding one's place in the team.	6	21	16	20	5
In the company, it is "stardom" that is rewarded rather than cooperation and friendliness.	8	13	10	23	14
Within the company, it is mainly those who are 'glamorous', yet not necessarily effective in achieving business goals, that are promoted.	10	18	11	19	11
In the company there is an organisational culture being shaped that emphasises norms and values which eliminate narcissistic attitudes and behaviours among employees.	7	21	25	11	4
An exuberant self-centredness is promoted in the company to justify the subjective, instrumental treatment of employees.	3	7	19	20	21
Within the company, managers surround themselves with uncritical or dependent 'claqueurs' who uphold an idealised self-image.	12	17	14	13	12
One's position in my industry is mainly determined by how a manager takes care of his or her own image.	3	22	16	17	13

Source: own study based on own empirical survey.

Table 5 shows that the surveyed managers are not unanimous in their opinion on narcissism in the company. 60% of them believe that exuberant egocentrism is not promoted in their companies to justify the subjective, instrumental treatment of employees. More than half of the respondents felt that their companies do not reward "stardom" instead of cooperation and friendliness. However, 37% of them are not sure whether in their companies there is an organisational culture that emphasises norms and values that eliminate narcssistic attitudes and behaviour of employees. With this statement, there were the highest number of 'neither agree not disagree' responses (25 indications).

The most positive responses (agree, somewhat agree) were given to the statements: "In the company, managers surround themselves with uncritical or dependent "claquers" who maintain an idealised self-image" (agree - 12 responses, somewhat agree - 17 responses), "in the company, it is mainly those who are ‘glamorous’, yet not necessarily effective in achieving business goals that are promoted (agree - 10 responses, somewhat agree - 18 responses), "in the company where I work , self-promotion, creating a buzz around oneself, the ability to attract attention is valued more than finding one's place in the team." (agree - 6 responses, somewhat agree - 21 responses). It should be noted that with these statements the number of 'disagree', “somewhat disagree' responses was close to the positive ones.

The next question was a multiple-choice item - respondents were asked to identify actions that apply to them. Table 6 captures the structure of the responses.

Table 6.
A selection of personal branding activities that relate to the managers surveyed

Activities	**Number of responses**
I have a penchant for embellishments, fashionable hairstyles and clothes that attract attention.	10
I focus on constantly monitoring myself and my image, trying to guess "what others think of me".	13
I have a compulsive need to please, to draw attention to myself, to impress others and myself with attributes such as prestige, power, possessions.	4
Being accepted by others and affirming myself is a kind of compulsion that organises my existence.	8
I have a compulsive need to leave behind a lot of information online, to search for information about myself.	1
On social media, I obsessively inform others about myself, uninhibitedly exposing myself in various situations.	0
I create myself as I want to be perceived by others.	37
Other.	18

Source: own study based on own empirical survey.

Table 6 shows that more than half of them create themselves as they want to be perceived by others, which may be related to individuals functioning in a culture of narcissism (cf. Szpunar, 2016, p. 160). The 18 'Other' responses included sentences that were grouped thematically:

- No action: "None of the above - I am myself, I don't need to 'create' myself as 'someone important'; " None of the above; "None of the above"; "None of the above applies to me"; "I like to be the centre of attention and I love the company of other people, but I don't think any of the above applies to me";
- Being authentic/myself: "I don't create anything, I am myself"; "I am just myself"; "None of the above, I rely on authenticity"; "I am myself. I like to look good/well-groomed and fashionable, I don't like large trinkets, I don't like to be photographed, I don't publish photos etc., I shy away from commenting on portals"; "I take care of my image, neat and clean clothes but I don't care about the opinion of others";

- Own personal branding strategies: "I selectively share information about myself on social media and like to show 'unique', 'prestigious' situations"; "I care primarily about my personal development and taking on continuous substantive challenges"; "I always try to follow my intuition, respecting others, but I also set a limit"; "I have a need to be accepted and perceived by both employees and employers as competent and good-looking"; "I value privacy and time spent with my family. I do not flaunt my personal life on social media and I like my workplace"; "Withholding information about my achievements undertaken individually".

The final open-ended question: 'Please give your comments. What can be considered a manifestation of narcissism in personal branding? Which personal branding activities are narcissistic in your opinion? How do you distinguish between conscious personal branding to shape authenticity, good reputation and visibility and the creation of a false self-image and typical 'self-promotion'?" was answered by 42 respondents.

The majority of the comments were attributed to the thematically separated threads on narcissistic actions in personal branding (cf. Table 7), the remaining comments referred to professional personal branding.

Table 7.
Narcissistic personal branding activities in the opinion of managers surveyed

Action category	Number of responses	Selected comments
Being better than others	13	"The relentless pursuit of being the best"; "Self-indulgence. Only me and nobody or nothing counts"; "Putting oneself on a pedestal and ignoring the others"; "Every day braggig to each new person 'what they have done in their life, where they have worked and who they have had an opportunity to deal with'. - Such ego-boosting"; "It is quite visible to the naked eye if someone has an exuberant ego and exalts themselves over others".
Lack of consistency	7	"Lack of consistency - among other things, behaviour 'on the forum' being completely different from private behaviour"; "Creating one's image as a competent, experienced, authoritative person - without delivering the tasks, without reflecting what he communicates in his daily management. Something like: 'Great talkers are little doers'"; "Pretending to be someone else", "Distorting reality and colouring it"; "Creating an image of oneself that has nothing to do with the truth. Overcolouring of all qualities, skills in order to get a job, get a partner, etc.".
Social media - too many posts and time spent	5	"Exaggerating the exposure of one's life on social media"; "Spending more time on social media than with real people"; "Posting a great deal of testimonials and photos online".
Bragging	4	"Citing past work-life experiences always in the form of boasting, statements that go on for a long time, do not contribute anything. For example, "In the Seychelles it is done like this", "In Saudi Arabia something like this is looked at differently, I had a situation like this (...); "Reporting only one's successes, blurring any data about any weaknesses, showing glamour"; "Exaggerated praising of one's person, promoting oneself, without visible involvement of other people who confirm these achievements" .
Focusing on oneself	2	"Focusing more attention on oneself than on the company/organisation"; "Over-focusing attention on oneself. Ignoring others".

Source: own study based on own empirical survey.

Eleven respondents gave more emphasis to personal branding than narcissism in their comments, focusing on the characteristics of a conscious way to build your brand. They noted that "there is a fine line between conscious personal branding and narcissism", however:

- "personal branding is a tool that is used to build your brand and a consistent perception of yourself along with your knowledge, experience and personality";
- "by taking care of your personal brand, being a coherent person without wearing masks";
- "conscious personal branding is nothing more than being oneself without flaunting it";
- "the basis is the compatibility of the created image with everyday professional and private activity. If they are not cohesive, they will not be authentic";
- "conscious self-branding is a long-lasting development process, a great deal of work put into building up trust in our person, our competences and values in qualitative terms. Narcissism is building a facade, a blow-up, it's taking shortcuts, it doesn't matter what they say, as long as they talk a lot and loudly, it has nothing to do with authenticity or coherence, it's only creation and play, and for me it is inextricably linked to the moral spine....in narcissists it seems to be either disappearing or completely absent... and maybe norms have loosened up and analogues should be placed in the archives?"

They stressed that 'a good reputation and personal branding is based on professionalism, expertise and the ability to collaborate. So-called self-promotion is taking all the credit. Conscious branding is performing one's duties (whatever they may be) conscientiously and reliably and making quick decisions based on facts, not emotions (rumours or myths)".

To conclude, it is worth quoting two extended comments on the manifestations of narcissism in personal branding:

- "The question is so complex that it is difficult to give a clear answer. The mechanisms for promoting content on social media balance on a fine line between showing life, private achievements and professional success. In the same way, the abbreviated, iconic nature of electronic communication, in my opinion, flattens the possibility of providing reliable information/making an impact on most followers. More often than not, they only take a cursory glance at a post and react (by ‘like’ button) or scroll on. Success is probably only guaranteed by consciously built content based on one's own backyard (e.g. a website) with a system of social media notifications, engagements that lead to ‘our backyard’. What seems narcissistic in all of this is building an image based solely on success, showing 'Myself' rather than, for that matter, ‘Ourselves’ or the team of people who lasered in on a particular challenge".
- "The deluge of content on the subject of self promotion is now a massive phenomenon; in the current situation, I believe that a person who does not have adequate information regarding a particular industry is not able to properly and clearly identify and evaluate the content that appears there".

From the comments quoted above, it can be inferred that narcissistic actions during the process of personal branding involve self-indulgence, inconsistency and distortion of reality, excessive social media activity, boasting and focusing attention solely on oneself.

4. Conclusion

The phenomenon of narcissism is acknowledged in modern organisations. Almost all managers surveyed (95% of respondents) agreed that "the Internet and new media have reinforced the narcissistic traits of many individuals, inducing an eruption of egocentric behaviour in society", and 87% of them confirmed that nowadays human personality has become a commodity with a certain market value.

When it comes to assessing actions taken within the organisation, they are no longer so unanimous. More than 40 per cent of them felt that in companies, managers surround themselves with uncritical or dependent 'claquers' who uphold their idealised self-image and that they promote mainly those who are 'glamorous' yet not necessarily effective in achieving business goals, which may entail certain negative consequences 'short-term gains but long-term losses' (cf. Black, in: Fiejdasz-Kaczyńska, 2019).

With the statement "In the company there is an organisational culture being shaped which emphasises norms and values that eliminate narcissistic attitudes and behaviours of employees", there was the highest number of vague ‘neither agree nor disagree’ responses. Although 60% felt that their companies did not promote exuberant egocentrism to justify the subjective, instrumental treatment of employees, they did identify the desire to dominate and devalue others among the manifestations of narcissistic attitudes of individuals managing the organisation.

This implies the subordination of everything and everyone to oneself, which is associated with narcissistic competition (see Rogoza, Rogota, Wyszyńska, 2016, pp. 440-444). A propensity to dominate, exploitative tendencies may be associated with overt rather than covert type of narcissism (see Sanecka, 2020, p. 37). These traits may be closer to the characteristics of one of the five narcissist characters (Lowen, 1995), namely psychopathic personality, with its contempt for people and sense of superiority and lack of interaction with others (see Olchanowski, Sieradzan, 2011, pp. 18-19). It should be emphasised, however, that the findings obtained concern the perception, the subjective assessment of the managers surveyed and are not based on methods known in the clinical field for measuring narcissism (see Hyla, 2021, pp. 14-15), which may represent some limitation of this empirical study.

More than half of the managers surveyed create themselves as they want to be perceived by others, which may be related to individuals operating in a culture of narcissism (Szpunar, 2016, p. 160). Only one in five people surveyed admitted that they focus on constantly monitoring themselves and their image, trying to guess 'what others think of me'.

In personal branding, the main manifestations of narcissism are such actions which are not supported by facts and are forms of overt or covert self-promotion. The essence of narcissism is preoccupation with oneself, a sense of self-importance, uniqueness, being superior, a sense of entitlement, arrogance and an instrumental attitude towards people used to maintain an unrealistic self-image (more in Pilch, 2014, pp. 165-181). Such manifestations of narcissism were also indicated by the managers surveyed in the area of personal branding. In particular, the belief in being superior and the inconsistency between what one does and what one creates and projects around oneself were highlighted. What distinguishes conscious personal branding from narcissistic shaping is authenticity and consistency in action.

The present empirical study among managers was exploratory in nature. Due to the small research sample and it not being representative, the obtained findings of the study cannot be generalised. However, the article may inspire further in-depth research into the following interconnections: narcissism - personal branding, organisational culture - narcissism of managers.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

COMPARISION OF TRADITIONAL AND SUSTAINABLE BUSINESS PRACTICES

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Purpose: The goal of the paper is to analyze the differences between traditional and sustainable business practices.
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 main principles of sustainable business practices include the Triple Bottom Line principle, which considers people, planet, and profit; environmental stewardship; social responsibility; stakeholder engagement; long-term thinking; innovation and collaboration; transparency; and proactive compliance. These principles guide organizations in integrating sustainability into their strategies and decision-making processes. Traditional business practices, focused on short-term profitability, often neglect the environment and society. In contrast, sustainable business practices emphasize long-term value creation, balance economic, environmental, and social considerations, and actively mitigate environmental and social impacts. They prioritize resource efficiency, eco-friendly technologies, fair labor practices, and stakeholder engagement. Sustainable practices also embrace innovation, transparency, and proactive compliance.
Originality/value: Detailed analysis of all subjects related to the problems connected with the relation between traditional and sustainable business practices.

Keywords: Industry 4.0; business practices, sustainability, sustainable business, sustainable business practices, CSR, environment.

Category of the paper: literature review.

1. Introduction

Sustainable business practices refer to the strategic integration of environmental, social, and economic considerations into the core operations and decision-making processes of a business entity. This concept is rooted in the understanding that businesses have a responsibility to not

only generate profit but also mitigate their negative impacts on the environment and society, while simultaneously creating long-term value for stakeholders.

The goal of the paper is to analyze the main differences between traditional and sustainable business practices.

2. Sustainable business practices- main concepts

From an environmental standpoint, sustainable business practices entail the adoption of strategies and initiatives aimed at minimizing resource consumption, reducing greenhouse gas emissions, and conserving biodiversity. This includes implementing energy-efficient technologies, promoting the use of renewable energy sources, managing waste effectively through recycling and waste reduction measures, adopting sustainable supply chain practices, and considering the entire life cycle of products, from design to disposal (Liu et al., 2023).

The social dimension of sustainable business practices involves recognizing and addressing the broader societal impacts of business activities (Sułkowski, Wolniak, 2015, 2016, 2018; Wolniak, Skotnicka-Zasadzień, 2008, 2010, 2014, 2018, 2019, 2022; Wolniak, 2011, 2013, 2014, 2016, 2017, 2018, 2019, 2020, 2021, 2022; Gajdzik, Wolniak, 2023; Michalak, Wolniak, 2023). This includes ensuring fair labor practices, providing safe and healthy working conditions, promoting diversity and inclusion within the workforce, supporting local communities through philanthropic activities, and engaging in responsible marketing and consumer education. Businesses are encouraged to foster positive relationships with stakeholders such as employees, customers, suppliers, and communities, taking into account their needs and concerns (Cerciello et al., 2023).

Economically, sustainable business practices recognize that long-term profitability is closely linked to environmental and social performance. By implementing sustainability measures, businesses can achieve cost savings through improved resource efficiency, reduced waste generation, and enhanced operational efficiency. Additionally, sustainable practices contribute to building a positive brand reputation, increasing customer loyalty, and accessing new markets that prioritize sustainability (Wolniak, 2016; Czerwińska-Lubszczyk et al., 2022; Drozd, Wolniak, 2021; Gajdzik, Wolniak, 2021, 2022; Gębczyńska, Wolniak, 2018, 2023; Grabowska et al., 2019, 2020, 2021). While there may be initial investment costs associated with implementing sustainable practices, the potential for long-term economic benefits outweighs these costs (Sani, Garg, 2023).

The main principles of sustainable business practices encompass a holistic approach that considers the economic, environmental, and social dimensions of business operations. These principles guide organizations in integrating sustainability into their strategies, decision-

making processes, and daily practices. Here are the key principles of sustainable business practices (Moghrabi et al., 2023; george et al., 2022; Das et al., 2021; D'Adamo et al., 2022):

- The Triple Bottom Line (TBL) principle emphasizes the consideration of three interconnected dimensions: people, planet, and profit. It entails measuring organizational performance not only in terms of financial profitability but also by assessing social and environmental impacts. By striving for a balance between these three bottom lines, businesses can create long-term value and contribute to sustainable development.
- Sustainable business practices prioritize environmental stewardship by minimizing negative impacts on natural resources, ecosystems, and climate. Organizations commit to reducing their carbon footprint, conserving energy and water resources, adopting sustainable sourcing and production practices, promoting waste reduction and recycling, and integrating environmental considerations into product design and lifecycle management.
- Social responsibility entails actively addressing the well-being and interests of various stakeholders, including employees, customers, local communities, and society at large. Sustainable businesses prioritize fair labor practices, safe working conditions, diversity and inclusion, ethical sourcing, and human rights. They also engage in philanthropic activities, support community development, and contribute to the advancement of social causes.
- Sustainable businesses recognize the importance of stakeholder engagement in decision-making processes. They actively involve employees, customers, suppliers, investors, local communities, and NGOs in shaping business strategies, policies, and practices. By soliciting input, fostering collaboration, and considering diverse perspectives, organizations can align their actions with stakeholder expectations, build trust, and ensure accountability.
- Sustainable business practices focus on long-term thinking rather than short-term gains. Organizations consider the potential social, environmental, and economic impacts of their decisions and actions over time. By prioritizing the long-term well-being of stakeholders and the planet, businesses can ensure their own resilience, adaptability, and continued success in a rapidly changing world.
- Sustainable businesses embrace innovation and collaboration as drivers of positive change. They seek innovative solutions to sustainability challenges, develop new technologies, and implement sustainable practices across their value chains. Collaboration with stakeholders, industry peers, academia, and governments enables the sharing of best practices, knowledge exchange, and collective efforts to address complex sustainability issues.

- Transparency is a vital principle of sustainable business practices. Organizations are encouraged to disclose information about their sustainability performance, goals, targets, and progress. Transparent reporting allows stakeholders to assess the environmental and social impacts of a business, fostering accountability and trust. Adhering to recognized reporting frameworks, such as the Global Reporting Initiative (GRI) or Sustainability Accounting Standards Board (SASB), helps ensure consistency and comparability.
- Sustainable businesses go beyond mere regulatory compliance by proactively identifying and addressing sustainability challenges. They adhere to applicable laws and regulations while also striving to exceed minimum requirements and anticipate future sustainability standards. By adopting voluntary initiatives, industry certifications, and best practices, organizations demonstrate their commitment to continuous improvement and responsible business conduct.

By embracing these principles, businesses can drive positive change, mitigate risks, enhance reputation, and create shared value for all stakeholders. Sustainable business practices not only contribute to a more sustainable future but also foster innovation, resilience, and long-term profitability.

3. Sustainable and traditional business practices

Business practices play a crucial role in shaping the economic, environmental, and social landscape of our society. Traditional business practices have long been focused on short-term profitability and financial gains, often neglecting the broader impacts on the environment and society (Jonek-Kowalska, Wolniak, 2021, 2022; Jonek-Kowalska et al., 2022; Kordel, Wolniak, 2021, 2023; Rosak-Szyrocka et al., 2023; Gajdzik et al., 2023; Orzeł, Wolniak, 2021, 2022; Ponomarenko et al., 2016; Stawiarska et al., 2020, 2021; Stecuła, Wolniak, 2022; Olkiewicz et al., 2021; Wolniak, 2013, 2016; Hys, Wolniak, 2018). In contrast, sustainable business practices aim to strike a balance between economic prosperity, environmental stewardship, and social responsibility. This chapter delves into the significant differences between traditional and sustainable business practices, highlighting their implications and emphasizing the transformative potential of adopting sustainable approaches (Anaman et al., 2023).

From economic perspective traditional business practices prioritize immediate profit maximization and often overlook the long-term implications. On the other hand, sustainable business practices recognize the value of long-term thinking and take a holistic approach by considering the triple bottom line - people, planet, and profit. Sustainable practices have been shown to generate economic benefits through cost savings achieved via resource efficiency, waste reduction, and energy conservation. Moreover, sustainable businesses enjoy enhanced

brand reputation and customer loyalty, providing access to new markets and emerging opportunities (Sanchez-Planelles et al., 2022).

In the case of environmental impact traditional business practices tend to be resource-intensive, resulting in excessive consumption, waste generation, and pollution. Sustainable business practices, however, embrace the concept of environmental stewardship. They prioritize resource conservation, employ eco-friendly technologies, and actively seek to reduce their carbon footprint. Sustainable practices integrate renewable energy sources, implement sustainable supply chain management, and adopt eco-design principles that consider the entire lifecycle of products. By doing so, they mitigate environmental impacts and contribute to the preservation of natural resources and biodiversity (Lathabhavan, 2022).

The next important factor is connected with social responsibility. Traditional business practices often exhibit limited social responsibility, focusing primarily on profit generation and neglecting the welfare of employees and communities. In contrast, sustainable business practices recognize the importance of social responsibility. They foster employee well-being, promote diversity and inclusion, ensure fair labor practices, and provide safe and healthy working conditions. Sustainable businesses actively engage with local communities, supporting their development through philanthropic activities, responsible marketing, and ethical sourcing. By prioritizing social responsibility, sustainable practices foster positive relationships with stakeholders and contribute to the overall welfare of society (Yacob et al., 2022).

In the case of stakeholders engagement traditional business practices typically involve minimal stakeholder engagement beyond immediate customers and investors. In contrast, sustainable business practices embrace stakeholder engagement as a core principle. They actively involve employees, customers, suppliers, and local communities in decision-making processes, seeking their input and considering their concerns. Sustainable businesses prioritize transparent communication, accountability, and collaboration with stakeholders, recognizing the importance of their perspectives and needs. This engagement fosters trust, enhances reputation, and ensures the alignment of business practices with the broader societal context (Jananipriya, Usha, 2022).

The long-term visibility also differs traditional and sustainable business practices. Traditional business practices often face challenges in a rapidly changing business landscape. Their focus on short-term gains can hinder adaptation to emerging trends and market demands. In contrast, sustainable business practices demonstrate resilience and long-term viability. They anticipate regulatory changes, proactively comply with evolving standards, and embrace innovations that align with sustainability principles. Sustainable businesses possess the agility to respond to emerging challenges and capitalize on sustainability-driven opportunities, thereby securing their long-term success (Singh et al., 2022).

In the table 1 there is a detailed analysis of differences between traditional and sustainable business practices.

Table 1.
Comparison of traditional and sustainable business practices

Traditional Business Practices	Sustainable Business Practices
Focus primarily on short-term profitability and financial gains	Emphasize long-term value creation and consider the triple bottom line (people, planet, profit)
Primarily driven by profit maximization	Balance economic, environmental, and social considerations
Resource-intensive and inefficient	Strive for resource efficiency and conservation
Limited consideration for environmental impacts	Actively mitigate and reduce environmental impacts
Minimal social responsibility and stakeholder engagement	Engage stakeholders and address social and community needs
Linear production and consumption models	Promote circular economy principles and sustainable supply chain practices
Reactive approach to regulations and compliance	Proactive compliance and go beyond regulatory requirements
Short-term cost savings prioritized	Recognize the long-term economic benefits of sustainable practices
Lack of transparency and accountability	Transparent reporting and accountability for sustainability performance
Limited consideration for social and environmental risks and opportunities	Identify and capitalize on social and environmental risks and opportunities
Emphasis on individualistic decision-making	Collaborative decision-making involving stakeholders and considering diverse perspectives
Single bottom line (financial performance)	Triple bottom line approach (people, planet, profit)
Extractive approach to natural resources	Conservation and responsible use of natural resources
Reactive approach to social and environmental issues	Proactive identification and mitigation of social and environmental risks
Focus on short-term customer satisfaction	Prioritization of long-term customer relationships and satisfaction
Limited innovation and adaptation to changing market needs	Focus on innovation and adaptation to address sustainability challenges and market demands
Limited consideration for employee well-being and development	Employee-centric approach, promoting well-being, diversity, and professional growth
Lack of engagement with local communities	Active engagement with local communities, addressing their needs and supporting their development
Limited transparency and disclosure	Transparent reporting of environmental, social, and governance (ESG) performance
Minimal consideration for climate change and carbon emissions	Efforts to reduce carbon footprint and mitigate climate change impacts
Inefficient use of energy and water resources	Implementation of energy and water efficiency measures
Focus on short-term cost reduction	Long-term cost savings through resource efficiency and waste reduction
Risk of reputational damage from unsustainable practices	Enhanced reputation and brand value through sustainable practices
Ignoring potential regulatory and legal risks	Proactive compliance with regulations and anticipation of future requireme

Source: Authors own work on the basis of: George et al., 2022; Das et al., 2021; Lathabhavan, 2022; Singh et al., 2022; Cerciello et al., 2023; Liu et al., 2023; Pietro et al., 2021.

The differences between traditional and sustainable business practices are significant and far-reaching. Sustainable practices encompass a broader perspective, taking into account the economic, environmental, and social dimensions of business operations. By adopting sustainable practices, businesses can achieve not only financial success but also contribute to the well-being of the planet and society. The transformation towards sustainability is not only an ethical imperative but also a pathway to resilience and long-term viability. It is crucial for

businesses to recognize the profound implications of sustainable practices and actively embrace them, playing a vital role in creating a sustainable and prosperous future for all.

4. Examples of sustainable business practices

Sustainable business practices have gained increasing recognition as organizations strive to address environmental and social challenges while pursuing long-term profitability. This chapter highlights exemplary examples of sustainable business practices implemented by companies across various industries. These examples demonstrate how businesses can successfully integrate sustainability into their core operations, contributing to positive environmental outcomes, social well-being, and economic prosperity. The examples of selected sustainable business practices were described in the table 2.

Table 2.
Examples of sustainable business practices

Organization	Type of sustainable practice	Description
Patagonia	Embracing Environmental Stewardship	Patagonia, an outdoor clothing company, exemplifies a commitment to environmental sustainability. They have implemented innovative practices, such as using recycled materials, reducing waste through repair and recycling programs, and advocating for fair labor practices throughout their supply chain. Patagonia's transparency and efforts to raise awareness about environmental issues set them apart as a leader in sustainable business practices.
Interface	Leading the Path to a Circular Economy	Interface, a global carpet tile manufacturer, has made substantial progress in transitioning to a circular economy. They introduced a product take-back program, enabling the recycling and reuse of old carpet tiles. Interface also focuses on sustainable sourcing, energy-efficient manufacturing processes, and carbon-neutral operations. Their "Mission Zero" commitment demonstrates how sustainable business practices can drive innovation and profitability while minimizing environmental impact.
Unilever	Driving Sustainable Consumption	Unilever, a multinational consumer goods company, has embarked on a sustainability journey encompassing their entire value chain. They have set ambitious goals for reducing their environmental footprint, promoting responsible sourcing, and improving the well-being of billions of people worldwide. Unilever's Sustainable Living Plan showcases their dedication to sustainable business practices and serves as a model for engaging consumers in making sustainable choices.
Tesla	Revolutionizing the Automotive Industry	Tesla, an electric vehicle manufacturer, has revolutionized the automotive industry with its sustainable business practices. By prioritizing the development of electric vehicles, Tesla aims to reduce dependence on fossil fuels and combat climate change. They have built an extensive network of charging stations, fostered renewable energy integration through energy storage solutions, and revolutionized the energy sector with their innovative products such as the Powerwall. Tesla's commitment to sustainability extends beyond their products to the way they produce and deliver them.

Cont. table 2.

Danone	Nurturing Communities and Empowering Farmers	Danone, a multinational food company, embraces sustainability by focusing on community engagement and responsible sourcing. They work closely with farmers to promote regenerative agricultural practices, ensuring the sustainability of their supply chain. Danone's initiatives for empowering local communities and improving access to nutritious food demonstrate the broader social impact that sustainable business practices can achieve.
Grameen Bank	Financial Inclusion and Social Impact	Grameen Bank, founded by Nobel laureate Muhammad Yunus, exemplifies sustainable business practices in the realm of microfinance. By providing financial services to the unbanked and marginalized populations, Grameen Bank empowers individuals to start sustainable businesses, fostering economic growth and reducing poverty. Their focus on social impact and financial inclusion showcases the transformative potential of sustainable finance models.

Source: Authors own work on the basis of: George et al., 2022; Das et al., 2021; Lathabhavan, 2022; Singh et al., 2022; Cerciello et al., 2023; Liu et al., 2023, Alfaras, Alfaras, 2021; Mohaghegh et al., 2021.

The examples provided in this paper illustrate the diverse ways in which businesses can adopt sustainable practices, creating a positive impact on the environment, society, and the economy. These companies serve as inspirations, demonstrating that sustainable business practices can be successful and profitable while contributing to a more sustainable future. By embracing sustainability, businesses can drive innovation, engage stakeholders, and create shared value. The transformative power of sustainable business practices extends far beyond individual companies, inspiring a new paradigm of responsible and ethical business conduct.

5. Conclusion

Sustainable business practices are essential for addressing the environmental, social, and economic challenges of our time. From an environmental standpoint, businesses must adopt strategies to minimize resource consumption, reduce greenhouse gas emissions, and conserve biodiversity. Socially, they must recognize and address the broader impacts of their activities, ensuring fair labor practices, safe working conditions, and engagement with stakeholders. Economically, businesses must understand that long-term profitability is closely linked to environmental and social performance.

The main principles of sustainable business practices include the Triple Bottom Line principle, which considers people, planet, and profit; environmental stewardship; social responsibility; stakeholder engagement; long-term thinking; innovation and collaboration; transparency; and proactive compliance. These principles guide organizations in integrating sustainability into their strategies and decision-making processes.

Traditional business practices, focused on short-term profitability, often neglect the environment and society. In contrast, sustainable business practices emphasize long-term value creation, balance economic, environmental, and social considerations, and actively mitigate

environmental and social impacts. They prioritize resource efficiency, eco-friendly technologies, fair labor practices, and stakeholder engagement. Sustainable practices also embrace innovation, transparency, and proactive compliance.

Examples of sustainable business practices include companies like Patagonia, Interface, Unilever, Tesla, Danone, and Grameen Bank. These companies demonstrate a commitment to environmental stewardship, circular economy principles, sustainable consumption, renewable energy, community engagement, and financial inclusion. Their success showcases the transformative potential of sustainable business practices.

In summary, adopting sustainable business practices is crucial for creating a more sustainable future. By integrating economic, environmental, and social considerations into their operations, businesses can drive positive change, mitigate risks, enhance reputation, and create shared value for all stakeholders. The examples provided serve as inspirations for other companies, demonstrating that sustainability and profitability can go hand in hand. Sustainable business practices are not only an ethical imperative but also a pathway to resilience, innovation, and long-term success.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANISATION AND MANAGEMENT SERIES NO. 177

THE ROLE OF SOCIAL ENTREPRENEURSHIP IN DECARBONIZATION: A NEW AVENUE FOR SOCIAL ENTERPRISES

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Purpose: The objective of this paper is to explore potentially new area where social economy and social enterprises can become active while contributing to the field of green transition at the same time. Moreover, it shows the examples of innovative ideas and good practices introduced by social economy organisations, including social enterprises, and municipalities to promote way for the decarbonization of the social economy activities.
Design/methodology/approach: The study draws on qualitative research and is based on the analysis of innovative good practices collected as part of the international project "Social Economy for a Just Green Transition (JustGreen)".
Findings: The findings emphasise the potential of social economy to contribute to sustainability transitions and decarbonization efforts at the community level.
Research limitations/implications: The research methodology focuses on analysing existing practices and literature rather than conducting primary data collection. While this approach provides valuable insights, it may lack contextual understanding that can be achieved through in-depth interviews, surveys, or case studies.
Social implications: The research highlights the role of social economy in creating opportunities for marginalised groups and individuals. By focusing on decarbonization and sustainability, social economy can contribute to social empowerment by providing training, employment, and economic opportunities for disadvantaged communities.
Originality/value: The originality and value of this paper lie in its exploration of the intersection between social economy and decarbonization efforts. While there is existing research on both topics individually, this paper contributes by examining the specific role of social economy in driving decarbonization and its associated social implications.

Keywords: decarbonization, social entrepreneurship, social enterprise, social economy, European Green Deal, sustainability.

Category of the paper: Research paper.

1. Introduction

Growing concerns regarding climate change, unmet social needs and other societal problems that, if left unsolved, may have dramatic consequences on the global scale (George et al., 2016), have intensified calls to harness the potential of alternative forms of business and social innovation (eg. Fagerberg, Hutschenreiter, 2019; Markman et al., 2019; Ranabahu, 2020; Kaufmann, Danner-Schröder, 2022). This paper focuses in particularly on challenges reflected by the ambition of the European Commission to invest in a green Europe and work towards a climate neutral Europe by 2050 through the proposed European Green Deal and Sustainable Europe Investment Plan (eg. EC, 2011; 2018; 2019; Kougias et al., 2021). Social enterprises or value-driven 'hybrid' businesses, which operate in between the private, public and non-profit sectors, are often perceived as having particular advantages in simultaneously meeting economic, social and environmental needs (Battilana et al., 2015; Borzaga et al., 2020; Defourny, Nyssens, 2021; Ćwiklicki, Pacut**,** 2023). Therefore, this paper explores potentially new area where social enterprises can become active while contributing to the field of green transition at the same time. It aims to show the examples of innovative ideas and good practices introduced by social economy organisations, including social enterprises, and municipalities to promote way for the decarbonization of the social economy activities. Moreover, it highlights how social enterprises and the social economy can contribute to the transition towards a low-carbon economy. These goals were achieved based on the analysis of innovative good practices gathered and disseminated as a part of the international project "Social Economy for a Just Green Transition (JustGreen)". This paper encompasses three main sections. Firstly, it reviews the existing academic literature pertaining to social entrepreneurship and explores emerging areas of activity for social enterprises and social economy organisations. Following that, it outlines the empirical research methodology employed and interprets the findings obtained. Lastly, it highlights the theoretical and practical implications derived from the research and proposes avenues for future investigations.

2. Theoretical assumptions

2.1. Social entrepreneurship and social enterprises

Social entrepreneurship (SE) and social enterprises are widely recognised as a crucial tool for social and economic policy, particularly in addressing issues like unemployment, social exclusion, and sustainable regional and local economic development (Borzaga, Bodini, 2012). Social enterprise is an umbrella term that refers to various organisations that engage in trading activities with the primary goal of achieving a social purpose (Haugh, 2007). As highlighted by

Ebrahim et al. (2014), social enterprises blend characteristics of both charitable organisations and for-profit businesses and aim to generate profits, which are then reinvested to achieve multiple bottom lines, including social and environmental impact, in addition to financial sustainability (Cieslik, 2016). Social enterprises therefore seek to strike a balance between fulfilling a social and/or environmental mission and market activities (Defourny, Nyssens, 2021; Bacq et al., 2016), which is why they are often referred to as hybrid organisations – being neither commercial organisations nor traditional non-profit organisations. They primarily rely on commercial activities as their revenue source, operating and scaling up their operations through market activity rather than relying solely on donations or grants (Ebrahim et al., 2014). Social enterprises are situated within the third sector of the economy, which emerges where there are shortcomings in the provision of social welfare by the market or government entities. They have progressively emerged as significant contributors to social progress. The autonomous nature of the social-economic model employed by these organisations offers a promising approach to reducing reliance on state social welfare and has demonstrated its effectiveness as a model for driving social change (Hillman et al., 2018). Social enterprise possesses the potential to revitalize communities by addressing local needs, fostering community independence, and cultivating social capital among individuals and communities (Haugh, 2007). As a result, community-level approaches and social enterprises enable increased engagement with local stakeholders, facilitating the customization of sustainability initiatives according to the specific requirements of each community.

Over time, the number of social enterprises has increased significantly, and they are now present in various economic sectors (Zahra, Wright, 2016; Defourny, Nyssens 2021; Defourny et al., 2021). As a result, their scope of engagement is gradually expanding to tackle emerging societal challenges, including climate change, pollution, financial and gender inclusion, as well as digitisation. In recent times, the field of social entrepreneurship and the social economy has been experiencing rapid evolution, driven by emerging innovations and trends across major sectors of the global economy. Social enterprises are increasingly introducing innovative solutions not only in areas like professional activation, social and health services, and local development but also in sectors such as renewable energy, socially engaged agriculture, the environment (including recycling), and culture (e.g. Stratan, 2017; Lekan et al., 2021; Costanza, 2023; Alevizou et al., 2017; van der Horst, 2008; Sengupta et al., 2020; Hudcová et al., 2018). This expansion is a result of countries adopting broader social goals that align with the United Nations' Sustainable Development Goals (SDGs). Consequently, many social economy organisations and social enterprises now prioritize "green policy," poverty reduction, gender equality, and environmental sustainability (EC, 2020). In line with these objectives, there has been a growing interest in the circular economy, short food chains, energy cooperatives, and various other areas with the potential to generate significant social and environmental impact. One of those areas is decarbonization.

2.2. Decarbonization as a new avenue for social enterprises

There is no doubt that the European Union is well aware of the climate challenges. Many directives reflect the EU's commitment to advancing renewable energy sources and making substantial progress in mitigating greenhouse gas emissions (GHG) emissions to address climate change challenges. To name a few, in 2011, the European Commission introduced the 'Roadmap for moving to a low-carbon economy in 2050' (EC, 2011). This roadmap set forth the objective of reducing greenhouse gas emissions in the EU-27 by a minimum of 80% in 2050 compared to the emissions recorded in 1990. In 2018, the European Union Renewable Energy Directive II (EC, 2018) came into effect, establishing a target of achieving a 32% share of renewable energy and a minimum of 40% reduction in GHG emissions by 2030, relative to the levels recorded in 1990 (Kougias et al., 2021). Subsequently, during the 25th session of the Conference of the Parties (COP25) in December 2019, Ursula von der Leyen, the President of the European Commission, introduced the European Green Deal (EC, 2019). This comprehensive package encompasses a range of policy initiatives designed to achieve climate neutrality and foster sustainability within the EU economy (Kougias et al., 2021). The European Green Deal aims to attain climate neutrality by 2050 and endeavours to assist organisations in becoming global leaders in clean products and technologies. Additionally, it aims to ensure a fair and inclusive transition to a sustainable economy (EC, 2019) and represents EU's biggest action to reach climate neutrality. Following a comprehensive impact assessment, it emerged that, under current EU legislation, the European Union would only achieve a 60 percent net emission reduction by 2050. Therefore, in 2020, as part of the '2030 Climate Target Plan', the Commission established that the interim target of a 55 percent net emission reduction by 2030 was necessary to achieve climate neutrality by 2050 (Wilson, 2021). To reach this goal, the European Commission adopted the "Fit for 55 Package" in July 2021.

At present, global energy systems are experiencing a profound transformation, shifting from centralized models reliant on fossil fuels to decentralized (EC, 2011) and decarbonised systems (Allen et al., 2015). By definition, decarbonization is a process of reducing and eliminating fossil fuel use in the economy, a process in which state institutions conduct various policies and political processes to promote economic and social practices that reduce the generation of carbon emissions (e.g. Hildingsson et al., 2019; Gajdzik et al., 2022; Gajdzik et al., 2020). Ultimately, the objectives of decarbonization go beyond relative decoupling of emissions from economic activity towards liberating society and the economy from its high-dependence on fossil energies (Gough, Meadowcroft 2011). Decarbonization strategies mainly consist of material transition (e.g. circular economy and bio-based construction), energy transition (e.g. energy efficiency improvement and renewable energy supply), or green lifestyle (e.g. less floor area per capita or gradually decreasing room temperatures are a result of the increased awareness of environmental protection and the reduction in vacancy rates) (Yang et al., 2022).

It can also address the decarbonization of buildings, especially the old stock – mainly through energy efficiency improvements and the use of renewable energy – which not only reduces carbon emissions, but also generates co-benefits in health, energy affordability and the labour market (Roca-Puigròs et al., 2020). Decarbonization may also involve green mobility understood as, among other things, (i) elimination of emissions from transportation, (ii) electrification of private vehicles and public transportation, (iii) promotion and development of the market for zero- and low-emission vehicles (electric cars, scooters, bicycles) and public transportation, (iv) long-term transition to alternative and climate-neutral fuels for transportation, or (v) promotion of car and bicycle sharing and other similar solutions (Results of 2nd workshop on decarbonization, 2021). Finally, it is important to note that decarbonization can also be understood within the social dimension. This includes various aspects such as the creation of new green jobs, including those in the form of social enterprises. Additionally, decarbonization can create new markets for clean technologies and products, leading to increased employment opportunities in sectors such as construction and sustainable transport, with a greater demand for local labour. Decarbonization efforts also contribute to the fight against energy poverty and aim to improve living conditions while maintaining a healthy environment (Results of 2nd workshop on decarbonization, 2021). Therefore, in the social dimension of decarbonization, the focus goes beyond technological solutions and includes addressing social equity, justice, and community engagement. It recognises that the transition to a low-carbon economy should not exacerbate existing inequalities but rather promote inclusive and fair outcomes. This is emphasized by Healy and Barry (2017), who promote a 'just transition' approach, stressing the necessity of providing support for communities that have been left out or adversely affected by the processes of transitioning to low-carbon energy.

Interestingly, social economy organisations and social enterprises have not been given significant consideration as means for sustainability transitions, even though both the European Union's Green Deal and other EU directives present both challenges and opportunities for social enterprises. Most of the existing studies highlight the role of social entrepreneurship and social innovation in tackling energy poverty (eg. Hiteva, Sovacool, 2017; Thomas et al., 2020). Even still, commercial actors as social innovators addressing energy poverty have received limited attention in research, which has mostly focused on the role of public agents (Bouzarovski, Simcock, 2017). Additionally, energy poverty can be described as a one of *Grand Challenges*[1] due to its intricate, interconnected, multifaceted, and often unnoticed characteristics (George et al., 2016). It necessitates the collaborative involvement of various interconnected stakeholders (Elia, Margherita, 2018). Therefore, exploring the potential for social enterprises to engage in decarbonization could open up new avenues for their involvement and contribute to the broader field of green transition. In a qualitative research

[1] The scientific community uses the label "*grand challenges*" to address broad societal problems that, if left unsolved, may have dramatic consequences on the global scale. The Grand Challenges (GC) concept was revitalized in 2015 when the United Nations adopted the 2030 Agenda for Sustainable Development defining a set of 17 grand challenges in terms of the Sustainable Development Goals (SDGs).

study conducted by Hillman et al. (2018) on a sample of seven energy focused social enterprises based in the UK, it was discovered that in general social enterprises have not yet been thoroughly explored as viable instruments for facilitating sustainability transitions. However, they can have a significant impact on local communities by demonstrating how to become involved in the energy system and empowered to take action against climate change in their own lives. Moreover, most interviewees expressed optimism on the contribution of social enterprises to the shift to a low carbon energy system. Also, social entrepreneurs may find the aspects of invisibility, stigmatisation, and empowerment of marginalised individuals, which have been extensively explored by researchers studying energy poverty (Day et al., 2016; Bouzarovski, Simcock, 2017), to be compelling. For instance, in a study conducted by Cieslik (2016) examining a pilot development intervention in rural Burundi, it was found that equipping village solidarity groups with energy generators had a positive impact. These groups achieved self-sustainability by selling energy, thereby becoming economically viable structures. As pointed out by Hillman et al. (2018), there is a need for further research on the role of social enterprises as catalysts for low-carbon transitions at the community level. Therefore, this paper investigates the value of social economy organisations and social enterprises as a driver of sustainability at the community level, with an emphasis on the field of decarbonization.

3. Research methodology and research results

The research material and data for the analysis were collected as part of the international project *Social Economy for a Just Green Transition (JustGreen)* financed by the European Union through the COSME program (Grant Agreement number 101015873), in which the author of this paper was involved in 2021. Just Green project aimed at promoting the transition of social economy organisations into a greener and fairer economy and society, following the United Nations Sustainable Development Goals slogan of *leaving no one behind*. Within this objective, three key themes were explored in order to develop strategies (i) to bridge social economy and the circular economy, (ii) to promote decarbonization of the social economy, and (iii) to foster short food supply chains and agroecology. Transversal to these topics was the goal of leaving no one behind (IV), namely fostering social entrepreneurship by targeting work integration of vulnerable groups and unmet social needs, often of most vulnerable (i.e. elderly, disabled people) (Project proposal, 2020). To address the above objectives, the project consortium put together five very diverse partners with demonstrated good practices, together with a broad spectrum of social economy stakeholders, which allowed to position the social economy within the green (and digital) transition and to reinforce the dynamics of social economy organisations within local and inter-regional ecosystems, boosting learning, cooperation and the building of a transnational Social Economy community.

The project involved four municipalities, namely the Municipality of Vila Nova de Famalicão from Portugal, Comune di Mozzo from Italy, Gmina Świetochłowice from Poland, Budapest-Terézváros from Hungary and one European network – European Network of Social Integration Enterprises (ENSIE). Over the course of one year (02.2020 to 01.2021) the project created conditions to involve a group of participants – 24 social economy organisations and social enterprises with more and less experience in European projects, and more and less experience in the field of green transition topics – in an enriching process of sharing and mutual learning as well as fostering the establishment of bonds and contacts. The project also aimed to promote cooperation among different types of stakeholders from various countries and regions and empowered participants for a just and greener transition.

The objectives of the year-long project were pursued through three workshops in partnering countries (in Portugal, Poland and Italy), three parallel online thematic working groups in which project participants explored the area circular economy, decarbonization or short food supply chains (6 online working sessions each) and other dissemination activities (preparation and dissemination of newsletters, preparation of promotional films, etc.).

One of the most important tools used in the project were **good practices**. Good practices are powerful instruments for learning and inspiration that lead to the development of new approaches and the dissemination of practices considered appropriate for today's cooperation and development challenges. A good practice is not only a practice that is good, but a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it (FAO, 2016).

In the context of the JustGreen project a good practice was a practice that:

1. Is performed by a social economy organisation, whether in collaboration with other entities OR is performed by a municipality and directly involves one or more social economy organisation(s) (SEO);
2. Has been directly relevant to promoting circular economy or decarbonization or short food supply chains;
3. Has had a positive effect on inclusion or employment issues (for instance: generates jobs, facilitates access to goods and services, provides participation or learning opportunities - for vulnerable groups);
4. Has been validated, meaning that points 2 and 3 are supported by quantitative or qualitative evidence;
5. Has included measures that will ensure the sustainability of its effects;
6. Has included measures that promote transparency;
7. Is replicable by other organisations, in other contexts and/or for the benefit of other groups (FAO, 2016; Results of Online Working Group Session 1).

Over the course of a year 42 good practices submitted by both municipalities[2] and 24 organisations taking part in the project have been analysed in order to find out (1) What kind of a good practice is it? (Initiative of local/regional authorities involving social economy organisation and/or initiative of social economy organisations), and (2) What is the area of this practice? (circular economy, decarbonization or short food supply chains). The following paper presents good practices in the field of decarbonization without addressing the other two areas.

Given the limited knowledge about decarbonization as a new area of engagement for social economy organisations and the strategies they employ to scale up their positive impacts in the transition to a more sustainable economy and society, this paper aims to address these issues by exploring two research questions:

RQ1: What are the different approaches to decarbonization as reported by the analysed social enterprises' good practices?

RQ2: What is the maturity level of the identified good practices in question?

The following section of the paper presents a description of the five good practices collected during the project period. The good practices reported by partnering organisations have been analysed and assessed using the criteria employed in the project, including collaboration 1, collaboration 2, environmental value, social value, transparency, and maturity (refer to the radar charts for individual good practices below). Subsequently, the good practices were consolidated in a table to provide a synthesis. The table also highlights the most significant aspect from a project perspective, which is the social or environmental value generated by each practice.

3.1. Good practice 1: Smart Building Automation System, Escolla Profissional CIOR, Cooperativa de Ensino de Famalicão, Portugal

Escolla Profissional CIOR is an educational, training and socio-cultural project aimed at responding to the challenges of acquiring professional qualifications. More than just a vocational school, CIOR is an active agent and partner in the development of the local and regional community. The idea for the Smart Building Automation System project arose from the need felt at CIOR to reduce expenses associated with electricity consumption (e.g., lighting, air conditioning, and computers). The project enables integrated management, control, and automation of lighting, air conditioning, sockets, computers, room temperature, blinds, CCTV circuits, alarms, and more. Essentially, it is a complete home automation system, Open-Source, applied beyond the domestic scope. The installation of the smart system and renovation work were carried out by a group of students attending vocational courses in Electronics and Electrical Installations as part of their final project, enhancing learning opportunities for future self-employment. Studies conducted allowed for estimating the annual difference in electric energy consumption before and after the installation of the automation system. As a result of the project implementation, annual bills decreased from €4,200 to €1,486. The reduction in

[2] Municipality of Vila Nova de Famalicão from Portugal, Comune di Mozzo from Italy, Gmina Świetochłowice from Poland, and Budapest-Terézváros from Hungary.

electrical consumption also directly impacts the emission of CO2 and other gases responsible for the greenhouse effect (2nd project newsletter).

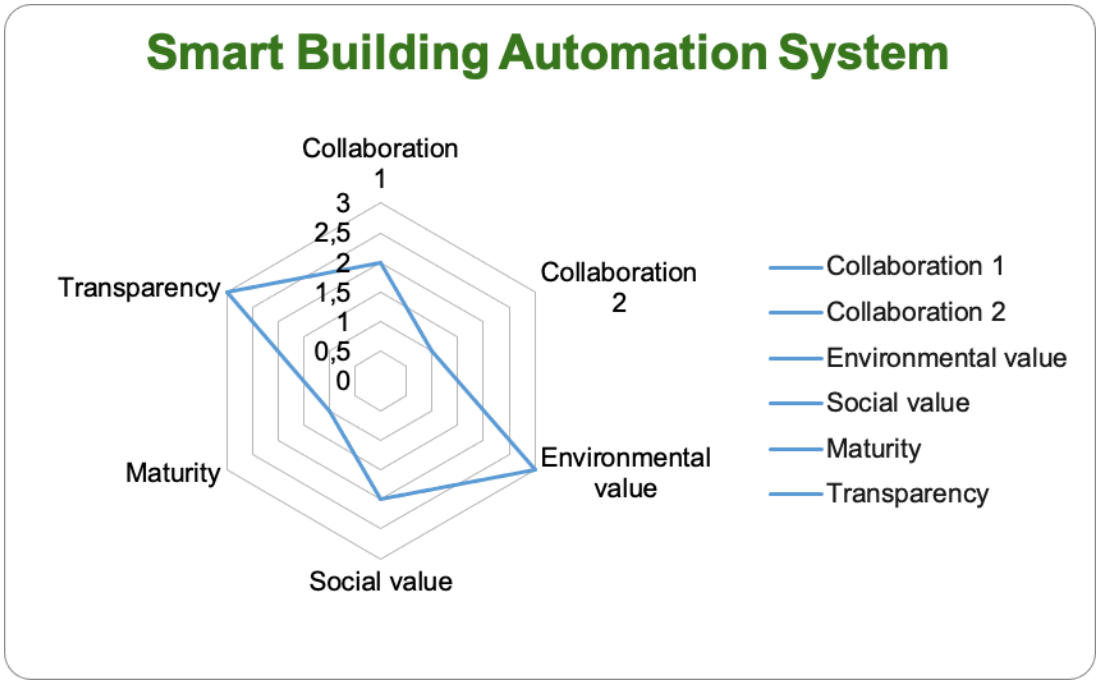

Figure 1. Radar chart for good practice 1.

Source: own elaboration based on project materials.

3.2. Good practice 2: The Green Office, Social Integration Centre in Świętochłowice, Poland

A Social Inclusion Centre (CIS) is an institution that implements a specialised program aimed at working with individuals who are socially excluded or at risk of exclusion, over a specific period of time. The primary goal of CIS is to restore and enhance the ability of socially excluded individuals to independently and effectively fulfil social roles, as well as to enable them to navigate the labour market autonomously. The Green Office encompasses a range of practices that involve the daily activities of CIS employees. These practices include maximising the use of natural daylight, turning off unnecessary lighting, powering down devices after work, switching off devices from standby mode, utilizing double-sided printing and copying, and implementing waste segregation. Moreover, the procurement of supplies and services is based on selecting economically and environmentally advantageous offers. Additionally, the electronic circulation of documents is employed to promote the rational use of paper (2nd project newsletter).

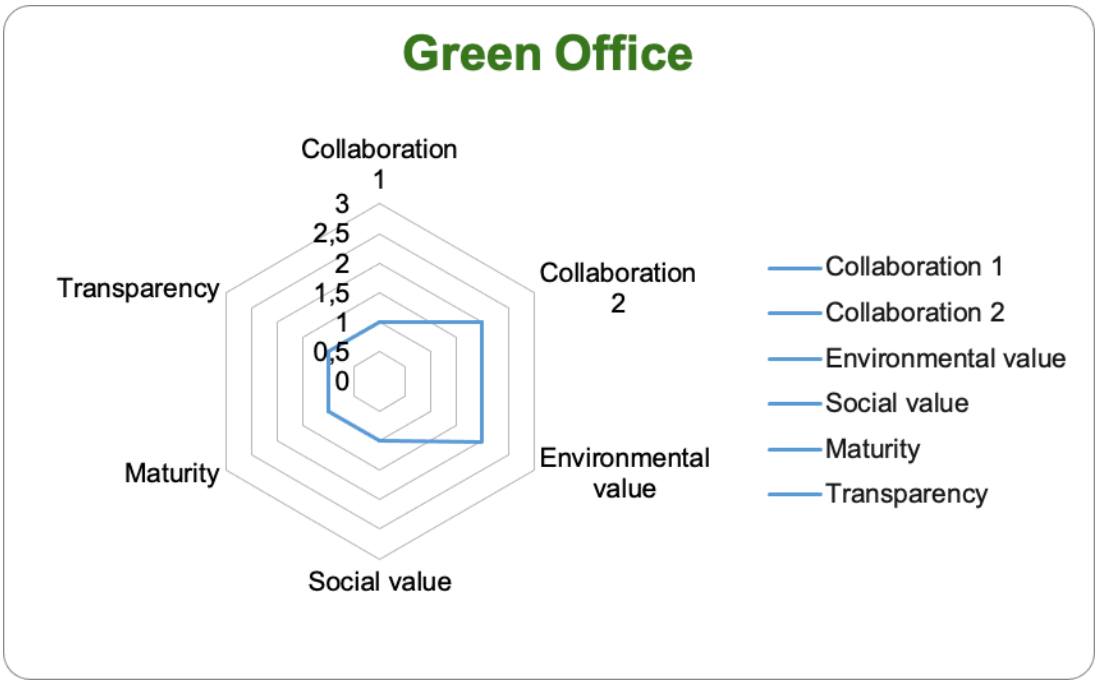

Figure 2. Radar chart for good practice 2.

Source: own elaboration based on project materials.

3.3. Good practice 3: Mastiff Cargo Bike, Budapest, Hungary

MASTIFF is a self-designed and self-developed Long John-type cargo bike manufactured in Hungary. The brand was established in 2020 and now offers a stable, fast, and practical partner for everyday transport and delivery. It is available in both a normal and pedal electric cycle version. With its versatile accessories (such as open transport boxes, child box, aluminium convoy box), MASTIFF is ideal for both companies and families. MASTIFF is not only cheap to maintain and operate, but also environmentally friendly and carbon-neutral. It has zero emissions, and by replacing just one van, we can save 12 tons of CO2 emissions. Additionally, MASTIFF can navigate through traffic jams and access areas where cars are prohibited. Indirectly, MASTIFF can help sustain short supply chains and improve sustainability, facilitating the environmentally friendly transportation of food and other commodities. Interestingly, the authorities of the Budapest-Terézváros historic district also support such a solution as they aim to reclaim the historic centre from cars, including urban freight transport, and prioritize the needs of residents and tourists (2nd project newsletter).

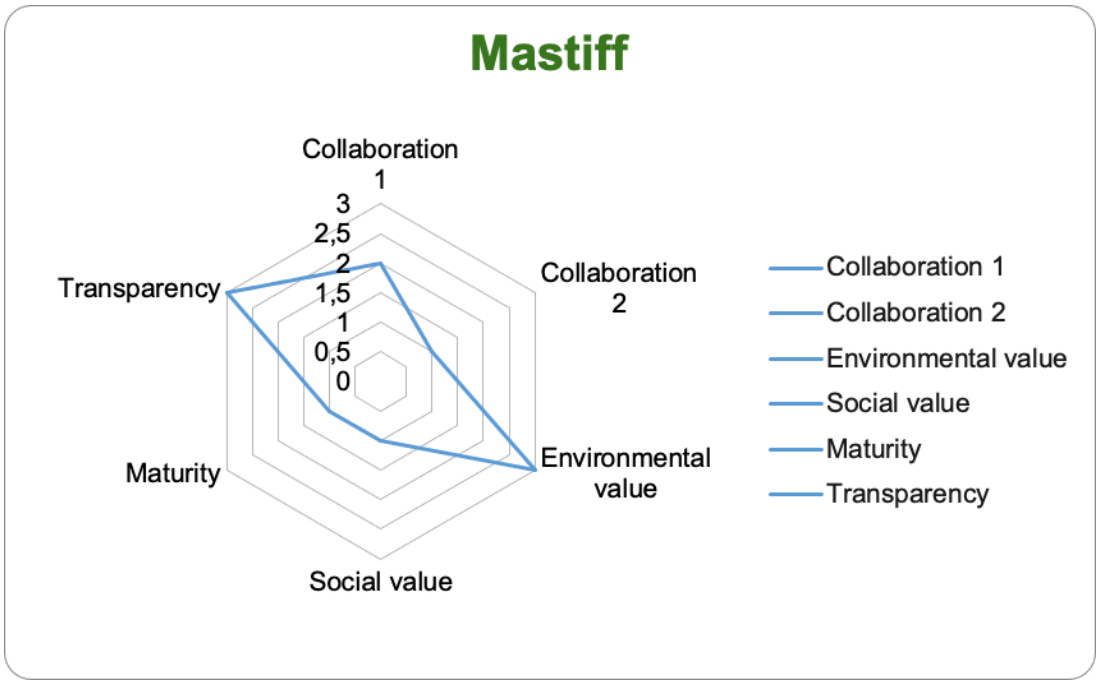

Figure 3. Radar chart for good practice 3.

Source: own elaboration based on project materials.

3.4. Good practice 4: Ressolar - CERESS: Comunità Energetiche Rinnovabili, Lombardy Region, Italy

Since 2021, in Italy, it has been possible to establish "Renewable Energy Communities" (CER) among buildings. These communities allow for the exchange of self-produced renewable energy for direct consumption on-site. Previously, this was not permitted, which meant that those who generated renewable energy had to feed any unused energy back into the national system. However, with this new development, renewable energy produced by a company, private house, or school building can now be utilized and consumed by nearby houses, shops, or state buildings within the same neighbourhood. This maximises the utilisation of renewable energy, enabling its consumption even by those who do not have their own photovoltaic system. The aim is to reduce reliance on fossil fuel-based energy sources and promote the transition towards a decarbonised economy and society. Specific economic and fiscal incentives are provided to encourage the establishment of these Renewable Energy Communities. CERESS, a start-up within the Ressolar Group, is responsible for promoting and organizing these energy communities. They oversee the technical, administrative, and economic management throughout the entire process (2nd project newsletter).

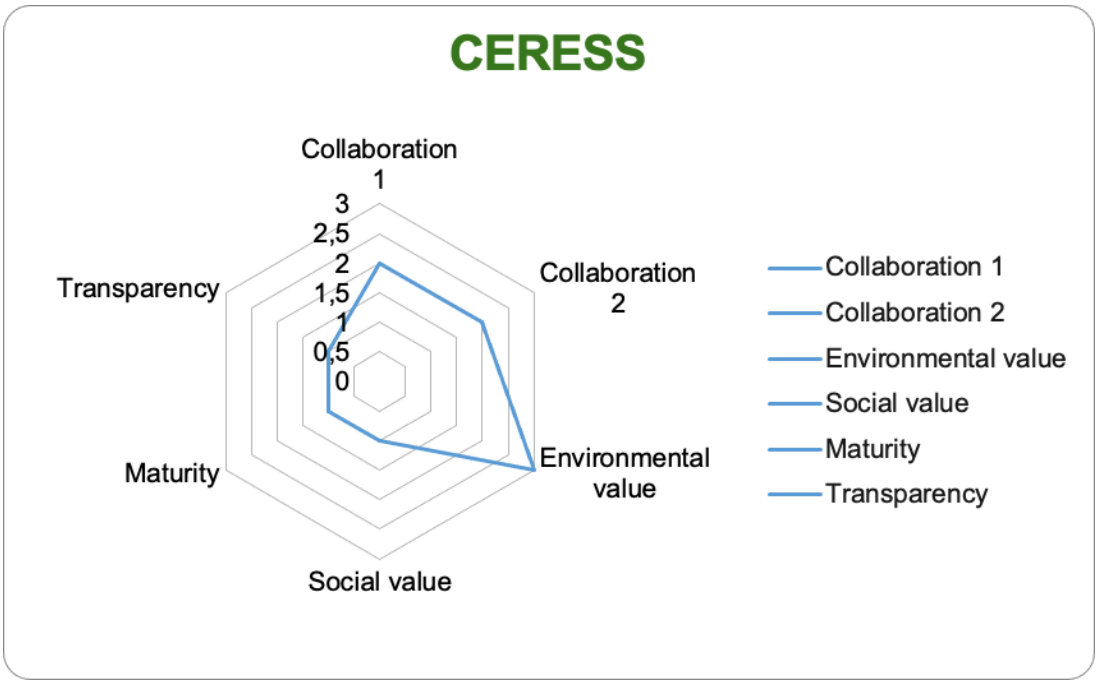

Figure 4. Radar chart for good practice 4.

Source: own elaboration based on project materials.

3.5. Good practice 5: The thermo-modernisation of public buildings, the Municipality of Świętochłowice, Poland

The thermo-modernisation of a complex of buildings owned by the Świętochłowice Commune, along with the renovation of apartments, serves as a prime example of pro-ecological activities in the city. This initiative showcases a commitment to environmental sustainability by implementing energy-efficient measures and improving the thermal performance of the buildings. By upgrading the apartments, the project aims to enhance comfort for residents while reducing energy consumption and lowering greenhouse gas emissions, thus contributing to a greener and more sustainable urban environment. The entire building has been connected to the city's central heating network, which will contribute to reducing the use of high-emission solid fuel heat sources such as coal, wood, and pellets. The main renovation works were carried out by the municipal company, in which the Świętochłowice commune is a 100% shareholder. Additionally, some renovation works were performed by socially excluded individuals as part of their professional and social reintegration program at the Social Integration Center in Świętochłowice and the social enterprise. The following list outlines the works performed by individuals in social employment: replacement of windows and doors, replacement of basement windows, renovation and painting of the staircase and minor cleaning work. The positive outcomes of this project include the connection of 11 flats to the municipal central heating network. Moreover, the removal of 22 tiled stoves will lead to a significant reduction in CO2 emissions, estimated to be around 66%. Additionally, the engagement of individuals at risk of social exclusion in the project aligns with the fundamental objectives of

the social economy, which include preventing social exclusion and mitigating social tensions. By providing employment opportunities and involving marginalized individuals in the work, the project aims to address social challenges and promote inclusivity within the community (2nd project newsletter).

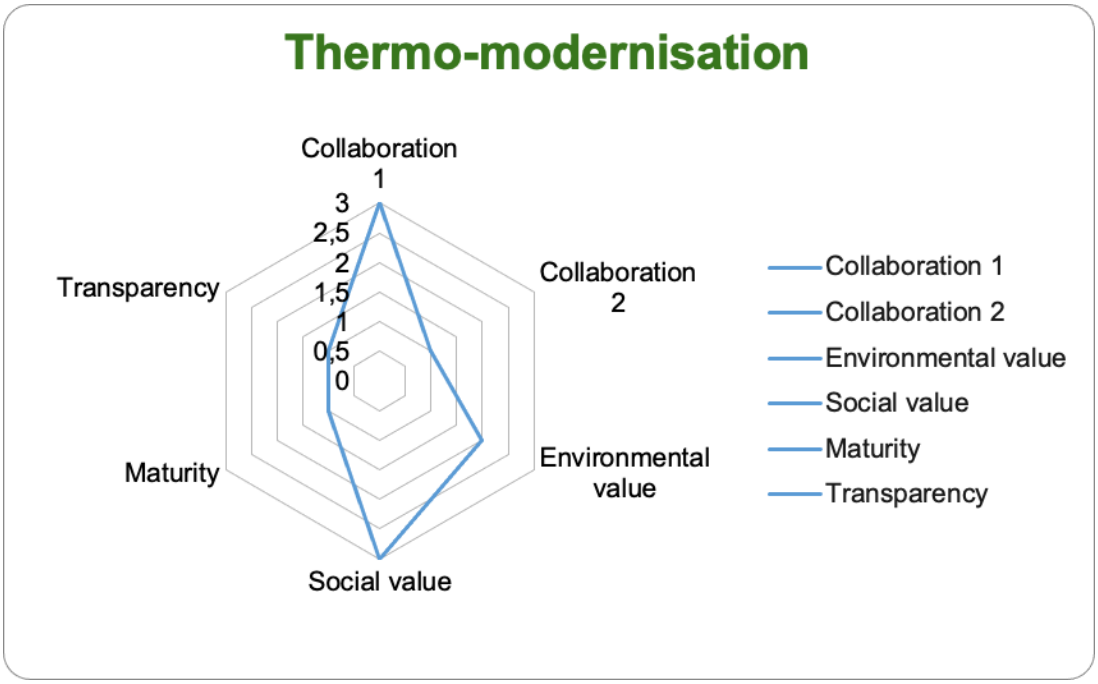

Figure 5. Radar chart for good practice 5.

Source: own elaboration based on project materials.

The following table presents a summary of good practices as well as social or environmental value generated by each practice.

Table 1.
Summary of good practices

Organisation	**Country**	**Good practice and its short description**	**Year of the beginning of the practice**	**What kind of a good practice is it?**	
				Initiative of local/regional authorities involving SEO	Initiative of SEO
Escolla Profissional CIOR, Cooperativa de Ensino de Famalicão	Portugal, Vila Nova de Famalicão	Smart Building Automation System which enables integrated management, control, and automation of lighting, air conditioning, computers, room temperature etc.	2019	X	

Cont. table 1.

Impact	1. It provides an opportunity to increase students' social and environmental awareness while also fostering a sense of solidarity as they apply and develop their professional skills. 2. The reduction in electrical consumption also directly impacts the emission of CO2 and other gases responsible for the greenhouse effect. 3. The project offers the advantage of reusing appliances or small components instead of abandoning them in nature. 4. It provides an opportunity to increase students' social and environmental awareness while also fostering a sense of solidarity as they apply and develop their professional skills.				
Centre for social integration	Poland, Świętochłowice	The Green Office encompasses a range of practices that involve the daily activities of employees aimed at promoting sustainability and reducing environmental impact.	01/2020		X
Impact	1. Reducing electricity consumption directly decreases CO2 and other greenhouse gas emissions. In fact, there has been a 13% decrease in energy consumption compared to the previous year, resulting in a significant reduction in emissions. 2. In comparison to the previous year, there has been a 10% decrease in paper consumption. This reduction in paper usage demonstrates an effort to promote sustainability and reduce environmental impact.				
The Municipality of Świętochłowice	Poland, Świętochłowice	The thermomodernization of a complex of buildings aimed at contributing to a greener and more sustainable urban environment.	04/2021	X	
Impact	1. According to the energy audit, the building's energy efficiency is projected to improve by 65.49%. Additionally, the overall reduction in PM10 suspended dust, including benzopyrene, benzo(a)pyrene, dioxins, and furans, is estimated to be 0.0007 Mg per year. These improvements indicate a positive impact on both energy conservation and air quality. 2. Additionally, some renovation works were performed by socially excluded individuals as part of a professional and social reintegration program conducted by the Social Integration Centre and the social enterprise. This allowed socially excluded individuals to actively participate in the renovation process, gaining valuable skills and contributing to their social reintegration.				
MASTIFF Cargo Bike	Hungary, Budapest	Locally manufactured and environmentally friendly equipment for urban freight transport.	O9/2020		X
Impact	1. The reduction of urban freight transport directly impacts the emission of CO2 and other gases responsible for the greenhouse effect. 2. Cargo bikes are environmentally friendly and carbon-neutral. It has zero emissions, and by replacing just one van, we can save 12 tons of CO2 emissions per year.				

Cont. table 1.

Ressolar - CERESS: Comunità Energetiche Rinnovabili	Lombardy Region, Italy	Renewable energy communities that allow for the exchange of self-produced renewable energy for direct consumption on-site	12/2021		X
Impact	1. The creation of many semi-autonomous local energy communities, independent of the national grid, facilitates the transition away from large power plants that produce significant amounts of energy and reduces dependence on foreign energy sources. 2. By enabling the local consumption and sharing of renewable energy, this approach contributes to reducing reliance on fossil fuels and fostering a more sustainable future.				

Source: own elaboration based on project materials.

As shown in the table above, the JustGreen project encompasses various good practices that differ in their focus. Many of these practices are directly associated with environmental impact, as their implementation directly reduces CO2 and other greenhouse gas emissions or energy consumption. Indeed, this aligns with the fact that social enterprises commonly establish mission statements that give precedence to social and environmental objectives. By participating in decarbonization activities, they take responsibility for their carbon footprint and contribute to mitigating the impacts of climate change. It aligns with their core values and helps them set an example for other businesses. However, it is important to note that presented good practices also have a social dimension. They generate new green job opportunities, foster employment in the construction sector for socially marginalised individuals, enhance living conditions while ensuring a healthy environment, and offer avenues for increasing students' awareness of social and environmental issues as well as their green skills. A common feature of these good practices is their relatively low level of maturity, which is due to the fact that the area of decarbonization is a relatively new area of interest for social entrepreneurs. Nevertheless, it is undeniable that presented good practices demonstrate the growing involvement of the social economy and social enterprises in decarbonization efforts. This involvement may lead to the exploration of new solutions for social needs, the implementation of diverse measures to reduce carbon footprint, and the utilisation of new technologies and digital social innovations to improve the quality of services provided by social economy organisations. Embracing decarbonization often requires implementing new technologies and innovative solutions. Engaging in these activities can lead to learning experiences that foster adaptability and resourcefulness within the social enterprise. Participating in decarbonization activities can also impact the attraction and retention of customers as consumers are increasingly conscious of the environmental impact of their choices.

4. Conclusions

Nowadays it is crucial to recognise the significant educational role that social economy and social enterprises can play in stimulating and empowering individuals regarding practices in the field of decarbonization. Therefore, by showing examples of new areas of engagement of social economy and social enterprises, this the study develops the knowledge concerning strategies using which they seek to scale up their positive impacts in transition to a more sustainable economy and society. An essential added value of the study is that its outcomes are not limited to polish context, but also shed light on other countries, where the level of development of social entrepreneurship varies. Moreover, the good practices presented show how new initiatives of social economy may emerge or be strengthened, for instance related to exploring new responses to social needs or buildings and contributing to the targets of zero-carbon economy.

The findings of this study also suggest that social enterprises, through their involvement in decarbonization, are responding to the increasing demands of consumers who have become more environmentally aware. Moreover, their activities contribute to the further growth of this environmental consciousness. Engaging in decarbonization activities offers numerous advantages for social economy and social enterprises, including the opportunity to assist low-skilled workers who may be at risk of job loss due to automation and robotization (EC, 2020). However, these entities often encounter challenges, particularly in terms of insufficient financial resources. Therefore, it is advisable for business institutions to provide support to social economy in accessing funding and obtaining relevant information on funding opportunities.

The main limitations of the presented study stem from the adopted methodology, which focuses on analysing existing practices and literature rather than conducting primary data collection. While this approach provides valuable insights, it may lack contextual understanding that can be achieved through in-depth interviews, surveys, or case studies. Additionally, the data collection process primarily focused on internal stakeholders. Undoubtedly, the study would have benefitted from the inclusion of interviews with external stakeholders such as municipality officials, the local community, or other recipients of these initiatives. Due to these limitations, the authors exercise caution in interpreting the obtained results and their generalisability. Furthermore, the authors acknowledge that the paper does not fully exhaust the research problem but rather serves as a contribution to further research. Fortunately, this research topic has recently garnered attention, as evidenced by the work of Manjon, Merino and Cairns (2022), whose systematic review of the literature reveals a fragmented understanding of social entrepreneurship and social innovation approaches to addressing energy poverty, as expected in this emerging area of research. Nevertheless, presented study's results provide valuable insights for business practices and can be utilised by other social entrepreneurs, as well as representatives of business support institutions.

Acknowledgements

The dissemination of findings received funding from the subsidy for development of Young Scholars 2023, University of Economics in Katowice.

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SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2023
ORGANIZATION AND MANAGEMENT SERIES NO. 177

CITY BRANDING STRATEGY ON THE EXAMPLE OF BIELSKO-BIAŁA. SELECTED ASPECTS MANAGEMENT OF THE PUBLIC SECTOR DETERMINING THE DIRECTIONS OF DEVELOPMENT (YOUNG GENERATIONS)

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Purpose: The aim of the article is to present the direction of development of the brand of Bielsko-Biala in selected areas in the coming years, with particular emphasis on research conducted among high school students.
Design/methodology/approach: Own analysis of the strategy report of the city of Bielsko-Biala, analysis of literature on building the city's image and strategy, and local survey research in the city of Bielsko-Biala using a questionnaire available online.
Findings: Thanks to the conducted research, it is possible to identify the needs and expectations of students from Bielsko-Biala related to the development strategy of the city's cultural offer, as well as public transport.
Research limitations/implications: The research has been limited to data obtained from a single source and limited resources (selected group of respondents), hence future research can be extended to different levels and theoretical areas. It is important to conduct further research in this area to increase their universality.

Originality/value: research paper.

Keywords: city strategy, development management, industry, culture management, sustainability, brand strategy.

Introduction

The subject of consideration is the relationship between the processes of building the city's strategy and the offer addressed to young people (students). The starting point is the belief that a city is a brand that manages the processes taking place in various urban areas in the way it organizes and uses space (Żmijowska, 2021)**.** Due to the limitations of the size of the publication and the selected area of consideration, the issues in the article have been presented in a synthetic way.

Cities in Poland are currently undergoing intensive changes in various areas, including demographic ones. This is the result of transformations taking place as part of the second demographic transition that began in Poland in the early 1990s (Kotowska, 1998, p. 3; Kotowska, 1999, p. 279). For the contemporary shape of the social space of cities, the processes shaping the economic and relational reality remain important. Some of the processes are related to the general changes that are taking place in the world, while others are the result of local factors that build a given region and its specific conditions. What is a city today and how can it be understood? Marc Gottdiener and Lesley Budd, in a dictionary of terms related to urban studies, define a city as "delineated by the boundaries a space that is densely populated by a relatively large, diverse area cultural population" (Gottdiener, Budd, 2005, p. 4). Another perspective, which emphasizes the importance of the relationship between the city's stakeholders and its urban processes, is presented by Wallis. He claims that "The city is composed of two organically linked, but autonomous subsystems - urban and social" (Wallis, 1990, p. 45). The scientist also claims that there are regulatory mechanisms that can affect the stabilization of both the urban and social systems: "These mechanisms are based on two processes - on learning and evaluating individual city spaces. They are the basis for making decisions about spatial behaviour, i.e. decisions determining the deliberately directed ways of using the city and the ways of shaping it. These processes take place at the level of an individual, a small group and a large community. Thanks to this, we are dealing with the rationalization of social spatial behavior in the city" (Wallis, 1990, p. 47). Analyzing the words of the scientist, it can be seen that he pays special attention to the functional evaluation of the city, and the individual (inhabitant or person staying in the city) becomes the main actor for whom and through whom these processes take place.

Another very important element for the functioning of cities is their metropolisation. Contemporary socio-economic changes transform cities in a special way in all dimensions: social, economic, cultural and spatial. What is important for metropolisation is the transformation of the functions of cities, and thus the departure from the production offer in favor of services, as well as the creation and distribution of cultural values (Jałowiecki, 2005, p. 5). The process of metropolisation is associated with cognitive and cultural capitalism, which Allen J. Scott described as characteristic of developed urbanized areas. It is based on accumulating capital in such values as knowledge and culture, where human creativity is the core of development, and it is supported by the development of digital technologies (Ratajczak, 2015).

Shrinking of urban areas is also a frequently noticed phenomenon in agglomerations. Many studies have analyzed its causes and transitions, especially in the United States. This phenomenon is perceived as a natural process of the city, where social changes result from the life cycle (Lang, 2000) and the history of cities (Beauregard, 2003). The negative spiral of development is shown in Fig. 1.

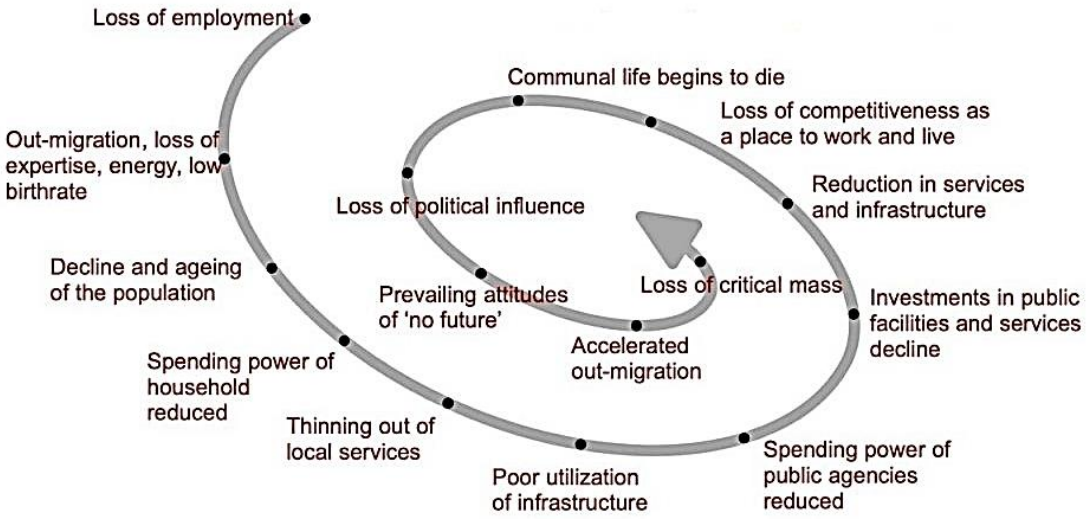

Figure 1. Negative development spiral.

Source: Weber, 2011.

The presented process is a sequence of multiple negative feedbacks. The spiral of negative development is a regression scenario as a result of a decrease in the number of inhabitants, which in relation to this article may also be associated with the departure of young inhabitants of the city (students who go to study or in search of work). With the increase in the "outflow of residents", the city loses the "critical mass" necessary for its functioning. In the further part of the article, especially in the methodological part, some needs and expectations of young residents of the city of Bielsko-Biała will be presented on the basis of the conducted research. However, as can be seen from the spiral of negative development, the problems of city dwellers often boil down to unsatisfactory conditions life, shortage of jobs, or inability to meet high life expectations. On the basis of research by G. Weber (2006, 2008, 2011a, 2011b, 2012), it is possible to distinguish individual phases related to the functioning of agglomerations:

Phase 1 - population outflow (decrease in know-how and activity).

Phase 2 - regression of the local economy (lack of development and investment).

Phase 3 - collapse of social life (lack of investment, e.g. in culture).

Phase 4 - final migration (intensive migration, especially of young residents).

Phase 5 - fall of the "critical mass" (point of no return).

The potential of cities is related not only to the number of (active) inhabitants, but also to the strategy of its development, which should include important assumptions in order to meet the most important needs in terms of the quality of life, i.e.: obtaining education, professional development and work, and spending free time.

Brand of the city: for the young

Each city is an individual brand that should take into account building its own development strategy. The brand strategy defines, above all, long-term goals that are consistent with its activities and specifies the resources necessary to achieve specific goals and processes (Burnes, 2004, p. 2111). Strategy is also a concept of activity (Robert, 2006, p. 94) and the way in which a given brand builds value for its stakeholders (Kaplan, Norton, 2011, pp. 22-23).

The city's brand creates its own image, which can be described as place branding. The value of the city is built through its reputation, i.e. positive management of the image of the place.According to Anholt, the reputation of a place, thanks to an appropriate city branding strategy, relates primarily to its "competitiveness". The researcher distinguished the main directions in this area (Anholt, 2007):

1) Advanced economy.
2) Attractive environment.
3) Effective management.

The competitiveness mentioned in the previous sections is related to the rivalry of cities on local, national and international markets. It is crucial for the development and potential of cities not only to maintain and consolidate current relations with their stakeholders, but also to gain new influence (tourists, entrepreneurs, investors, visitors, new residents). For this reason, cities often decide to take proactive actions to build their image. A brand is primarily a relationship, which has a particular impact on the public sector, where the stakeholder's contact with the public administration of a given agglomeration remains important.

It is particularly important to look at the young generation, which is now the future of every city. New actors are entering the city scene, also in Bielsko-Biała. This is the Zalph generation (children born in 1999-2015), also known as the crisis microgeneration. According to research (Zalpha, 2023), Zalpha was created at the junction of two generations - the Z generation (1995-2012) and the Alpha generation (born after 2013). The shared experiences of this generation have shaped times of uncertainty, such as the COVID-19 pandemic and the war in Ukraine. The Zalpha generation doesn't know the difference between the digital and the real world, but that doesn't mean they don't want to participate. The micro-crisis generation needs space in which it can be effective and experience. These needs are probably due to the fact that although Zalphy feel they are a lonely generation (a consequence of times of uncertainty, including lockdown), issues of the natural environment or social responsibility are important to them. „Research shows that 46% of teenagers say they are interested in climate issues: climate change or the state of the environment" (Zalpha, 2023). Taking into account the needs and expectations of the young generation, in 2020 the first *Program for young people* was created in Bielsko-Biała, containing proposals for actions in selected areas in the context of the city's depopulation trend. The program was a response to the diagnosed needs and problems of young people, which

were verified thanks to the research report on the needs and situation of young people in Bielsko-Biała in 2019. The trend of depopulation of cities is increasing. For example, in 2008, 38,663 young people in the 15-29 age group lived in Bielsko-Bała, and ten years later, in 2018, this number was 25,208 (GUS). The most important conclusions from the diagnosis of the study are primarily those concerning the location of the city. Young people positively assess the city of Bielsko-Biała in terms of its compactness and proximity to the mountains. However, issues related to education pathways, labor markets and housing opportunities are insufficient and make it difficult to plan for the future. The respondents also pointed to problems related to public transport and the lack of a program offer addressed to specific groups of residents. It is important, however, that despite highlighting the city's weaknesses, the research also brought suggestions for improving the current situation. One of them is a large percentage of people declaring their willingness to combine work and study already in secondary school, which is conducive to building their „base" (social sphere) here and creates a strong barrier against leaving for other urban centres (Program for young people, 2020).

Methods and Results[1]

In 2022, another study was conducted in Bielsko-Biała, this time related to the experiences and expectations of high school students (not necessarily in relation to the depopulation trend). The survey was conducted using a questionnaire available online from December 19, 2022 to January 15, 2023. The online survey was developed by councilors of secondary schools in Bielsko-Biała, in cooperation with a team of sociology students of the University of Bielsko-Biała: Dawid Wawrzuta, Katarzyna Piela, Wiktoria Cebula, Gabriela Podgórska, Damian Kierczak, Dominika Ryłko, Kasjan Górski, Karol Soj, Julia Radoń, Paulina Wiewióra, Klaudia Tyran, Jakub Śliwka under the supervision of Dr. Joanna Wróblewska-Jachna (substantive research coordinator). Representatives of the Youth City Council of Bielsko-Biała (main lecturer: Filip Macuda) and Dr. Paulina Żmijowska (operational research coordinator) also participated in the development of the research. The aim of the research was to collect information from young people and high school students in Bielsko-Biała in several thematic areas: culture, public transport, experience of various forms of violence, expectations and perception of the activities of the Youth City Council in Bielsko-Biała. Thanks to the distribution of the questionnaire by the councilors of the Youth City Council of Bielsko-Biała, 801 responses were collected. The questionnaires were distributed via social media channels and with the support of the Department of Education and Sport of the Bielsko-Biała City Hall

[1] The materials presented in this section come from the students' report and the substantive coordinator.

(mobiDziennik). The survey used open-ended questions (giving respondents the freedom to answer) and closed questions. The collected quantitative and qualitative data enable:

- Identification of the needs and expectations of students from Bielsko-Biała towards municipal services, taking into account the city's cultural offer, as well as public transport.
- Recognize young people's experience of personal security as well as identify forms of violence and discrimination.
- Awareness of the scope of activities and activities of the Youth City Council of Bielsko-Biała among high school students.
- Identification of students' expectations in relation to the activities of the councilors of the Youth City Council (who are their representatives).

Among the respondents in the study group, women predominated 54.4%, men 39.2%, people choosing the answer "other" accounted for 4.2%. Among the answers, 0.6% of people identify themselves as Genderfluid, while non-binary people accounted for 1.5%. The largest group of respondents were people living in Bielsko-Biała. As many as 48.7%, 36.8% of students (671 answers) commute to school from the Bielsk poviat, 4.7% from the Żywiec poviat (37 answers), and 3.6% from the Cieszyn poviat (28 answers). A much smaller group lives in the country Oświęcim 1.9%. Students living in the counties of Pszczyna, Wadowice, Warsaw, Katowice and Gliwice also took part in the study (the sum of such indications is 4.3% of responses, 34 answers). The overall percentage distribution of responses is shown in Fig. 2.

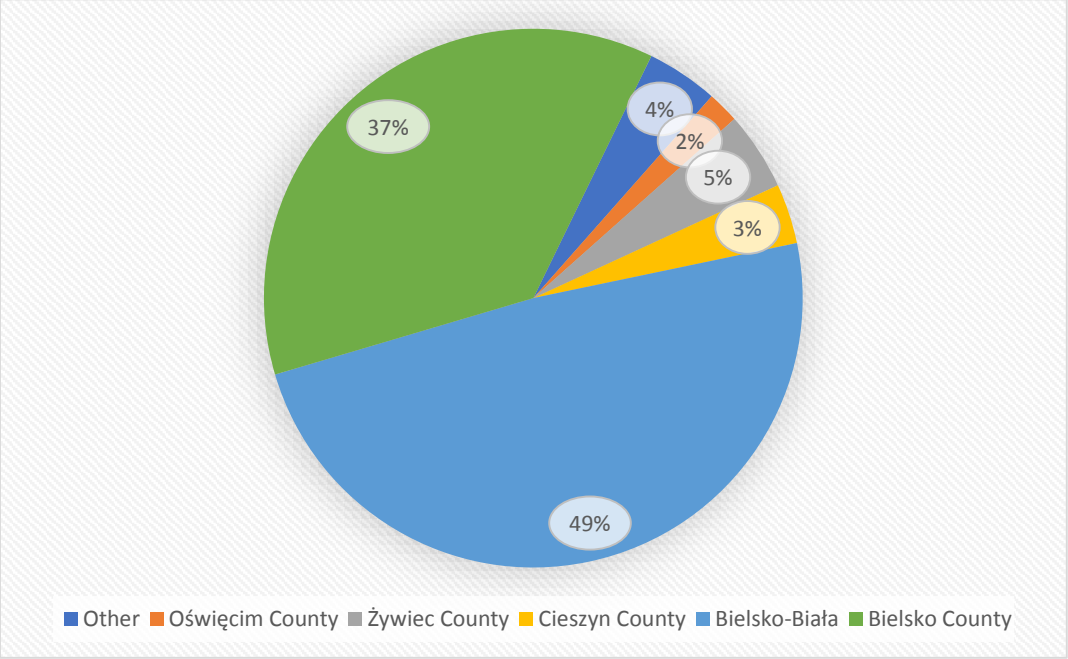

Figure 2. Place of residence of the surveyed students.

Source: Own based on an original research report.

The cultural sector is the area that strongly influences the experiences of young people and their involvement in the social life of the city, which is why it is worth briefly discussing these results. Respondents indicated their expectations regarding the cultural offer and sports events. Factors encouraging young people to participate in cultural events organized in Bielsko-Biała include:

- costs of participation in events: free admission (58.9%), low prices (34.3%),
- opportunity to spend time with family and/or friends (56%),
- famous artists (42.2%),
- attractive furnishings of the place (25.9%),
- convenient access (25%).

It is also worth emphasizing that the students assessed the city's cultural offer from their point of view using a 5-point scale, enabling identification of the degree of satisfaction. The overall rating is moderately positive.

Less than half of the respondents evaluate the offer as positive (definitely 4.1%, rather agree. agree 38.5%). A less numerous group gave a negative assessment (6.8% strongly disagree, 23.3% rather disagree). No opinion on the subject 27.4%. Most respondents believe that there is a lack of musical events in Bielsko-Biała, a much smaller number of indications concern sports, integration and cultural events.

Another interesting issue is the issue of obtaining information by students. According to the collected responses, these are:

- social networks 73.2%,
- posters, banners 40.6%,
- local press 4.7%,
- brochure leaflets 9.9%,
- radio 20.1%,
- family/friends 65.2%,
- school 0.5%.

In this part of the research on the participation of young people in cultural events, answers regarding participation in cultural events in Bielsko-Biała and in other places should also be provided. In Bielsko-Biała, the surveyed students participate in cultural events several times a year (46%) or once a year (25%). A small group uses it very intensively, i.e. at least once a month (5%). 21% of the surveyed students do not use it, 25% did not answer. In other places, respondents take part in cultural events several times a year (38%), once a year (26%), not at all (25%). 6% of respondents did not answer. The data are presented in Table 1.

Table 1.
Participation in cultural events

Frequency of participation	Bielsko-Biała	Other localities
several times a year	46%	38%
once a year	25%	26%
once a month	5%	-
not use	21%	25%
not answer	25%	6%

Source: Own based on the report.

As already mentioned, the report covered many issues, however, the main emphasis in the article was on participation in culture and the management of this sector in the city. This information is also important because the city of Bielsko-Biała is a candidate for the title of the European Capital of Culture[2], and the activities are carried out in many sectors. The conclusions of the extensive report prepared on the basis of the study also show that topics such as ecology, mental health, efficient public transport and broadly understood accessibility are important for young people. The new generation is more and more aware of the changes taking place in the city space and also puts emphasis on being able to be causative.

Conclusion

Cities go through certain development cycles, and in the long term, strong urban centers evolve: they transform from spatially separated cities, through extensive agglomerations, conurbations and metropolises, to multi-centre urban megaregions, which can be called megalopolises (Wróblewska-Jachna, 2012, 2021). An important resource for every city is cultural capital (which is a social element), which affects the experience of space and the ways of experiencing the world and reacting to social reality. Significant factors affecting the social condition of the city include the consequences of the COVID-19 pandemic, economic crises, the war in Ukraine and climate change. Many changes in the city's development are possible thanks to the use of exogenous factors that give direction to building the city's fabric and affect the intergenerational dialogue. An important sector of development, primarily aimed at the young generation, is culture. It is worth noting that since 2015, an increase in the number of entities classified as cultural and creative industries has been recorded annually. In 2021, the growth rate was higher than in previous years - the number of entities increased by 8.8% and amounted to 135.0 thousand. Entities classified as cultural and creative industries accounted for 5.7% of all non-financial enterprises, as shown in Fig. 3.

[2] More: www.bb2029.com.

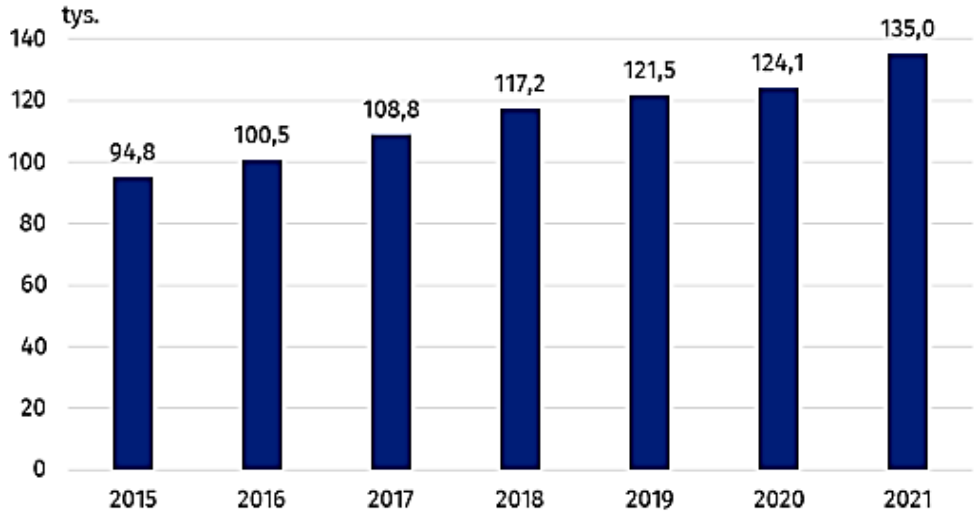

Figure 3. Number of entities classified as cultural and creative industries.

Source: GUS - Cultural and creative industries in 2021, 2023.

In the years 2015-2021, the share of entities in the field of visual arts in the total number of entities classified as cultural and creative industries almost doubled, while the share of entities operating in the field of books and press decreased by more than half (GUS - Cultural and creative industries in 2021, 2023). These data are important from the point of view of creating a city brand strategy and building new communication platforms with young recipients. They are identical to the responses of respondents who search for the most information about culture in social media, i.e. on visual and image platforms. In addition, the study showed that participation in culture is still a difficult topic due to budget constraints of young people, difficulties related to public transport and lack of activity in this area due to lack of participation. It should be noted, however, that in Bielsko-Biała, thanks to its own work on the preparation of a development strategy through culture and social consultations, there is a clear change in the perception of the role of culture and the opportunities resulting from it, which are used by beneficiaries, such as current residents, external guests or entrepreneurs. An important aspect is the intersectoral cooperation of the city's cognitive and cultural economy, thanks to which the processes that build the social capital of each urban agglomeration can develop.

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