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FOREWORD

Presented number of Silesian University of Technology. Scientific Papers. Organization and Management Series. Presented papers contain result of researches conducted by various universities. The number consists of 40 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about process management, social responsibility, quality management, service management, the impact of Covid-19 pandemic on management, logistics, human resource management, internalization, healthcare management, artificial intelligence in management, strategic management, environmental management, entrepreneurship, social economy, finances, small and medium enterprises, knowledge management, digital transformation, supply chain management and leadership.

Bożena Skotnicka-Zasadzień
Radosław Wolniak

SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

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ORGANIZATION AND MANAGEMENT SERIES NO. 217

INITIATIVES TO IMPLEMENT BUSINESS PROCESS MANAGEMENT SOLUTIONS IN ORGANIZATIONS

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Purpose: The aim of the article is to identify key initiatives in the implementation of business process management solutions in modern organizations.
Design/methodology/approach: A review of the relevant literature and studies on business business process management and artificial intelligence.
Findings: Classical concepts of the process-oriented approach to management, rooted in the Industrial Revolution, are evolving towards the concept of intelligent business process management based on information technology and artificial intelligence.
Practical implications: The presented research results and practical guidelines can be a reference point for both companies already using the process approach and those that are just planning to implement it. Implementing a process-based approach allows not only for better use of resources, but also for increased innovation and the organization's ability to respond effectively to new challenges.
Originality/value: The research indicates that both in the strategic and operational perspective of business business process management, artificial intelligence will be increasingly present. The challenge will not be its implementation, but the way it will be used. The way in which organizations integrate AI mechanisms into the management and implementation of business processes will determine their competitive advantage. Therefore, an interesting research direction seems to be to determine in which elements of BPM artificial intelligence is likely to provide the most benefits to companies of specific sizes, models and scopes of operation.
Keywords: business business process management, BPM initiatives
Category of the paper: research paper.

1. Introduction

Changes in the environment of modern organizations make it necessary to use management concepts that enable flexible adaptation to market requirements, based on IT solutions and an agile approach to project implementation and change management. The application of business

process management to emerging economic, social, and technological challenges is seen as crucial (El Ghalbzouri, El Bouhdidi, 2022; Gzik, 2023; Mendling, Pentland, Recker, 2020). The interest of organizations in the process approach affects the dynamic development of the market of business process management tools. It is estimated to be worth $31.2 billion globally in 2030 (BPM Report, 2023). By 2027, the United States is projected to grow by 12.1% in Japan (6.1%), Canada (7.8%) and Germany (7.1%) respectively in the period to 2027 (Business process management (BPM) - Global Market Trajectory & Analytics, 2022). Managers are looking for areas and tools to optimize processes in the context of robotization, automation, the use of cloud computing and artificial intelligence. The aim of the article is to identify key initiatives in the implementation of business process management solutions in modern organizations. For this purpose, the article uses the classic method of literature analysis, which involves identifying the state of research and critically reflecting on it (critical literature review). Based on the literature analysis (using the Web of Science, Google Scholar and Springer databases), the subject of BPM development and implementation in organizations was identified, with particular emphasis on new trends related to business process management and artificial intelligence. The results of considerations and research presented in the article can serve as guidelines for managers of process-oriented organizations, as well as those who intend to implement such solutions in practice.

2. Business process management – essence and benefits

Business process management is about perceiving the company through the prism of the processes carried out in it. Processes define all activities undertaken by the company, in particular activities that are key from the perspective of its goals and are the main subject of management (Gzik, 2023). Business process management can be considered in various approaches: in the framework, thematic, organizational and methodological sense (Stabryła 2022, p.11). Business process management in the framework sense means an area of knowledge and practical managerial activity that applies to organizations configured in multiple dynamic systems, taking into account the functional and instrumental aspects (Stabryła 2022, p. 11). In a thematic sense, the following areas of this concept should be indicated: basics of the concept of business process management, formalization of business process management, modeling of business process management systems, diagnostic analysis in business process management, design and controlling of results in business process management, and research on the development of organizational activities in business process management (Stabryła 2022, p. 12). Business process management in the organizational and methodological sense refers to the field of activity and its functioning (any entity, business unit and the management process, modeling, diagnosis, design) (Stabryła, 2022, pp. 14-15). Scientific and practical issues of business process

management include: effectiveness of business process management systems, development of pragmatics of management processes, process design, improvement and generation of management process instruments (models, methods, techniques, algorithms, strategies, legal and administrative regulations, working procedures) (Trocki, 2014). In addition to process orientation, customer orientation, development and learning orientation, rationality orientation or strategic thinking orientation should also be taken into account.

Business process management makes it possible to adapt to the requirements of the environment and thus creates new opportunities to achieve a competitive advantage. Proper identification of processes, their modeling, implementation, control and improvement significantly affect the profitability of the company, the level of customer satisfaction and consequently competitiveness (Dumas, La Rosa, Mendling, Reijers, 2013, 2018; Chountalas, Lagodimos, 2019). It is also necessary to apply permanent regulations in organizations in the field of the functioning of processes – the so-called process governance (BPM Governance) (Ubaid, Dweiri, 2020). The use of business process management also requires dedicated IT tools, new technologies and building a process organizational culture (Reijers, 2021; Gross, Stelzl, Grisold, Mendling, Röglinger, vom Brocke, 2020; Gudelj, Delic, Kuzmanović, Tesic, Tasic, 2021; Helbin, van Looy, 2021). The use of this concept also makes it possible to achieve significant benefits in terms of streamlining the way the company operates, reducing costs, increasing flexibility, transparency, processes, customer orientation, and improving its competitive position (Reijers, 2021, Gudelj, Delic, Kuzmanovic, Tesic, Tasic, 2021). A holistic approach in this concept focusing on improving the quality of products and processes, shortening the time of process implementation and improving their efficiency, reducing negative impacts, effective communication and building proper relationships between stakeholders. It is important to put into practice a process portal that gives employees access to all processes, descriptions and other resources, by integrating your processes with the tools and applications that employees use (e.g. intranet portals, Confluence, workflow) (BPM, 2023).

The effects of the use of business process management taking into account the strategic level is also insufficiently researched, and as Rummler and Brache emphasize, it is the key approach to the company's strategy through the implementation of processes, which improves its efficiency (Rummler, Brache, 2000, p.18). Challenges in the soft aspects of business process management, risk management in processes, integration with other management concepts, such as knowledge management or project management are becoming important (Bitkowska, 2019; 2023). The implementation of business process management solutions gives opportunities to make the right decisions and actions, improve the flow of information and identify problems in the organization. It is also crucial to create an appropriate framework (process governance) by building process architecture, i.e. grouping the processes occurring in the company into appropriate categories (categories of basic, auxiliary and management processes). A defined process architecture, perceived as a system of ordering processes in an appropriate hierarchy along with connections and relationships between them, becomes an important key factor

in achieving significant benefits. A certain formalization of the descripttion of the processes themselves is necessary, a more detailed analysis will naturally overlap with the areas of process measurement with particular emphasis on their internal efficiency and efficiency. Constructing process architecture and identifying them is an innovative and creative teamwork for which a special team should be appointed. Business process management is a standard in many industries but managers express concerns about problems with implementing and maintaining the approach and various initiatives undertaken in organizations, in particular the use of new technological solutions.

3. Challenges of business process management initiatives

The subject of the development of process initiatives are very dynamic, as indicated by numerous studies, conducted research and methodologies (BPM 2023, Tech Trends 2023). Many instruments and tools to support these solutions are aimed at digitization, robotization and expanding technological knowledge. This is due to the fact that companies place great emphasis on software, applications and tools to support their business process management initiatives. It helps you quickly adapt to changes in processes, requirements and respond flexibly to new business requirements. This enables transparency, accelerates automation activities and provides a basis for action in both strategic decisions and operational activities.

Hyperautomation is one of the most important technological trends. It automates processes, reduces operational costs and improves process efficiency through the use of intelligent tools such as: robotic process automation (RPA), artificial intelligence (AI), process mining and task mining, organizational digital twins (DTOs). Leaders are considering replacing current BPMS tools with more intelligent software in the next few years. Today, technologies are transforming into more predictive technologies through data integration and machine learning. These systems are known as intelligent or AI-based, they use process intelligence technologies, including process mining, task mining, intelligent business process modeling (10 Useful BPM Trends Fueling the Future of BPM in 2023). Business process management plays a key role in the transformation activities of modern organizations, in the context of implementing new technological solutions or redefining the roles of employees. New technological solutions affect the analysis, modeling and optimization of processes, providing end-to-end process transparency, defining key performance indicators, business rules, roles, and documents (10 Useful BPM Trends Fueling the Future of BPM in 2023). An important area is customer-oriented proposals to use the customer journey. In this way, business leaders and change leaders can redesign activities in processes or automate to improve the quality of customer service.

Research carried out around the world has shown that 68% of the surveyed experts estimate that the future importance of their company's business process management will increase significantly (BPM 2023). The main benefits of business process management for the organization are: transparency of processes through documentation 73%, increased efficiency of work processes 67%, governance (compliance & governance) 55%, improvement of customer orientation 50%. Other benefits include: project support and/or change management 43%, implementtation of the company's strategy and its goals 42%, increased product quality 39%, support strategic and operational decisions 36%, increased staff satisfaction 29%, increased speed and flexibility of response to changing conditions 29%, support for innovation and development 27%.

Other studies point to many initiatives and new business process management solutions being implemented in organizations around the world (Harmon, 2020). More than half of the respondents indicated that their organizations will spend more on process projects in the next two years. This applies, among other things, to technologies that are the subject of an organization's pursuit of improving IT tools, their capabilities to support the implementation and design of processes. Process automation, as well as iBPM (intelligent Business process management) stand out as the most preferred directions of technology development, as 58% in relation to artificial intelligence and 57% in relation to user automation are looking for opportunities for development and investment in these areas. In turn, 39% of the surveyed companies are interested in process mining tools, and 38% are interested in business process management and robotization (RPA). The above data show an upward trend in the investment of financial resources in further work on business process management. The main emphasis is placed on the development of process technologies, which significantly contribute to more efficient modeling, implementation or improvement of the processes taking place, also from the customer's perspective.

Artificial intelligence as an element supporting the optimization of processes in various sectors of the economy is becoming more and more widely used. Polish companies spent PLN 1.8 billion on AI in 2024, according to the PMR Market Experts report - Artificial intelligence market in Poland 2025. Market analysis and development forecasts for 2025-2030. It was pointed out that AI is currently the most important element of technological transformation, and experts predict its huge impact on the business sector and the mass market in general (PAP Business, 2024). The report prepared by the University of Warsaw, Accenture and FinTech Poland shows that the impact of artificial intelligence on the economic development of many sectors is growing and by 2035 the growth resulting from its use will be: 3.8% in the service sector, 4.4% in manufacturing, 4.3% in the financial sector, 4% in trade, 3.4% in construction and 3.4% in healthcare (Accenture). According to a 2024 EY study, 43% of companies worldwide are investing in generative artificial intelligence (GenAI) (EY, 2024). Other sources, such as the McKinsey report, indicate that about 72% of companies globally implement various forms of artificial intelligence (McKinsey, 2024). In the small and medium-sized enterprise

(SME) sector in the Central and Eastern Europe region, as many as 90% of companies use AI and machine learning, with one in four companies using these technologies to a significant extent (AI Chamber, 2024). The use of AI in BPM brings numerous benefits, such as increased efficiency, cost reduction, and improved customer experience. The current approach that has guided BPM for decades was shaped during the industrial revolution. It was created as a result of the transition from artisanal production to mass production. Meanwhile, the environment has changed significantly since then, and digital technologies (in particular artificial intelligence) are creating a new technological framework for business process management (Rosemann, 2024). All leading providers of IT solutions supporting business process management use artificial intelligence mechanisms for supporting process modeling, analysis, prediction and implementation of process applications (Gartner). The above indicates that both in the strategic and operational perspective of business business process management, artificial intelligence will be increasingly present. The challenge will not be its implementation, but the way it will be used. The way in which organizations integrate AI mechanisms into the management and implementation of business processes will determine their competitive advantage. Therefore, an interesting research direction seems to be to determine in which elements of BPM artificial intelligence is likely to provide the most benefits to companies of specific sizes, models and scopes of operation.

4. Summary

Business process management plays a key role in the adaptation of modern organizations to the dynamically changing market environment. This approach allows for a better understanding of internal processes, their optimization and integration with modern technologies, such as robotization, artificial intelligence or cloud computing. The article presents key initiatives related to the implementation of process solutions in organizations, indicating their importance in building flexible management structures. The presented research results and practical guidelines can be a reference point for both companies already using the process approach and those that are just planning to implement it. The dynamic development of tools supporting business process management and the forecasted increase in the value of the global market for these solutions emphasize their growing importance in effective management of organizations. Implementing a process-based approach allows not only for better use of resources, but also for increased innovation and the organization's ability to respond effectively to new challenges. Future research should focus on analyzing the long-term effects of implementing business process management and its integration with advanced technologies to further understand its impact on organizational development.

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SOCIAL RESPONSIBILITY OF UNIVERSITIES – THEORETICAL AND PRACTICAL APPROACH

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Purpose: The aim of this article is to present the essence of social responsibility of universities and its areas. The problem on which the study was focused comes down to answering the questions: What should be the direction of education at universities in the context of the challenges of the modern world? What actions are taken by the Department of Logistics and Innovation in the context of SRU in cooperation with the environment?
Design/methodology/approach: The research methods and techniques used included, among others: content analysis, selected methods of qualitative analysis, case study.
Findings: The article reviews selected definitions of social responsibility of universities (SRU), indicating examples of its levels in relation to internal and external stakeholders. Attention is drawn to the need for education for sustainable development (ESD). Examples of socially responsible activities implemented by the Department of Logistics and Innovation in the years 2017-2023 are presented.
Research limitations/implications: The study has some limitations. It shows the levels of social responsibility in a theoretical approach, and in a practical approach only on the example of one department. Further research projects in this area should include a larger research group.
Practical implications: They mainly concern the comprehensive presentation of the areas of social responsibility of universities and challenges in the context of education for sustainable development.
Social implications: Internal and external stakeholders can gain knowledge about the direction of evolution of universities and the nature of responsibility towards them.
Originality/value: The presented case study can be an example of good practices in the area of social responsibility of universities in the area of cooperation with business.
Keywords: social responsibility of universities (USR), areas of social responsibility, education for sustainable development (ESD), cooperation with business
Category of the paper: research paper.

1. Introduction

From a scientific point of view, corporate social responsibility (CSR) has been a subject of interest since the 1920s. In the 1950s, a modern view of CSR emerged (stating that business activities have an impact on people/society, and therefore should be consistent with social goals and values). The 1960s and 1970s were a period when there was a discussion on ethics in business and attempts were made to create theoretical foundations for the concept - the concept of sustainable development appeared then, in the principles of which CSR also has its roots. Today - according to the definition of the European Commission – CSR can be defined as the responsibility of companies for their impact on society. This is an approach in which companies take into account the social and environmental consequences of their actions, taking conscious actions aimed at sustainable social development, environmental protection and compliance with ethical standards. This involves, among others, taking care of the well-being of employees, ensuring fair working conditions and remuneration, minimizing the negative impact on the environment, supporting local communities and complying with the principles of business ethics. The idea of CSR is starting to play an increasingly important role in public institutions (Bokhari, 2017; Kouatli, 2018; Ogarca, Puiu, 2017). And it also applies to universities, because expectations towards them have begun to go beyond education and research (Etzkowitz, 2008; Puukka, 2008). Components of corporate social responsibility that can be/are transferred to universities (Carroll, 1991):

- economic – including productivity, profitability, growth;
- legal – requiring actions in accordance with the law;
- ethical – including unwritten norms and values accepted by society;
- philanthropic – focused on voluntary actions aimed at improving the quality of life of the public.

In the 1990s, the issue of the responsibility of universities towards society emerged – the Erfurt Declaration stated that universities are obliged to identify social and economic needs and contribute to meeting them (The Erfurt Declaration, 1996). One of the groundbreaking documents in expanding the role of the socially responsible university was the UNESCO World Declaration, which emphasized, among other things, that universities are important factors in cultural, socio-economic and environmental development on a global scale. Paraphrasing the definition of the European Commission, one can say that the social responsibility of universities (SRU) is their responsibility for the impact on society.

The aim of this article is to present the essence of social responsibility of universities (with particular emphasis on its two dimensions: cooperation with business and education for sustainable development). The problem on which the study was focused comes down to answering the questions:

- What should be the direction of education at universities in the context of the challenges of the modern world?
- What actions are taken by the Department of Logistics and Innovation in the context of SRU in cooperation with the environment?

In summary, the article aims to present the areas of social responsibility of universities.

2. Methods

Selected research methods and techniques were used to achieve the research objective. Descriptive analysis was used to define the subject of the research. The method of analysis and criticism of literature proved useful for systematizing the current scientific achievements and the state of knowledge on the essence of social responsibility of universities and indicating its areas (including in the field of education). The literature review was conducted in accordance with the classical approach (i.e.: selection of sources, keyword search, review and selection of articles, in-depth analysis of selected publications in relation to the subject of the research). The article will use the case study method, which is used in research on the social responsibility of universities (Hill, 2004; Vasilescu et al., 2010; Metha, 2011; Karwowska, Leja, 2017). The considerations will be exemplified based on the activities undertaken at the Department of Logistics and Innovations of the University of Lodz in 2017-2023.

3. Results

The idea of social responsibility of universities has been discussed in the literature since the 1980s (Bok, 1982) using different terminology – in the American sense, scholarship of engagement or engaged scholarship, then in the categories of university community (Australia and Great Britain), and finally social responsibility of university as an approach adopted in Europe and Asia (Esfijani, 2014). Although it is a relatively new idea (Kouatli, 2018; Larran Jorge et al., 2011), it is the subject of growing academic interest (Larran Jorge and Andrades Pena, 2017; Meseguer-Sanchez et al., 2020). Examples of definitions of social responsibility of universities are presented in Table 1.

In Poland, apart from Leja mentioned in Table 1, the issue of social responsibility of universities was dealt with by, among others, Geryk (2010), who conducted pioneering research in this field in the years 2007–2010; Chmielecka (2008), who analysed this issue from the point of view of academic ethos; from the perspective of image, considerations of SRU were conducted by Białoń and Werner (2012), and from the perspective of brand – Iwankiewicz-Rak and

Shugina (2013); and from the perspective of the university mission – Koj (2013), and from the perspective of the local environment – Szewior (2018).

Table 1.
Selected definitions of social responsibility of universities

Author	Content of the definition
J.Reiser (2007)	Flexible quality of the academic community (students, lecturers and administrative staff) ensured by appropriate management of the educational, cognitive, human resources and environmental impact of the university; conducted in interactive dialogue with society in order to promote the sustainable development of humanity.
M.Nejati et al. (2011)	Stakeholders give universities permission to operate and to strengthen this social contract, universities should be socially responsible.
E.E.Navarrete et al. (2012)	The ability to disseminate and implement multiple principles and values through key processes (such as governance, education, research) extended to the community in order to ensure sustainable development.
R.Vasilescu et al. (2010)	The ethical need to strengthen the social engagement and civic activity of students and university staff by encouraging them to provide services to the local community through volunteering and to promote sustainable development on a local and global scale.
P.G.Reiser (2007)	University social responsibility is the responsible management of the educational, cognitive, human resources and environmental impact of the university through interactive dialogue with society, the aim of which is to promote the sustainable development of humanity.
Project EU USR (2015)	Policies, strategies and practices undertaken by universities to enhance social, cultural, economic and environmental well-being, emphasizing that social responsibility of universities: - is a tool for promoting civic values and sustainable development, - should be mandatory in some aspects due to the fact that education is a public good, - constitutes a commitment to transparency and accountability.
K. Leja (2008)	The university responds positively (but not uncritically) to the expectations of its stakeholders, and the degree to which expectations are met is a measure of its social responsibility.
Declaration of Social Responsibility of the University (2017)	A strategic and systemic approach to university management and building cooperation with stakeholders that contributes to: sustainable development, shaping the values and attitudes of civil society, supporting academic values and creating new ideas, and maintaining and developing scientific and teaching competences that affect the effectiveness of operations and innovation.

Source: own study based on a review of the literature on the subject.

The broadest definition of SRU in Poland is included in the Declaration of Social Responsibility of Universities (2017), and consists of twelve points, concerning, among others: education, research and projects in the field of social responsibility and sustainable development, cooperation in the field of SRU and dialogue with stakeholders, also responsible and transparent management of the university, nurturing values and minimising the negative impact on the environment. Its main goal is to generate public awareness of the role that higher education plays in shaping the conditions for sustainable socio-economic development of the country. The declaration motivates universities to promote the idea of sustainable development and social

responsibility in both scientific research and education, as well as organizational solutions[1]. The key to the philosophical and ethical[2] foundations of the SRU defined in this way is, on the one hand, the axiological dimension of the theory of sustainable development (assuming that each human generation bears responsibility for future generations), and on the other, the idea of social responsibility. Considering the multiple roles that the university plays, its obligations in terms of social responsibility are dual in nature (Chmielecka, 2008):

- the area of direct service related to meeting the needs of internal and external stakeholder groups: the needs of students, staff, and the university's social environment;
- cognitive functions: increasing knowledge, seeking truth, and educating in the perspective of not only the dynamics of work, but also broadly understood proactivity and preparing graduates to act as social leaders in the environment, to being a center for the transmission and transformation of culture and good manners. Effective ongoing training in the field of social responsibility, going beyond business ethics itself, should be integrated with corporate strategies by future employers of current students (Syper-Jędrzejak et al., 2022).

The social responsibility strategy should be linked to the overall strategy of the university and respond to external challenges (social, economic, environmental changes) and build social capital among employees and students. It can be said that in a strategic sense it is inscribed in the DNA of the university – starting from the vision, mission and key values, through strategic goals, policies and programs, and ending with procedures. By including SRU in the basic development strategy of the university, it can be ensured that all actions for the implementation of this concept will be coherent and will contribute to the implementation of sustainable development in the long term.

Jongbloed et al. (2008) claim that a socially responsible university supports equal opportunities, provides education focused on social needs, strengthens the lifelong learning process and helps communities solve major social problems – a socially responsible university is a university serving its surroundings. According to Geryk (2012), the expectations of stakeholders are mainly focused on the needs of „establishing correct relations and stronger social bonds with the environment (...), creating benefits for society in the form of educated graduates or conducting scientific research consistent with the needs of modern society." In the literature, one can see a slightly broader perspective on the social responsibility of the university - going

[1] Assuming that socially responsible conduct of an organization is the result of proper and moral choices of its members, dictated by the organization's standards in this area (and not the effect of their commitment to fulfilling obligations towards society as a whole or individual stakeholder groups), then the organizational culture (including the system of values on which it is based) plays a key role in the development of ethical standards (Jones, 1995).

[2] The issue of ethics in higher education can be analysed in two contexts (Davis, 1999):
- as the application of moral values in the relationships between universities and their stakeholders (both internal and external) or, in a broader sense, as the professional ethics of academic teachers and scholars that flow from the ethos of these professions;
- as a university subject and field of study; Adkins and Radtke (2004) focus on this aspect and confirm that students find ethics training useful and valuable.

beyond the sphere of teaching, scientific research and operational activities (Esfijani et al., 2013; Teneta-Skwiercz, 2017). It can be identified with its third mission, i.e. all activities influencing the formation of relations with the social environment. The basic SRU are presented in Table 2.

Table 2.
Areas of social responsibility of universities

Social responsibility of universities	Examples of manifestations
Scientific and research	- high level of education, - high quality of scientific research, - shaping ethical and responsible business leaders, - supporting and developing innovation, - mobility of students and academic staff, - international and intersectoral exchange of experiences,
Social	Internally: - taking care of employee development, - promoting student and academic mobility, - maintaining international relations, - equalising students' social opportunities, - adapting infrastructure to the needs of disabled people,
	Externally: - providing specialists needed for the labor market, - opinion-forming, - creating political and economic reality, - activities for children, seniors and disabled people, - supporting activities for health protection and promotion of sports, - supporting culture and art, - protection of monuments, - charity events,
Ecological	- curriculum related to environmental protection, - creating and promoting pro-ecological attitudes, - implementing and monitoring sustainable development goals, - reducing the ecological footprint, - research responding to the problems and needs of the natural environment,
Economical	Internal: - Sustainable supply chain, - Management systems ISO:9000, 14000, 26000, - Non-financial reporting (e.g. in accordance with GRI)
	External: - impact on the local economy, - creation of new staff, - university as an employer, - purchases from regional suppliers, - business partnerships, - consulting services and opinion formation.

Source: Pawłowska, Osiecka-Brzeska (2019).

From an educational perspective, Idowu and Sitnikov (2020) present several options: engaging young people in the concept of social responsibility; providing specialized training in this area; developing practical skills in social responsibility; and investing in basic and applied research on the subject. Audebrand (2017) argues that the responsibility for teaching social responsibility lies particularly with economic universities (they are expected to include

social responsibility in their strategy, as sustainable development is becoming an increasingly important part of strategic policy). The concept of education for sustainable development (ESD) has emerged in the literature. Most researchers use it in the context of the main goals of the new development paradigm, which „meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). This approach is crucial from the perspective of the social responsibility of universities, as it allows to equip students with the ability to make informed decisions and take responsible actions for environmental integrity, economic profitability and a just society for current and future generations, while respecting cultural diversity (Leicht et al., 2018).

The main goals of ESD are to envision alternative and preferable futures and to anticipate and prevent future negative changes as well as the consequences of global sustainable development problems and challenges (Wiek, Withycombe, 2011).

Bokhari (2017) presents a comprehensive analysis of the social responsibility area of HEIs. It combines two types of measures: the first is knowledge transformation (acquisition/knowledge and dissemination/education) and the second is social institutionalization (organization/-socialization). Bokhari examines the different responsibilities of HEIs – leading as an organization by example by maintaining socially responsible campuses, conducting valuable research in the ESG (environment, society, governance) domain, and providing evidence-based education, policy advice, and business consulting. Through responsible education, the university encourages awareness of social responsibility and engages students in SRU-related activities; in this way, universities drive and shape sustainable development. Social responsibility of HEIs is a contribution to the UN Sustainable Development Goals and targeted policies in the context of ESG, and raising awareness of social responsibility is a key part of this.

Universities play a unique role in maintaining sustainable development in terms of knowledge creation, knowledge transfer and teaching (Esfijani and Chang, 2012). Ali et al. (2021) share this view that universities are guarantors of sustainable development because these institutions nurture future leaders. Soderbaum (2009) also recognizes that universities influence and educate young people about sustainable development and social responsibility, and therefore universities play an important role in engaging people with these ideas.

Palacios Garay et al. (2016) and Rutti et al. (2016) indicate that education in social responsibility benefits students both professionally and as responsible consumers and citizens. Their research confirms that training students in social responsibility improves their career prospects and competitiveness, while equipping them with knowledge on sustainable development in line with EU policies.

Social responsibility should be based on building voluntary, mutual relations between the organization and its stakeholders in order to meet their expectations (Piasecka, 2015). According to the stakeholder theory and the stakeholder management process – presented by R.E. Freeman (2010) – each organization, after identifying its stakeholders, should attempt to deter-

mine their potential participation in creating the organization's value. Focusing on the stakeholder concept requires and allows for the identification of entities with which the university maintains (both directly and indirectly) a relational character, which means identifying to whom the university is socially responsible. This responsibility has a dual nature: towards internal stakeholders (students, academic staff, administrative and technical staff) and external (graduates, candidates for studies, advisory or supervisory bodies operating at the university Senate, regional community, employers from the external environment of the labor market, authorities – central, regional and local, universities – domestic and foreign). Moubed and Nadizadeh (2022) argue that communication and collaboration between higher education institutions and local and global communities can support the pursuit of a more sustainable society.

Focusing on the cooperation between universities and enterprises, which includes intentional, voluntary interactions aimed at obtaining benefits for the cooperation partners (D'Este, Perkmann, 2011), using resources owned by both parties (Hardy, Phillips, Lawrence, 2013); it should be emphasized that cooperation differs in the degree of formalization, the scope of the parties' activity (from passive, unidirectional use of knowledge to active co-creation), the type of transferred knowledge (explicit vs. tacit), the need for physical mobility, the number of cooperation partners (bilateral and network projects), etc. Examples of forms of cooperation between universities and businesses are presented in Table 3.

Table 3.
Matrix of individual and institutional forms of cooperation between universities and business

		Business	
		Individual forms	**Institutional forms**
Universities	**Individual forms**	Personal contacts Participation in conferences Guest lectures Participation in project teams	Student internships and placements Phd internships/research Consulting Additional employment
	Institutional forms	Visiting professors Studies/research internships Participation in scientific councils Additional employment	Cooperation agreements Research consortium Joint research programs Commissioned research projects

Source: Responsible Partnering (2005).

The empirical approach to selected forms of cooperation – presented in Table 3 – in the context of socially responsible activities is presented in the next part of the article.

4. Case study

The University of Lodz carries out activities in the field SRU, e.g: typical of a third-generation university:

- appointing a vice-rector for cooperation with the environment responsible, among others, for searching for opportunities for change (and using them) as well as developing cooperation with the environment;
- operation of the Center for the Outward-Oriented Cooperation (www.uni.lodz.pl), which cooperates with both the economy and non-governmental organizations; creates fields of study with the involvement of practitioners; develops the culture of entrepreneurship - by providing webinars that create entrepreneurial attitudes for students or supporting startups; mediates in student practices/internships; organizes job fairs and maintains relationships with graduates (e.g. by monitoring graduates' careers, implementing the VIP UŁ graduate program or the UŁ mentoring project).
- two-track student education: general and elite education (implemented thanks to academic tutoring programs);
- internationalization of studies;
- offering direct support to the surrounding entities (those that want to implement changes in their operation) as part of the Science Hub UŁ program[3].

They are implemented at the central level but may have an impact on the functioning of individual university units, employees, or students.

The article is intended to represent a case study of the cooperation with the environment implemented by the Department of Logistics and Innovations of the University of Lodz in the years 2017-2023. Therefore, our attention will now be directed to selected examples of this activity (Bukowska-Piestrzyńska, 2024). The presented dimensions USR will refer primarily to students (including their parents) and employers (and in the broader context of the labor market).

Since all the logistics students undergo compulsory internships, they constitute the most ordinary form of cooperation between the Department and business. As the Internship Manager, an employee of the Department is responsible for the compliance of the internship with the field of study, its proper conduct and settlement of its implementation. During the internship, students may collect materials for their diploma thesis, but it sometimes happens that they return to the enterprise later to obtain information relevant to the thesis topic approved by the supervisor. Annually, approximately 130-150 male and female students complete this mandatory element of their studies.

The form of cooperation between the Department and the business with the longest history is the Logistics Practice Academy, in which business representatives (mainly TSL industry

[3] The aim of this project is to connect university students carrying out applicable scientific projects (including diploma theses) together with the external entities, such as local enterprises, institutions, and non-governmental organizations with the support of scientific supervisors. Its idea is to strengthen the cooperation of the University of Lodz with its environment by creating a university-wide platform for cooperation between the University of Lodz and external partners. The project is scheduled for 2022-2024 and is financed by the Ministry of Science and Higher Education as part of the Scientific Excellence program. from: https://www.sciencehub.uni.lodz.pl-/science-hub-ul.

entities, but also motivational speakers, representatives of HR departments, and even the Police and Prison Service) present biweekly meetings the mechanisms of operation of various functional areas of enterprises and solutions to problems in their enterprises. The topics of the speeches related to both hard aspects of business functioning and soft skills needed in the workplace[4]. Over 7 years, almost a hundred meetings were held, attended not only by students of logistics, but also of other fields and even universities. Furthermore, they continued during the pandemic - on the Teams platform - and their topics were related to current economic challenges[5]. Thanks to such cooperation, students often gain a good insight into the specifics of the TSL sector from the very beginning of their studies. This allows them to understand better current challenges, e.g. related to the deteriorating economic situation or human resources management in logistics centers or transport companies (due to staff shortages related to the war in Ukraine).

Training in the field of soft skills, offered to a narrow group of students (mainly members of the LOGIN scientific club) and employees of the Department and carried out by the employees of the HR departments of the entities cooperating with the Department comprises the next step in the development of this form of cooperation[6].

Open research and economic seminars comprise yet another form of the APL lectures evolution[7] prepared by the Department's employees in cooperation with representatives of the economic environment. During the debate, guests answer questions not only from the academic leading the meeting, but also from students obliged to prepare for the meeting and actively participate in it.

The above-mentioned forms of cooperation provide students (including employees) with the opportunity to acquire practical knowledge and develop skills, and to establish contacts for internships or future employment as well as the opportunity to prepare for the requirements of the labor market and the expectations of enterprises.

A common form of cooperation between the Department and business are study visits by logistics students in a specific enterprise, e.g. visit to the Group *Wastewater Treatment Plant of the Łódź* Urban *Agglomeration* within the framework of the 'Reverse Logistics' program, visit to the logistics center of Transfer Multisort Elektronik sp. z o.o. (it is a global entity that

[4] Sample meeting topics: 1) Practical aspects of transport management for an e-commerce warehouse; 2) Kaizen – practical methods and techniques supporting the development of the organization; 3) Trends in e-commerce logistics, off-line and on-line e-commerce; 4) Logistically functional product. Design supporting logistics; 5) Organization of a modern purchasing department in global corporations and market trends; 6) Every generation wants to change the world, i.e., age management in the organization; 6) Customer relationship management in the international supply chain.

[5] Sample meeting topics during the pandemic: 1) Logistics - mobility - Covid-19 - change in thinking and action; 2) Challenges and opportunities of the distribution for the e-commerce in the era of the pandemic; 3) Distribution challenges and opportunities for e-commerce in the era of the pandemic.

[6] Sample training topics: 1) Memory and speed-reading techniques; 2) Self-presentation – public speaking; 3) Modern recruitment and selection tools and techniques in the TFL industry.

[7] Titles of scientific and economic seminars: 1) Responsible supply chains – transformation in the face of contemporary challenges; 2) Logistics and supply chains 4; 3) Adaptability of supply chains in the contemporary economy.

offers approximately 600,000 product items and handles over 5,000 shipments a day) as a part of the 'Distribution Logistics' program based on which they prepare a short report on the essence of distribution logistics implemented by TME sp. z o.o. student science club Login members take part in a larger number of visits to enterprises which are often combined with workshops[8]. Lecturers also participate in study visits[9].

The previously mentioned university-wide Science Hub project has become a special form of cooperation with business, in which students, under the supervision of an academic lecturer, solve the problem of an external partner. As a result of the competition procedure, two teams of logistics students were qualified for the project pursuing the following research topics:

- analysis and identification of opportunities and threats for an e-commerce warehouse in the fashion industry - potential directions of the development - in cooperation with Arvato Polska sp. z o. o.;
- optimization of the selected areas of internal logistics of Dradura Polska Sp. z o. o.

While working on the project, students obtain knowledge and support from experts, starting from the idea of the topic through searching for solutions to the presentation of the achieved results. Supervising a student project is a new experience for the mentor from the enterprise as well (sharing knowledge with young people and influencing their development).

From the Department's perspective, the project implemented in 2021 for ARVATO Polska sp. z o.o. (operator of comprehensive services for the e-commerce sector in Poland and worldwide) comprises an important example of cooperation. It was entitled 'Development of the ecological and reusable packaging for use in e-commerce logistics services' and included research and development work and conducting workshops for students which ended with a competition with a prize pool of PLN 10,000 (funded by a business partner). Research has contributed significantly to the transfer of knowledge in an interregional system between the business, academic and scientific research sectors.

5. Conlusions

The Code of Good Practices in Higher Education (2017) developed by the Polish Rectors Foundation indicates the awareness and understanding of the needs of higher education institutions. The lack of ignorance towards the social responsibility of universities is evidenced by the provision that they are called to honestly seek the truth, and „the results of this search should document (research goals), educate young generations in methodical knowledge of it, support

[8] For example: 1) in 2022 members of the scientific club visited: Geis logistics center in Stryków and Decathlon distribution center in Łódź, 2) in 2023 – ID Logistics logistics center in Wola Rakowa and GXO distribution center in Natolin and Łódź.

[9] For example: 1) in 2018 - PKP dry transshipment port in Małaszewicze; 2) in 2021 – Frigologistics warehouse-freezer distribution center in Żnin; 3) 2022 – PGF distribution center in Łódź.

their intellectual and moral development, as well as prepare future graduates to responsibly perform public and professional functions in a democratic state (didactic and educational goals) and support the cultural and civilizational development (of the entire society (social goals)". SRU should be expressed in education in the field of social responsibility (including business ethics and eco-development) and sustainable development (Haski-Leventhal, Concato, 2016).

The universities' growing interest in including social responsibility activities in their development strategies, or even in creating separate strategies in that area, is determined by various factors. They include (Dąbrowski at al., 2018):

- the growing popularity of social responsibility and its active promotion within international initiatives and organizations, such as the UN Global Compact or the European Union;
- the growing competition on the education market, forcing universities to seek new ways to gain a competitive edge by turning to uncharted territories to reinforce their reputation;
- the expanding and thickening network of university stakeholders, whose assessment and the related support (or lack thereof) becomes crucial for the conditions in which those entities function (the growing expectations of accrediting institutions in terms of organizational social responsibility are a part of that phenomenon);
- the growing gap between the education models and the market need for new skills, includeing skills related to the development of organizational social responsibility policies;
- the growth of universities and their campuses in terms of size - resulting in considerable consumption of resources, such as energy and water, by those entities and thus their growing environmental impact (and growing awareness of the university in this respect).

The article identifies areas of social responsibility of universities. It presents the importance of education for sustainable development as a socially responsible activity. It identifies areas of cooperation between universities and enterprises that can create value and presents their empirical exemplification. The presented case study – examples of socially responsible activities implemented by the Department of Logistics and Innovation, University of Lodz – is a contribution to the development of research on socially responsible universities. This approach is in line with the position of Palacios Garay et al. (2016) and Rutti et al. (2016), who point out that education in social responsibility brings benefits to students (both professionally and as responsible consumers and citizens) and improves their career prospects.

In the context of designing further directions of scientific research on the social responsibility of universities, the research implications concern the recognition of the level of awareness of decision-makers in higher education institutions about the areas of social responsibility and, consequently, the issues of relations between universities and other stakeholders (e.g. local government entities or graduates) and the creation of a catalogue of good practices in the discussed scope. A broader research problem may be the search for an answer to the question: what

should be the direction of education at universities in the context of the challenges of the modern world?

In light of the unethical behaviour of some universities, it is crucial for policymakers and national regulators to create incentives for universities to take steps to develop and implement multi-faceted social responsibility strategies.

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DYNAMIC CAPABILITIES AND FIRM PERFORMANCE: EMPIRICAL EVIDENCE FROM ORGANISATIONS IN

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Purpose: The primary goal of the study is to measure dynamic capabilities in Polish enterprises and analyze the relationship between dynamic capabilities and firm performance.
Design/methodology/approach: The study employs a mixed-methods approach that combines quantitative and qualitative research methods to achieve its objectives. The study takes a multi-dimensional approach. It conceptualizes dynamic capabilities through a multi-logic perspective, enhancing the traditional framework by integrating new variables like effectuation, bricolage and stakeholder synergy. Through a combination of quantitative measurements and qualitative insights, the research verifies the theoretical model in real-world business contexts. Provides actionable recommendations for business practitioners on measuring and developing dynamic capabilities to enhance organizational effectiveness. The focus is on small, medium, and large enterprises in Poland, with a broad sectoral representation to ensure relevance across various industries. The research is geographically confined to Poland but offers implications that can be extended to other markets.
Findings: The findings emphasize that dynamic capabilities are essential for organizational success, particularly in adapting to changing environments. However, their full impact on organizational effectiveness depends on multiple variables, including strategic potential, industry context, and internal resources. Future research should focus on expanding the scope of explanatory variables to better understand the multifaceted nature of firm performance.
Research limitations/implications: Future research should focus on expanding the scope of explanatory variables to better understand the multifaceted nature of firm performance.
Practical implications: This research provides a roadmap for enterprises aiming to leverage dynamic capabilities to enhance effectiveness and competitiveness, particularly in unpredicttable market environments.
Originality/value: The paper presents a novel approach by integrating dynamic capabilities theory with the concept of strategic potential and its microfoundations (e.g., opportunity sensing and seizing, resource reconfiguration, stakeholder synergy, effectuation and bricolage. This integration goes beyond existing models by emphasizing the role of dynamic market adaptation as key drivers of organizational effectiveness in volatile environments.
Keywords: dynamic capabilities, resource reconfiguration, stakeholder synergy, effectuation, bricolage
Category of the paper: research paper.

1. Introduction

The concept of dynamic capabilities emerges from strategic management, rooted in the resource-based view, focusing on an organization's ability to identify, seize, and reconfigure resources to exploit emerging opportunities and create value in turbulent environments (Teece et al., 1997). This perspective has gained prominence in recent years due to its relevance in volatile and complex business contexts, providing organizations with a competitive edge by leveraging strategic potential and dynamic resource orchestration.

Key contributors, including Teece, Pisano, and Shuen (1997), laid the theoretical foundations, defining dynamic capabilities as a firm's capacity to integrate, build, and reconfigure internal and external competencies to address rapid environmental changes. Further, Teece (2007) identified three core components: opportunity sensing, value creation, and resource reconfiguration. These elements form the theoretical basis of this dissertation, which aims to measure the level of dynamic capabilities in Polish enterprises, identify their key components, and examine their relationship with organizational effectiveness and strategic potential.

The concept of dynamic capabilities is one of the most prominent in strategic management, often seen as a critical factor determining a company's survival or success in rapidly changing environments (Pezeshkan et al., 2016). These capabilities encompass the ability to adapt, innovate, and reconfigure resources to exploit emerging market opportunities, benefiting customers while creating challenges for competitors (Teece et al., 2016).

Despite broad acceptance, the concept faces criticism for its lack of empirical clarity and definitional ambiguity. Critics argue that the distinction between dynamic and ordinary capabilities is often blurred (Helfat, Winter, 2011), and some question its tautological nature (Kraatz, Zajac, 2001; Danneels, 2008). While Eisenhardt and Martin (2000) suggest that dynamic capabilities may not guarantee a competitive advantage in rapidly evolving environments, Teece et al. (1997) maintain that they are essential.

Recent studies have shifted focus toward firm-specific processes for developing and renewing competencies to adapt to changing business conditions. However, despite growing empirical research, comprehensive frameworks addressing the dimensions, mechanisms, and outcomes of dynamic capabilities remain incomplete (Helfat, Martin, 2014; Peteraf et al., 2013).

Since 1997, various attempts have been made to define dynamic capabilities, first conceptualized by Teece, Pisano, and Shuen. They describe "dynamic" as the ability to renew competencies to adapt to changing business environments and emphasize that strategic management is essential for integrating and reconfiguring internal and external resources (Teece et al., 1997). Dynamic capabilities involve continuous organizational transformation through resource reconfiguration, fostering competitive advantage (Mitrega, Pfajfar, 2015).

Dynamic capabilities differ from ordinary capabilities, which are routine processes essential for daily operations, while dynamic capabilities enable strategic change (Winter, 2003; Zahra

et al., 2006). Despite their importance, defining these capabilities has been challenging due to overlapping terms like "competence" and "skill" (Krzakiewicz, Cyfert, 2017). Studies have shown that valuable competencies combine knowledge and cross-functional skills, essential for sustaining long-term competitive advantage (Bratnicki, 2000).

The concept of dynamic capabilities focuses on the ability of organizations to adapt, innovate, and respond effectively to changing environments. Developing it requires a strategic approach emphasizing creativity, entrepreneurship, and innovation, supported by key resources such as knowledge, technology, intellectual property, and stakeholder relationships.

Dynamic capabilities rely on microfoundations—organizational processes, decision-making frameworks, and resource orchestration—making them unique and challenging to replicate. They integrate resource-based view with strategic management, leveraging organizational history and current resource positions (Teece et al., 1997). Effective dynamic capabilities development depends on absorptive, adaptive, and innovative capabilities, which enhance organizational flexibility, learning, and innovation.

Key enablers of dynamic capabilities include resource positions, processes, and path dependencies, shaped by past decisions and current assets. Dynamic capabilities act as mechanisms to continuously sense and seize opportunities and reconfigure resources, ensuring competitive advantage. While traditionally analyzed at the organizational level, recent perspectives highlight the role of individual managers and teams in shaping and implementing these capabilities. To sustain competitive advantage, firms must recognize their strategic resource limitations and invest in dynamic capabilities development that enables continual resource reconfiguration, leveraging internal and external assets to align with evolving market demands. Investments in talent development, process improvement, and innovation enhance dynamic capabilities, enabling firms to adapt, innovate, and maintain long-term competitive advantage (Schilke, 2014).

Dynamic capabilities, comprising sensing opportunities and threats, seizing opportunities, and reconfiguring resource bases, are shaped by past organizational decisions and learning processes (Teece, 2007; Tallot, Hilliard, 2016). Organizational learning, supported by managerial awareness and decision-making, plays a critical role in developing these capabilities. Dynamic capabilities framework is inherently tied to organizational knowledge, encompassing accumulated experiences, explicit articulation, and activity codification (Zollo, Winter, 2002). This integration of tacit and explicit knowledge allows organizations to adapt, innovate, and respond effectively to changing environments.

Key stages of dynamic capabilities development include recognizing opportunities, managing knowledge, coordinating resources, reconfiguring assets, and adapting to new conditions. These processes hinge on resource orchestration, including technological, complementary, financial, reputational, structural, institutional, and market resources. Effective resource management, combined with innovation and adaptability, drives competitive advantage.

Managers play a vital role in identifying, interpreting, and acting on environmental changes. Their ability to make strategic adjustments ensures organizational flexibility and long-term success in dynamic markets. Moreover, knowledge-based dynamic capabilities (Denford, 2013) highlight the acquisition, integration, and application of knowledge as foundational to capability development. Microfoundations such as skills, processes, decision-making models, and organizational routines form the building blocks of dynamic capabilities, enabling firms to achieve sustainable competitive advantage (Teece, 2007).

Moreover, Strategic potential, encompassing assets like a strong brand, innovative technologies, and operational capabilities, provides the foundation for dynamic capabilities, which enable organizations to adapt effectively to changing market conditions. It refers to a firm's resources, skills, and attributes that drive competitive advantage and achieve strategic goals through the deliberate development of dynamic capabilities (Cyfert et al., 2017). This includes tangible and intangible assets such as reputation, financial resources, intellectual property, employee expertise, and distribution networks. The microfundations of dynamic capabilities such as employee knowledge, structured processes, organizational flexibility, and knowledge management (Teece, 2007) foster adaptability, innovation, and efficient response to external changes, forming an integral part of strategic potential.

H1: Strategic Potential (SP) is a unidimensional construct.

H4: There is a positive relationship between Dynamic Capabilities (DC) and Strategic Potential (SP).

Dynamic capabilities are categorized into three key areas (Teece, 2007). This construct, foundational to my research and theoretical model, requires further elaboration to deepen the understanding of its dimensions and relevance. The first category of dynamic capabilities is opportunity sensing, which involves identifying and leveraging market opportunities to create value for customers (Teece, 2007). This strategic approach focuses on recognizing market gaps, trends, and niches to develop innovative strategies, products, or services that provide a competitive edge. Effective opportunity sensing requires market analysis, competitor insights, and understanding customer behavior to quickly adapt to changes and manage risks.

H2: The variable Dynamic Capabilities (DC) is a three-dimensional construct, comprising Opportunity Sensing (OppSen), Opportunity Seizing (OppSei), and Resource Reconfiguration (RR).

According to Teece (2007), opportunity sensing encompasses activities like scanning, creating, learning, and interpreting environmental signals. These actions help organizations identify market conditions, driving significant performance improvements (Tseng, Lee, 2014). Limited sensing capability may result in missed opportunities for growth and innovation, reducing competitiveness.

Opportunity sensing also involves organizational learning and knowledge management. Organizational learning enables firms to gather, process, and utilize internal and external know-

ledge to refine processes and make informed decisions (Zollo&Winter, 2002). Effective knowledge management-collecting, storing, sharing, and using information-enhances understanding of market dynamics, helping organizations swiftly adapt and identify business opportunities. Together, these practices ensure agility and innovation in navigating dynamic markets.

The second group of dynamic capabilities in Teece's (2007) framework is opportunity seizing. This involves actively leveraging identified business opportunities by taking actions, allocating resources, and managing risks to gain competitive advantages, increase revenue, or expand operations. Effective opportunity seizing requires flexibility, quick decision-making, and adaptability to changing market conditions, along with innovation and creativity. Successful seizing can enhance competitiveness, drive market expansion, and strengthen long-term positioning, though it involves risks as not all opportunities guarantee success.

Based on the operationalization of dynamic capabilities by Bratnicka-Myśliwiec, Dyduch, and Bratnicki (2019), opportunity seizing in the research model is tied to three constructs: a) effectiveness, b) bricolage, and c) stakeholder synergy. These constructs provide a broader perspective on their importance to the research problem and how they support the phenomenon under study.

Effectuation refers to leveraging available resources under the organization’s control to create desired outcomes, especially in uncertain conditions (Sarasvathy, 2001). It emphasizes action based on current means rather than pre-established goals, supporting entrepreneurial efforts like innovation and market adaptation (McMullen&Shepherd, 2006). Effectuation aligns with dynamic capabilities, focusing on value creation, opportunity recognition, and strategic resource management (Arend et al., 2015). Key principles of effectuation include: (1) acceptable loss, investing only what can be affordably lost; (2) strategic alliances, forming partnerships for new opportunities; (3) exploiting unforeseen circumstances; and (4) controlling unpredicttable futures by learning from surprises (Sarasvathy, 2001). This orientation enables quick, flexible decision-making essential for navigating uncertainty in entrepreneurship and innovation. Incorporating effectuation in opportunity seizing helps illuminate the strategic process of value creation, enhancing the understanding and operationalization of dynamic capabilities within research model.

Bricolage plays a critical role in seizing opportunities, often accompanying effectuation (Welter et al., 2016). It involves creatively combining available resources to address new challenges and create value (Baker&Nelson, 2005). This process enables firms to innovate by recombining existing resources to generate entrepreneurial opportunities where none previously existed (Bratnicka-Myśliwiec et al., 2019). Originally introduced by Claude Lévi-Strauss (1967), bricolage has been applied across disciplines, including organizational behavior, highlighting how resource-constrained firms achieve success despite limitations (Senyard et al., 2010). Key elements of bricolage include making do, which involves acting despite resource constraints and experimenting with unconventional approaches (Baker, Nelson, 2005). It also entails using resources at hand, leveraging internal or inexpensive external resources that are

often overlooked by others. Another element is resource recombination, which focuses on creatively repurposing resources for innovative applications beyond their original intent. Bricolage can manifest in two forms: parallel bricolage, where it is applied broadly and continuously across multiple activities, and selective bricolage, where it is used strategically in specific areas or for particular projects (Senyard et al., 2014).

Another significant variable is the stakeholder synergy that enhances stakeholder management by recognizing and leveraging opportunities to create value for multiple stakeholder groups simultaneously without diminishing the value for any group (Tantalo&Priem, 2016). This approach motivates and engages stakeholders by creating unique value combinations appreciated by different groups. Open organizational forms that involve external stakeholders are key to strengthening dynamic capabilities (Felin&Powell, 2015). Stakeholder synergy revises traditional approaches by demonstrating that actions can benefit shareholders and other stakeholders without trade-offs. Managers identify new value combinations tailored to different stakeholders, fostering synergy that increases overall value. Methods for achieving stakeholder synergy include enhancing value for one stakeholder group without negatively impacting others, addressing the needs of multiple groups through innovative actions that benefit all involved, and building motivation, trust, and collaboration among stakeholders to attract high-quality partners and enhance overall value (Harrison et al., 2010). Stakeholder synergy promotes cooperation and trust among groups, improving resource allocation, innovation, and responsiveness to changes. It aligns diverse interests to enhance competitiveness and support long-term success. By leveraging dynamic capabilities, firms achieve a competitive edge by combining resources and skills from stakeholders, making stakeholder synergy crucial for seizing opportunities and boosting organizational effectiveness.

Resource reconfiguration, the third dimension of dynamic capabilities, involves adapting resources to expand or reduce business scope by adding, divesting, or recombining assets for optimal use (Karim, Capron, 2016). Also known as resource orchestration, it refers to processes where managers accumulate, combine, and deploy resources to exploit current opportunities and create future ones, ultimately driving competitive advantage (Baert et al., 2016). Effective resource orchestration enhances organizational effectiveness and strategic entrepreneurship (Hitt et al., 2011). Resource reconfiguration includes three processes: structuring, bundling, and leveraging (Sirmion et al., 2007). Structuring involves acquiring, developing, or divesting resources to align with organizational needs. Bundling integrates resources to form specific capabilities, categorized as stabilizing (incremental improvements), enriching (expanding current capabilities), or pioneering (creating new capabilities). Leveraging entails mobilizing and coordinating capabilities to exploit opportunities, create unique competencies, and enter new markets (Ambrosini et al., 2009). These processes lay the groundwork for measuring dynamic organizational capabilities and conducting empirical studies on opportunity identification, resource utilization, and reconfiguration.

What is crucial in this study is that dynamic capabilities enhance organizational effectiveness and competitive advantage, but they must be developed and continuously shaped rather than acquired (Teece, Pisano, 1994). Building dynamic capabilities requires ongoing investments and is often assessed only after value creation (Zollo, Winter, 2002). This process involves cognitive, organizational, and operational efforts, along with managerial time and commitment. Errors in assessing the business environment can lead to poorly adapted capabilities, but even mistakes can offer valuable learning opportunities (Zahra et al., 2006).

Dynamic capabilities are vital for achieving superior organizational outcomes, enabling innovation, adaptability, and resource optimization (Teece et al., 1997; Helfat, Peteraf, 2009). They drive effectiveness through resource orchestration and allow businesses to anticipate challenges and exploit opportunities (Teece, 2007). Learning-oriented capabilities, as shown in studies like Pucci et al. (2017), play a critical role in improving performance, particularly by leveraging market trends and adapting strategies. Dynamic capabilities influence organizational outcomes by enabling adaptive, innovative, and anticipatory behaviors, tailored to market conditions.

Dynamic capabilities impact effectiveness indirectly, fostering resource reconfiguration and operational adaptability. Research highlights their role in long-term success, emphasizing the need for innovation, flexibility, and strategic alignment to sustain competitive advantage (Eisenhardt, Martin, 2000; Teece et al., 1997). Effectiveness and competitiveness are vital for success in today's dynamic markets. Dynamic capabilities help firms innovate, adapt, and optimize resources, enhancing financial performance, customer satisfaction, and market position (Teece, 2007). Competitive advantage relies on unique competencies, innovation, and responsiveness, enabling firms to outpace rivals and explore new markets. Moreover, effectiveness integrates learning, resilience, and forward-looking strategies, helping organizations minimize risks and create shared value for stakeholders (Holbeche, 2018). It involves aligning processes, leveraging dynamic capabilities, and using qualitative and quantitative measures for holistic firm performance assessment.

H3: Firm Performance (FP) is a unidimensional construct.

H5: There is a positive relationship between Dynamic Capabilities (DC) and Firm Performance (FP).

The theoretical approach, grounded in Teece's framework, examines the relationships between dynamic capabilities, strategic potential, and firm performance in subjective measures. The research explores how dynamic capabilities contribute to success in Polish enterprises, highlighting their strategic importance in a rapidly evolving business environment. The following research model provides a structural framework that predicts relationships between variables, enabling an understanding of how the studied construct is conceptualized (Figure 1).

When formulating the hypotheses, key categories characterizing the research sample were also considered, such as the respondent's position (M1) the form of business activity (M2), business profile (M3), company size (M4). The analysis of differences between individual

groups yielded intriguing insights into the specific characteristics of the surveyed enterprises and their potential impact on the study's outcomes.

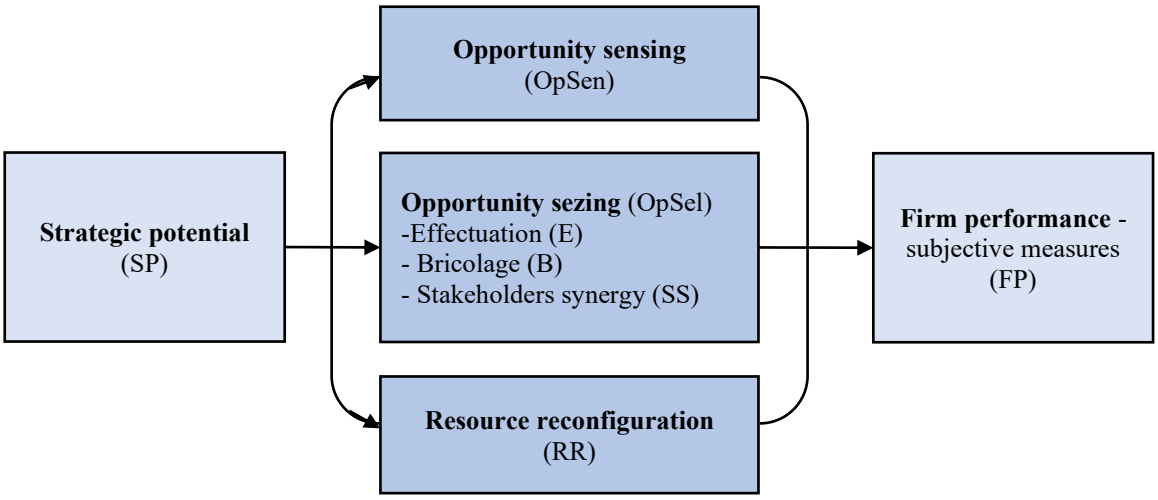


Figure 1. The research model.

H6: Evaluations of variables SP, DC, and FP significantly depend on the respondent's position within the company (M1).

H7: Evaluations of variables SP, DC, and FP significantly depend on the form of business activity (M2).

H8: Evaluations of variables SP, DC, and FP significantly depend on the business profile (M3).

H9: Evaluations of variables SP, DC, and FP significantly depend on the size of the company's workforce (M4).

The 9 formulated hypotheses provide a critical framework for predicting relationships between the various elements of the model, which serves as the foundation for empirical analysis aimed at identifying potential areas requiring deeper understanding. Accordingly, these hypotheses, encompassing all variables presented in the model as well as the characteristics of the respondents, will be subjected to rigorous statistical analysis.

2. Methods

The foundation and initial step of the research process involved a comprehensive review of both international and Polish literature, utilizing databases such as Scopus, Ebsco, Emerald, ProQuest, and Google Scholar. This review provided the theoretical context and framework for subsequent steps. Conducted in two phases, the literature review first examined scholarly articles on dynamic capabilities dating back to 1994, the year of David Teece's seminal publication, which served as the cornerstone for this study. Due to the extensive volume of literature on this topic, only the most frequently cited perspectives were included. Subsequently,

the keywords “dynamic capabilities” and “resource-based view” were used to identify articles linking this perspective to the dynamic capabilities construct. Additional key aspects related to value creation and capture—such as entrepreneurial and relational orientations—were identified by expanding the search with terms like “dynamic capabilities” combined with “entrepreneurial orientation,” “relational view,” “resource reconfiguration,” “effectuation,” “bricolage,” and “stakeholder synergy.” Furthermore, articles exploring relationships between strategic potential and firm performance were reviewed.

The literature review, both thematic and narrative, facilitated an in-depth understanding of the existing knowledge base and identified research gaps that provided the impetus for this study. The thematic review focused on key issues, theories, and concepts related to dynamic capabilities, identifying research streams and foundational ideas that informed the study. The narrative review traced the chronological evolution of dynamic capabilities and their connection to firm performance, offering historical and conceptual insights. This comprehensive review grounded the research, establishing a solid theoretical and empirical foundation for further investigation.

The next critical phase was operationalization, encompassing the identification of variables, creation of the research model, and development of a survey tool. The construct mixology method (Newman et al., 2016) was employed, combining existing constructs or their components to create a new framework. While this method does not generate new empirical knowledge, it integrates established knowledge in innovative configurations, advancing the field. Existing tools and scales were adapted to design a questionnaire tailored to the study’s specific constructs. This approach enabled the integration of diverse elements, aligning them with the theoretical framework. The survey tool, utilizing a 7-point Likert scale, ensured precise measurement of variables while reflecting theoretical objectives and maintaining alignment with the research model.

The research instrument incorporated constructs from previous operationalizations. Strategic Potential (SP) was measured through three dimensions: value creation points in the value chain, an organizational structure fostering innovation, and marketing capabilities to design, deliver, and capture value (Dyduch, Bratnicki, 2018). Dynamic Capabilities (DC) were operationalized as a three-dimensional construct comprising opportunity sensing, opportunity seizing (effectuation, bricolage, and stakeholder synergy), and resource reconfiguration. Tools for measuring these dimensions were adapted from existing scales (e.g., Bratnicka-Myśliwiec et al., 2019; Kuckertz et al., 2017; Chandler et al., 2011; Senyard et al., 2014), integrating relevant aspects while eliminating redundancies to ensure clarity and precision.

The effectuation scale combined elements from Chandler et al. (2011) and Werhahn et al. (2015), yielding a streamlined 15-item instrument. Bricolage, reflecting the use of available resources for innovative solutions (Baker, Nelson, 2005), was measured using a tool developed by Senyard et al. (2014), adapted to a seven-point Likert scale for consistency. Stakeholder synergy, emphasizing value co-creation across multiple stakeholders (Tantalo, Priem, 2016),

was measured using a four-item, one-dimensional scale by Bratnicka-Myśliwiec et al. (2019). Resource reconfiguration, the core dynamic capability for adapting resources to emerging opportunities, was assessed using an 11-item scale by Bratnicka-Myśliwiec et al. (2019), based on the framework by Sirmon et al. (2007).

The dependent variable, Firm performance (FP), was measured using non-financial subjective metrics. The scale, adapted from Dyduch and Bratnicki (2018), included 13 items capturing respondents' perceptions of firm performance. To enhance the tool's scope, three diagnostic items assessed the current state of dynamic capabilities, enabling a comprehensive understanding of the organizations' adaptability.

The final questionnaire consisted of 70 items rated on a seven-point Likert scale and four demographic questions regarding respondents' position, legal form, business profile, and company size. With 316 respondents, the study exceeded the recommended respondent-to-item ratio (Mider, Marcinkowska, 2013).

A subjective approach was adopted to capture respondents' perceptions and attitudes. This multidimensional construct approach allowed for nuanced insights, with participants rating their agreement or evaluation on a seven-point scale. The seven-point Likert scale ensured higher measurement precision by providing a balanced range of response options.

Data collection was conducted by the Center for Research and Expertise at the University of Economics in Katowice using the developed questionnaire. This method was selected for its effectiveness in gathering extensive data from respondents. The questionnaire included diverse question types to collect quantitative data for subsequent statistical analysis. It was tailored to the respondents' organizational roles, ensuring clarity and comprehensibility. Data collection, conducted in 2019, employed the Computer-Assisted Personal Interview (CAPI) technique, targeting small (10–49 employees), medium (50–249 employees), and large enterprises (250+ employees). The sample included companies across production, trade, and services, as well as sole proprietorships and partnerships, providing a comprehensive perspective on the research problem. The process yielded 316 complete responses, confirming the method's effectiveness and respondent engagement. This robust dataset facilitated detailed analysis and enhanced the validity and generalizability of the findings.

Following data collection, statistical analysis was performed, including descriptive statistics (mean, median, minimum, maximum, standard deviation, coefficient of variation) and normality tests (Chi-square). Distribution comparisons utilized nonparametric tests such as Kruskal-Wallis for three or more groups and U Mann-Whitney for two independent samples. Pearson's correlation coefficient measured variable relationships, with significance tested using t-tests. Regression models were applied to explore significant correlations, and hypothesis testing was conducted at $\alpha=0.05$ significance level. Factor analysis validated the constructs and variables in the model. All analyses were executed using PS IMAGO PRO 5.1, STATISTICA v.13.3, and MS Excel, ensuring precision and reliability.

These steps enabled hypothesis verification, statistical summaries, and an examination of relationships between model variables. The analysis revealed patterns, dependencies, and significant trends, forming a robust basis for conclusions and recommendations. Statistically significant relationships and factors influencing firm performance provided critical insights, contributing to knowledge advancement in this domain.

Considering the timing of data collection and unforeseen events affecting Polish enterprises, additional in-depth interviews were conducted to contextualize survey findings. These events included the Covid-19 pandemic, Russia's invasion of Ukraine, and legislative changes impacting businesses. In March 2024, semi-structured interviews were held with three senior managers from two service companies and one trading company, guided by a predefined interview scenario.

The in-depth interview script was designed to provide a detailed perspective on the dynamic capabilities of enterprises and their responses to global crises. The interviews followed a semi-structured format with open-ended questions, allowing respondents to freely share their experiences and insights. Key themes included challenges and opportunities arising from market changes and strategies employed by firms to adapt and grow.

The first significant event discussed was the Covid-19 pandemic, which disrupted markets globally, causing demand fluctuations, supply chain constraints, and shifting consumer preferences. Companies accelerated digital transformation, e-commerce adoption, remote work, and IT-based management (Dyduch et al., 2021). Another critical event was Russia's invasion of Ukraine, leading to geopolitical instability, supply chain disruptions, rising commodity prices, and financial market volatility. Businesses faced increased costs, restricted trade, and logistical challenges, necessitating rapid adjustments.

Additionally, domestic legislative and economic reforms, including the "Polski Ład" introduced tax incentives and investment support. However, implementation challenges created initial confusion, impacting operational stability. Despite these hurdles, enterprises gradually adapted to the new regulations, regaining stability.

Given these disruptions, the study aimed to explore entrepreneurs' views on the role of dynamic capabilities during adverse conditions. The qualitative interviews complemented quantitative findings, providing additional insights. Conducted in March 2024, the interviews involved partially structured questions that encouraged detailed responses. Topics included respondents' roles, the firm's legal and operational profile, environmental dynamics, and the company's ability to identify and exploit market opportunities. Participants were asked about their understanding of dynamic capabilities, their firm's adaptability, and their resource allocation strategies in response to market shifts.

Further questions addressed the effectiveness of these strategies, measurements of success, and the overall impact on organizational development. Respondents reflected on gaps in their firms' capabilities, resource reconfiguration, and competitive positioning relative to other market players. The final section focused on the effects of global crises, including the Covid-19

pandemic, the war in Ukraine, and legislative changes, on the firms' dynamic capabilities and market responses.

This qualitative approach, while not fully meeting the criteria for mixed methods, offered valuable empirical insights that enriched the quantitative findings and deepened the understanding of dynamic capabilities in turbulent environments.

The research sample was selected through simple random sampling, initially consisting of over 1,200 enterprises. Contact was established with selected firms, and in cases of refusal, the next enterprise on the list was approached. If a firm agreed to participate, the survey questionnaire was sent via online communication methods. This process, conducted by the Center for Research and Expertise at the University of Economics in Katowice, resulted in 329 completed questionnaires. After reviewing the responses for completeness, 13 questionnaires were excluded due to missing data, leaving 316 for further statistical analysis.

The sample included respondents from various organizational roles to capture a comprehensive view of organizational dynamics. These roles ranged from entry-level specialists (12 respondents) to consultants/developers/analysts (57), managers (93), department heads (22), and executives/owners (122). This diversity provided insights into perspectives across different hierarchical levels, reflecting both top-down and bottom-up processes in opportunity identification and utilization (Nonaka et al., 2016).

Respondents also represented various legal forms of enterprises, including sole proprietorships (158 respondents) and other types of corporations. This division allowed for analysis of management practices and dynamic capabilities across organizational types. Additionally, enterprises were categorized by sector—production (84 respondents), trade (81 respondents), and services (151 respondents). This enabled a better understanding of sector-specific challenges and strategies.

Enterprise size, based on employee numbers, was another key factor. Small enterprises dominated the sample (200 respondents), followed by medium-sized (80) and large enterprises (36). While dynamic capabilities are considered independent of firm size, the division provided insights into resource constraints, decision-making processes, and adaptability across different scales. Smaller firms often face limited financial and human resources, while larger firms may encounter slower decision-making processes due to complex structures.

This detailed characterization of the sample facilitated a nuanced understanding of organizational practices, dynamic capabilities, and their impact on firm performance, providing the foundation for analysis.

3. Results

For the key dimensions of the model: Dynamic Capabilities (DC), Strategic Potential of the Enterprise (SP), and Firm Performance (FP), as well as the sub-dimensions of DC—Opportunity Sensing (OpSen), Opportunity Seizing (OpSei), and Resource Reconfiguration (RR)—a synthetic measure of the level of these variables was defined as the arithmetic mean of all responses to survey questions representing each dimension or sub-dimension. The highest average value was observed for the dimension Strategic Potential of the Enterprise (SP), while the lowest average score was recorded for Firm performance (FP).

The analysis of the distribution of the synthetic measure for Dynamic Capabilities (DC) shows that the majority of enterprises fall within the range of 5 to 6 (149 enterprises), with approximately 54% of enterprises exhibiting DC values above the average. For the Strategic Potential (SP) variable, the highest frequencies were observed in the intervals (4, 5] and (5, 6], with counts of 108 and 99, respectively. The distribution of Firm performance (FP) resembles a symmetric distribution, with the highest frequency of 140 observed in the interval (4, 5]. Based on the results of the χ^2 test, the hypothesis of normality was rejected for the DC and SP variables. However, for the Firm performance (FP) variable, there was no basis to reject the hypothesis of normality (Chi-square = 2.03699, p = 0.36).

To verify the validity of the variables used to describe the dimensions of Strategic Potential, Enterprise Dynamic Capabilities, and Firm performance, factor analysis was conducted. The following procedures, commonly recommended in the literature, were applied prior to performing the factor analysis: (1) Calculation of the Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy. This measure should be greater than 0.5; (2) Bartlett's Test of Sphericity, which assumes that the correlation matrix is an identity matrix, indicating no significant correlations between variables. Rejecting the null hypothesis confirms that data reduction through factor analysis is appropriate. The selection of the number of factors was based on two criteria: (1) Kaiser Criterion: Factors with eigenvalues greater than 1 were retained; (2) Cattell's Scree Test: The point on the screen plot where the slope of eigenvalues transitions to a gentler decline was identified as the cutoff.

To achieve the highest possible factor loadings for individual factors, principal component analysis with Varimax normalized rotation was applied. Variables with factor loadings below 0.6 for all identified factors were excluded from the group of variables describing the construct. The reliability of the scale for each factor was assessed using Cronbach’s alpha coefficient, with a minimum acceptable reliability set at a Cronbach’s alpha value greater than 0.6 (Sagan, 2003). The results indicate that factor analysis can be conducted for all the analyzed dimensions. According to the scree plot criterion and the Kaiser criterion, the following dimensions should consider only one factor: Strategic Potential (SP), Orientation toward Partnership and Other

Obligations (EPO), Bricolage (B), Stakeholder Synergy (SS), Resource Structuring (RRS), Capability Development (RRB), Capability Application (RRLC), and Firm Performance (FP).

During the analysis of the dimension "Orientation toward Partnership and Other Obligations," the variable EPO10 was removed due to its low correlation with latent variables (factor loading of 0.45). Based on the scree plot criterion and the Kaiser criterion, the dimensions describing effectuation—Affordable Loss Orientation (EAL), Flexibility Orientation (EEO), and Control/Experimentation Orientation (ECO)—were determined to be two-factor constructs. During the factor analysis of the ECO dimension, the variable ECO32 was removed as its factor loadings were less than 0.6.

The identified factors of the EAL dimension explain nearly 70% of the initial variance of the variables and were classified as the following subdimensions of Orientation toward Affordable Loss: Factor 1: Orientation toward Effectuation described by variables EAL16, EAL17, and EAL18; Factor 2: Effectuation Processes described by variables EAL13, EAL14, and EAL15.

The identified factors for EEO dimension explain nearly 61% of the initial variance of the variables and were classified as the following subdimensions of Orientation toward Flexibility: Factor 1: Orientation toward Effectuation described by variables EEO21, EEO23, EEO24, EEO25, and EEO26; Factor 2: Effectuation Processes described by variables EEO19, EEO20, and EEO22. The identified factors of the ECO dimension explain nearly 60% of the initial variance of the variables and were classified as the following subdimensions of Orientation toward Control/Experimentation: Factor 1: Effectuation Processes described by variables ECO27, ECO28, ECO29, and ECO30; Factor 2: Orientation toward Effectuation described by variables ECO31, ECO33, and ECO34.

The conducted analysis enabled the verification of the previously formulated hypotheses:

H1 The strategic potential variable (SP) is a unidimensional construct — Confirmed.

H2 The dynamic capabilities variable (DC) consists of three dimensions: opportunity sensing, opportunity seizing, and resource reconfiguration — Confirmed.

H3 The firm performance variable (FP) is a unidimensional construct — Confirmed.

The Dynamic Capabilities (DC) variable is a three-dimensional construct, providing the basis for testing research hypothesis H4 through the analysis of Pearson correlation coefficients between the SP variable and the dimensions OpSen, OpSei, and RR, as well as between the key variables SP and DC. The calculated correlation coefficients are significantly greater than zero ($p < 0.000$), indicating a fairly strong relationship between the analyzed variables. The strongest positive correlation was observed between SP and Resource Reconfiguration (RR).

Additionally, the relationship between the key synthetic variables of the model, DC and SP, was examined. The Pearson correlation coefficient between these variables is significantly positive, amounting to 0.541 ($p < 0.000$). The scatterplot illustrating the analyzed variables is presented in Figure 2.

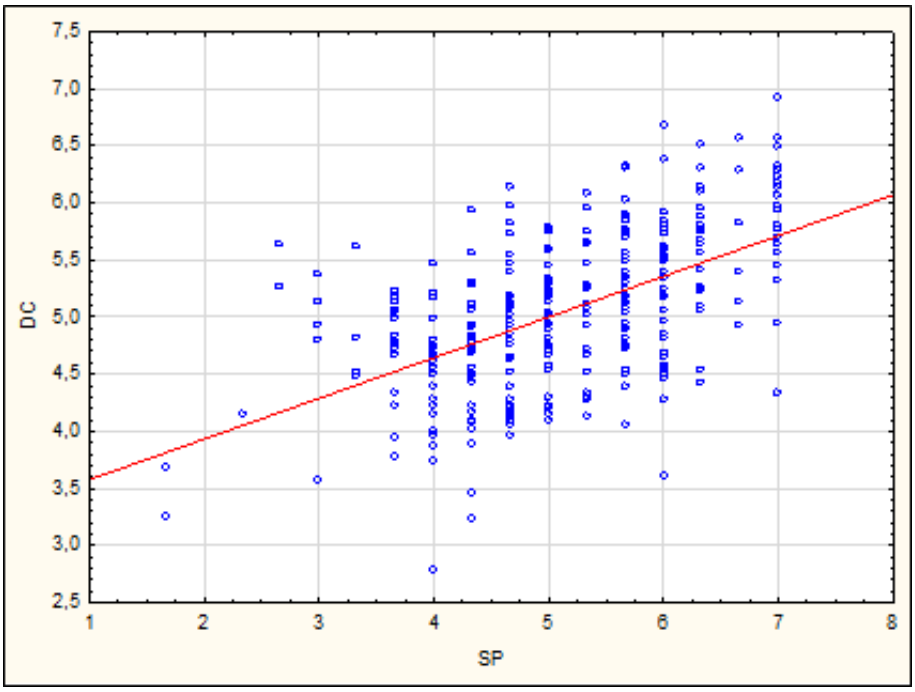


Figure 2. Scatter plot of the variable Dynamic Capabilities (DC) against the variable Strategic Potential (SP).

Source: Own elaboration.

After establishing a significant correlation between the considered variables, the parameters of a linear regression function describing the relationship between the variable DC and the variable SP can be estimated. A summary of the regression analysis results is presented in Table 1.

Table 1.
The results of the estimation of the linear regression model describing the relationship between the variable DC and the variable SP

R= 0,5402; R^2=0,2918; (F(1,314)=129,37; p<0,0000); Std. Error 0,579				
N=316	**b**	**Std. error**	**t(314)**	**p**
Intercept	3,219	0,164	19,642	0,000
SP	0,356	0,031	11,374	0,000

Source: own elaboration.

The coefficient value for the variable SP is significantly different from zero (t-test statistic value = 19.64, p < 0.000); no outliers were identified. Therefore, it can be concluded that the model is valid. However, only about 30% (R^2 = 0.2918) of the variability in the Dynamic Capabilities (DC) variable is explained by the proposed model. It is important to note that the model includes only one explanatory variable, Strategic Potential (SP), while other factors influencing this variable were not considered in these analyses.

The analyzed relationship is described by the following regression equation:

$$\widehat{DC} = 3{,}22 + 0{,}36\ \mathrm{SP} \qquad (1)$$

where (DC) - represents the theoretical values of the DC variable determined using equation (1).

The basis for verifying research hypothesis H5 is the analysis of Pearson correlation coefficients between the subdimensions of the DC variable and the FP variable, as well as between the synthetic variables DC and FP. The correlation coefficients for the analyzed variables are presented in Table 2.

The calculated correlation coefficients are significantly greater than zero (p-values < 0.000). The strongest positive relationship was observed between Resource Reconfiguration (RR) and Firm Performance (FP). The variable Opportunity Sensing (OpSen) exhibited the weakest correlation with the analyzed variable FP. The Pearson correlation coefficient between the variables DC and FP is significantly positive at 0.501 (p-value < 0.000). A scatter plot of these variables and the regression line is presented in Figure 3.

Table 2.
Correlation coefficients between the analyzed variables

Variable	OpSen	OpSei	RR
FP	0,2477	0,4399	0,5593

Source: own elaboration.

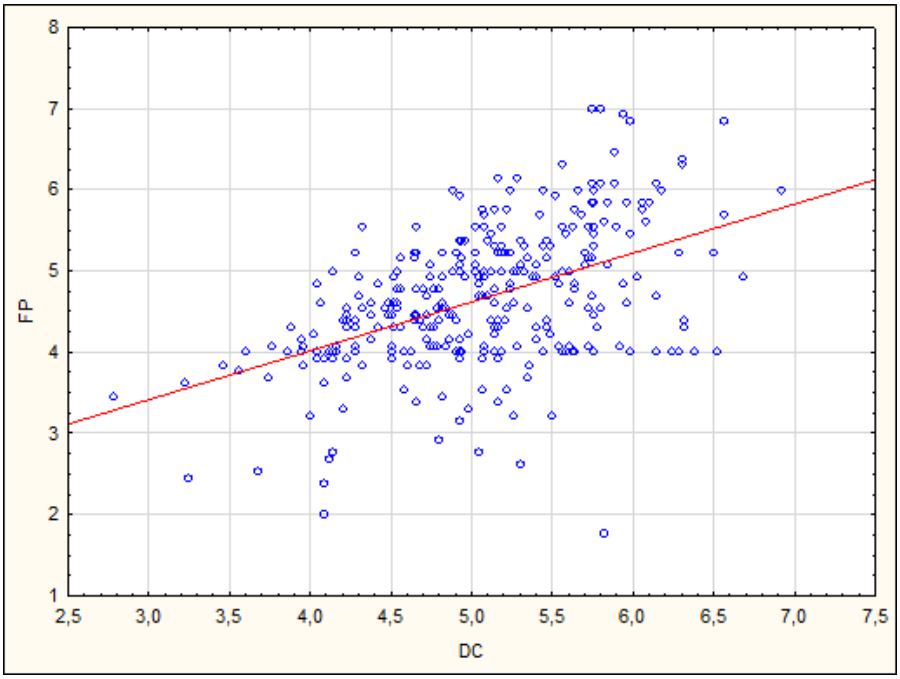


Figure 3. Scatter plot of the variable Firm performance versus Dynamic Capabilities.
Source: own elaboration.

In the presence of a correlation between the analyzed variables, it is appropriate to identify the nature of this relationship. To this end, parameters of a linear regression function were estimated, where, in accordance with studies described in the literature, the dependent variable is Firm Performance. The results of the regression analysis are presented in Table 3.

Table 3.
The estimation results of the linear regression model describing the relationship between the variable FP and the variable DC

R= 0,501; R^2=0,251 (F(1,314)=97,01; p<0,0000); Std. error 0,746				
N=316	b	Std. error	t(314)	p
Intercept	1,608	0,311	5,165	0,000
DC	0,602	0,061	9,850	0,000

Source: own elaboration.

The coefficient for the variable DC is significantly different from zero (t-statistic value = 9.85, $p < 0.000$); no outliers were identified. The model includes only one explanatory variable, DC, which explains just 25% ($R^2 = 0.251$) of the variability in the dependent variable FP. The analyzed relationship is described by the following regression equation:

$$\widehat{FP} = 1{,}61 + 0{,}602\ \mathrm{DC} \qquad (2)$$

where (FP) – represents the theoretical values of the variable FP determined from the equation (2).

The conducted analysis enabled the verification of the previously formulated hypotheses:

H4: There is a positive relationship between Dynamic Capabilities and Strategic Potential – Confirmed.

H5: There is a positive relationship between Dynamic Capabilities and Firm Performance (FP).

To verify hypotheses H6, H8, and H9, which suggest that the distributions of assessments for variables SP, DC, and FP depend on the metric variables M1, M3, and M4, a nonparametric alternative to one-way analysis of variance - the Kruskal-Wallis test was used. The classical Anova assumptions are not met: the distribution of variable DC is not normal, and subgroup sizes are unequal. The obtained values of the Kruskal-Wallis test statistic are presented in Table 4.

Table 4.
Results of the Kruskal-Wallis Test

Variable	**Metric**	**K-W**	**p**
SP	M1	H (4, N= 316) =11,44	**0,022**
	M3	H (2, N= 316) =7,20	**0,027**
	M4	H (2, N= 316) =13,18	**0,001**
DC	M1	H (4, N= 316) =8,031	0,091
	M3	H (2, N= 316) =2,05	0,357
	M4	H (2, N= 316) =2,39	0,302
FP	M1	H (4, N= 316) =10,06	**0,039**
	M3	H (2, N= 316) =0,98	0,611
	M4	H (2, N= 316) =0,63	0,729

Source: own elaboration.

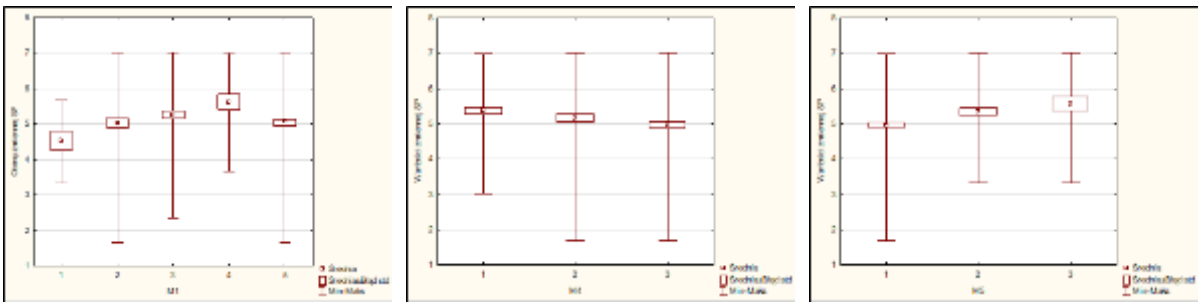
The distribution of the variable SP significantly depends on: the respondent's position in the company (M1), the business profile (M3), and the size of the company's workforce (M4). The results of the Kruskal-Wallis test are presented graphically in Figure 4.

To determine which of the observed differences in the levels of the SP variable across groups defined by metric variables are statistically significant, Dunn's multiple comparison test was applied. The p-values obtained from the multiple comparisons allowed for the following conclusions:

(a) assessments of strategic potential levels in the group of directors (department heads) are significantly higher than those in the group of entry-level specialists (no significant differences in the SP variable assessments were found for other pairs of respondent groups with different positions in the company);

(b) assessments of strategic potential levels in the group of respondents representing manufacturing companies are significantly higher than those in the group of respondents representing service companies (no significant differences in the SP variable assessments were found for other pairs of respondent groups representing companies with different business profiles);

(c) assessments of strategic potential levels in the group of respondents representing companies with more than 50 employees are significantly higher than those in the group of respondents representing companies with smaller workforces.



(a) (b) (c)

Figure 4. Graphical presentation of Kruskal-Wallis test results: distributions of the SP variable based on metric variables.

Source: own elaboration.

The results of the Kruskal-Wallis test indicate no dependence of the DC variable distribution on metric variables M1, M3, and M4. However, the distribution of the firm performance (FP) variable significantly depends only on the respondent's position in the company (M1).

The p-values from the multiple comparisons allowed for the following conclusion: assessments of performance levels in the group of directors (department heads) are significantly higher than those in the group of entry-level specialists (no significant differences in the FP variable assessments were found for other pairs of respondent groups holding different positions within the company). The results of the Kruskal-Wallis test for the FP variable are presented graphically in Figure 5.

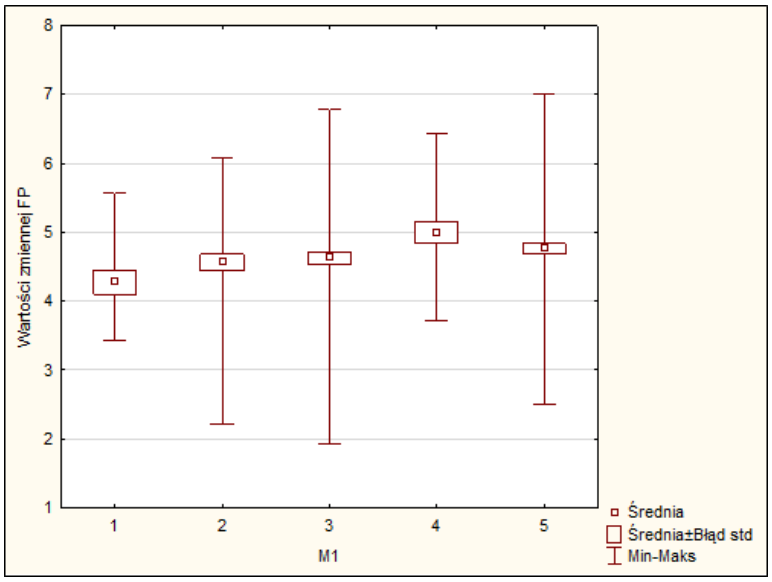


Figure 5. Graphical presentation of Kruskal-Wallis test results: distributions of the variable.
Source: own elaboration.

The survey distinguished only two forms of business activity M2. Therefore, to verify hypothesis H7, the U Mann-Whitney test (a non-parametric alternative to the independent samples t-test) was used. The test results are presented in Table 5.

Table 5.
U Manna-Whitneya test for M2

Variable	Sum.rang	Sum.rang	U	Z	p
SP	23700,0	22965,0	10404,0	1,570	0,116
DC	23210,0	23455,0	10894,0	0,934	0,351
FP	22224,5	24440,5	11346,5	-0,346	0,730

Source: own elaboration

The obtained test results ($p > 0.05$) indicate no dependence of the distribution of the analyzed variables SP, DC, and FP on the type of enterprise (p-values are greater than the adopted significance level $\alpha = 0.05$).

The conducted analysis enabled the verification of the previously formulated hypotheses:

H6: The evaluations of the variables SP, DC, and FP significantly depend on the respondent's position in the company (M1) - Partially Confirmed. The evaluation of the variable DC does not significantly depend on the respondent's position in the company.

H7: The evaluations of the variables SP, DC, and FP significantly depend on the type of business activity (M2) - Not Confirmed.

H8: The evaluations of the variables SP, DC, and FP significantly depend on the type of business profile (M3) - Partially Confirmed. The evaluations of the variables DC and FP do not significantly depend on the type of business profile.

H9: The evaluations of the variables SP, DC, and FP significantly depend on the size of employment in the company (M4) - Partially Confirmed. The evaluations of the variables DC and FP do not significantly depend on the size of employment in the company.

4. Discussion

The findings from this study highlight several trends regarding the role of dynamic capabilities (DC) in enhancing firm performance (FP). Although the collected data does not fully explain the mechanisms behind generating FP through DC, the results demonstrate that dynamic capabilities are perceived and developed uniquely across organizations. The research provides insights into the impact of dynamic capabilities on effectiveness and emphasizes the role of strategic potential (SP) as a precursor to developing these capabilities (Table 6).

Statistical analysis confirmed the validity of the proposed model and verified the research hypotheses. Key findings include the unidimensionality of SP and FP and the three-dimensional structure of DC, comprising opportunity sensing, opportunity seizing, and resource reconfiguration. The results showed a positive relationship between SP, DC, and FP, underscoring the importance of DC in achieving organizational goals.

Table 6.
Key research insights

Variable	Insight
Strategic Potential	SP contains micro-foundations essential for developing DC and is significantly linked to DC.
Dynamic Capabilities	Resource reconfiguration is crucial for achieving OE, while DC enables survival in crisis conditions.
Organizational Effectiveness	Besides DC, OE is influenced by multiple external and internal factors, warranting further exploration.

Source: own elaboration.

Respondents largely confirmed their organizations capacity to identify opportunities, leverage them, and reconfigure resources effectively, highlighting these as significant drivers of firm performance. Moreover, qualitative interviews supported these conclusions, with respondents emphasizing the necessity of dynamic capabilities for survival and growth in dynamic market environments. As noted by Kanter et al. (2015), an entrepreneurial orientation toward opportunities plays a pivotal role in achieving efficiency.

While SP and DC were highly rated, FP showed more cautious evaluations. This suggests that organizations with higher FP may not actively seek opportunities but rather focus on maintaining their current status. Conversely, organizations seeking to improve FP may actively develop and deploy DC. This nuanced perspective indicates that while DC can create long-term value, immediate results may not always be evident.

A strong relationship was observed between SP and DC, particularly in the dimension of resource reconfiguration, which aligns with findings by Cyfert and Krzakiewicz (2017). This indicates that SP, encompassing critical resources and competencies, serves as a micro-foundation for DC. Interviews further revealed the importance of human, financial, and learning resources in addressing market uncertainties and leveraging opportunities.

Interestingly, DC demonstrated universal applicability across various organizational contexts, regardless of industry or size. However, the ways these capabilities are utilized differ significantly depending on organizational specifics, including strategy and operational context. As Teece (2023) emphasizes, DC's effectiveness relies heavily on organizational systems, processes, and the leadership of senior management.

Finally, while SP ratings varied by respondent position, business profile, and firm size, DC ratings were independent of these factors. This suggests that while SP perceptions may differ due to role-specific awareness, DC are consistently valued across organizational contexts. However, resource-rich organizations, such as larger firms or production-oriented enterprises, tend to rate their SP higher, likely reflecting their tangible and measurable resources.

The findings also highlight the importance of exploring additional variables that influence DC, as FP was only partially explained by DC in the current model. Future research should investigate other determinants of FP to build a more comprehensive understanding of the factors driving organizational success.

5. Summary

This paper aimed to examine the construct of dynamic capabilities and their impact on firm performance. The study identified key components of dynamic capabilities, their microfoundations, and their effects on organizations. It also developed a conceptual research model based on these elements, drawing primarily on D. J. Teece's (2007) framework, which encompasses opportunity sensing, opportunity seizing (including bricolage, effectuation, and stakeholder synergy), and resource reconfiguration as core components. Additionally, strategic potential was identified as encompassing the microfoundations essential for dynamic capabilities development. The research successfully achieved its objectives by addressing processes, dimensions, relationships, and impacts associated with dynamic capabilities.

A review of the literature, combined with quantitative surveys and qualitative interviews, provided insights into the levels of dynamic capabilities in Polish enterprises and their influence on firm performance. The study confirmed positive relationships between strategic potential, dynamic capabilities, and firm performance. Statistical analysis validated the research model and provided evidence of dynamic capabilities critical role in enhancing firm performance. However, the findings also revealed that while respondents rated dynamic capabilities highly,

this did not directly translate into equally high assessments of firm performance, suggesting that other factors also contribute significantly to firm performance.

A key limitation of the study was its reliance on subjective measures of firm performance. While subjective evaluations provide valuable insights, integrating them with objective financial indicators, such as return on assets (ROA) or Tobin's q ratio, could enhance the robustness of future studies. Additionally, the data collection period (2019) preceded significant global disruptions, such as the Covid-19 pandemic and the war in Ukraine, which may have influenced the perception and development of dynamic capabilities. These events underscore the importance of examining dynamic capabilities under specific market conditions to capture their adaptive value during crises.

The study also highlights areas for future research. First, further investigation into additional factors influencing firm performance beyond dynamic capabilities is recommended to develop a more comprehensive model. Second, establishing a universally accepted set of dynamic capabilities components could provide actionable recommendations for practice. Third, integrating subjective and objective measures of firm performance would offer a more holistic perspective on firm performance. Lastly, assessing dynamic capabilities in dynamic market conditions could reveal new insights into their role during periods of instability.

In conclusion, this paper provides theoretical and practical contributions by identifying dynamic capabilities dimensions, their relationships with strategic potential and firm performance, and their critical role in organizational adaptability. However, the study's findings also emphasize that firm performance is influenced by a combination of dynamic capabilities and other organizational and environmental factors. This research offers a framework for understanding dynamic capabilities and lays the groundwork for further exploration of their impact on organizational success.

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RESEARCH ON THE DETERMINANTS OF SERVICE QUALITY IN THE TSL LOGISTICS SECTOR

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Purpose: The aim of the publication is to present the concept of the modified SERVPERF method for examining the quality of services and to verify whether this method is suitable for examining the quality of logistics services in the TSL sector (transport, forwarding, logistics).
Design/methodology/approach: Critical analysis of literature. Analysis of international literature from the main databases and Polish literature as well as the authors' own research related to the research topic. Empirical research conducted aimed at leaders of TSL sector enterprises in the Wielkopolska and Lubuskie voivodeships, as well as the world of science, especially students of management, quality management, logistics and transport. The research was conducted at the turn of 2023/2024. The research method was the SERVPERF method modified by the authors to study the quality of logistics services in the TSL sector, the tool was an electronic questionnaire.
Findings: The research results allowed us to determine the quality level of logistics services provided by leading TSL sector companies in the Wielkopolska and Lubuskie voivodeships using the modified SERVPERF research method and revealed areas that need to be improved in order to increase the quality of services provided and customer satisfaction.
Research limitations/implications: The presented research on service quality is not comprehensive due to the multi-faceted nature of the TSL sector. The presented results and formulated conclusions will provide important information for further modification of the SERVPERF research method and conducting proper research, so as to achieve objectivity and universality of the modified method in the study of service quality in the TSL sector.
Practical implications: The presented results are a valuable source showing the quality level of logistics services in individual areas of the TSL sector.
Originality/value: The results of the conceptual work provided a valuable modified research tool based on SERVPERF, and the research conducted using the modified method confirmed the usefulness of this method in examining the quality of TSL sector services.
Keywords: quality of services, criteria, determinants, logistics company, TSL sector
Category of the paper: literature review and own research.

1. Introduction

The TSL (Transport, Forwarding, Logistics) sector is a dynamically developing area of the European Union's economy. This growth is tied to the development of road infrastructure and the dynamic expansion of international trade, particularly e-commerce, which is a fundamental part of regional and global supply chains. The TSL sector in the European Union, especially in Poland, Germany, and France, plays a significant role in the modern European economy, serving as a foundation for its competitiveness. The growth of international trade, process automation, and increasing customer expectations are fundamental determinants of the growth in service quality, which is a condition for the modernity of the TSL sector in the European economy (Report Transport drogowy, 2023). Currently, there is a strong emphasis on the automation of TSL services, which allows for improved efficiency, increased delivery security, and, consequently, meets customer expectations regarding the quality of services provided. Innovative technologies, supported by information systems, enable the reduction of transportation costs by combining various modes of transport and optimally locating point infrastructure in the communication networks of European countries.

The purpose of logistics services is to provide services for enterprises and individuals that fulfill logistics functions. Due to the type of activities in the supply chain, logistics services are divided into:

- transport services - transporting goods in appropriate conditions for their natural, technical, and economic transportability,
- forwarding services - organizing the movement of goods on behalf of the client at the forwarder's own expense, excluding the transport itself,
- warehousing services - services related to inventory management in warehouses,
- additional services - including completing shipping documents, labeling, creating promotional sets, repackaging, and collecting payments (Damian, Górna, 2020; Fertsch, 2013; Frąś, 2004).

The TSL sector is one of the leading sectors of the Polish economy, which in 2023 generated 6% of Poland's GDP and is a leader among EU countries. Transport (including passenger transport), forwarding, and logistics remain one of the most important parts of the Polish economy. At the same time, Polish drivers transported 19% of goods on the internal EU market (Report Transport drogowy, 2023).

The most common type of transport is road transport, carried out primarily by trucks and delivery vehicles. Rail, inland waterway, sea, air, and pipeline transport can also be distinguished. Transportation services, which are part of the TSL sector, involve the transportation of goods or people. During the implementation of transport orders, particular emphasis is placed on on-time delivery and the ability to transport various types of cargo, from small packages to bulk goods.

Forwarding services provide the organizational backbone of the TSL sector. They primarily deal with planning the entire transportation process. They always seek the optimal solution, determining how goods, by what means of transport, when, and at what cost will be delivered to the customer. The main goal in the forwarding process is always to find the most efficient possible solution for delivering goods (Rynek logistyczny, 2024). In addition, forwarding also involves preparing the necessary documentation (bills of lading or CMR documentation (consignment note in international trade), providing insurance and customs clearance.

Logistics services are a complementary area of activity in the TSL sector. The functions, scope of activities, and responsibility of logistics operators are much broader than those of a classically understood forwarder or carrier. Transport logistics, in addition to transport and forwarding activities, guarantees, for example, terminal services. These include warehousing, assembly, and value-added activities - labeling, packaging, creating promotional sets, or carrying out necessary repairs. In addition, TSL companies, as part of logistics processes, can manage customers' resources, manage the flow of goods, and provide broadly understood consulting (Christopher, 2016; Fertsch, 2013). Some companies within the TSL sector also offer cross-docking, a method of distributing goods in the supply chain without the need for warehousing. This reduces order fulfillment time and the goods reach the customer much faster.

Currently, the largest customer of the TSL sector in Poland is companies engaged in retail and wholesale trade. In addition, industrial sectors - food, electronics, and automotive - are also very important. The so-called full truckload services, which involve transporting the entire load from one point to another, dominate. In this aspect, the Polish TSL sector differs from the European one, where contract logistics based on carrying out operations within a warehouse area prevails." Entities operating in the TSL sector aim to, among other things:

- ensure the highest possible efficiency of services provided,
- guarantee customer satisfaction,
- operate in accordance with environmental protection,
- adapt to market changes,
- ensure safety (Bowersox, Closs, Cooper, 2019; Pfohl, 2020).

Many factors have contributed to the development of the TSL sector in Poland, including:

- intensification of international trade, especially e-commerce,
- favorable location on the European map,
- access to a highly qualified workforce,
- development of transport infrastructure, both point and linear,
- mass consumption,
- ongoing globalization,
- increasing networking of the economy,
- automation and robotization of warehouse processes (Chrostopher, 2016; Fertsch, 2013; Report Transport drogowy, 2023).

Enterprises on the domestic TSL market are very diverse. Among enterprises, one can point to small companies offering niche services aimed at specific customers, as well as huge corporations with a wide range of activities, both in terms of available solutions and the scope of orders carried out.

In 2023, there were approximately 127,000 enterprises in Poland engaged in the road transport of goods. This accounted for about 7% of all registered enterprises. Generally, these are individual economic activities, but the fastest development is observed among medium and large enterprises (Report Transport drogowy, 2023). In 2021, in Poland, the largest revenues from the TSL sector were recorded by companies such as the Raben Group, DPD Polska Capital Group, DSV Group, DB Schenker, and ROHLIG SUUS Logistic S.A., which are also present on the Wielkopolska market (Report Transport drogowy, 2023; Rynek logistyczny, 2024).

The aim of this work is to present a modified version of the SERVPERF method for assessing the quality of logistics services in the TSL sector, to popularize this method, and consequently to conduct further research aimed at its improvement.

2. Quality of services in the TSL sector logistics

The quality of services provided is no longer a distinguishing feature in the modern global market, but is becoming an element of competitive struggle. Maintaining a competitive position in the logistics services market therefore requires a continuous drive to improve customer service quality and other processes that contribute to the customer's perceived quality (Frąś, 2014; 2013). The customer plays a particularly important role in shaping the quality of services in the TSL sector. The customer's active participation in the service delivery process means that the final outcome of the cooperation depends to a large extent on their skills, knowledge and motivation. In order to ensure the quality of the services offered, companies must not only provide services to customers, but also have appropriate knowledge about them. The starting point for determining the level of customer satisfaction with the purchased service, not only in logistics, is the measurement of perceived service quality, which results from customer expectations and what is actually offered. More about the assessment of service quality in the next part of the work.

The degree to which a service meets the needs and expectations of customers is one of the ways of defining the quality of services in logistics, referring to the definitions of quality contained in the ISO 9000 series standards. The quality of services in the TSL sector is a concept that is difficult to define unequivocally due to its complexity. Defining the quality of logistics services using a single, universal definition is a difficult or rather impossible task. Many factors influence the definition of the quality of a logistics service, including:

- consideration of different aspects of the service product - on the way of defining,

- the quality of services is influenced by its type, resulting from the choice of attributes that characterize the quality of specific service products,
- the role of customers in the process of assessing the quality of services and how they perceive the service;
- the possibility of applying the proposed definition in management (Report Transport drogowy, 2023; Frąś, 2013; 2015). Service quality in the TSL sector can be defined in terms of many factors, such as:
- reliability and timeliness of deliveries,
- safety of goods transported,
- flexibility in adapting to changing market conditions,
- service costs in relation to their value,
- customer service and transparency of the order fulfillment process (Biesok, 2013; Damian, Górna, 2020; Gulc, 2020; Mydlarz, 2018).

The above determinants and others contribute to the overall perception of service quality by customers.

According to the American Society for Quality, quality is defined as "the sum of the characteristics of a product and service that determine a product's ability to satisfy stated or implied needs (Mydlarz, 2018; Urbaniak, 2014).

The Council of Logistics Management defines logistics quality as the service provider's fulfillment of customer requirements and expectations, related to such characteristics as: ease of obtaining necessary information, timeliness and reliability of deliveries, comprehensive order fulfillment, timely after-sales service, accurate and timely obtaining and transmission of information within and outside the enterprise to support planning, and others (Bowersox, Closs, Cooper, 2019; Chiu, Lin, 2004; Christopher, 2016; Gulc, 2020).

As a result of scientific research on service quality, numerous methods and models have been developed to study it. The most well-known include: the Parasuraman, Zeithaml, and Berry model (the gap model), the Grönroos model, the Gummesson model, Moore's quality improvement model, the model of perceived and expected quality by Nash, and others (Bielawa, 2011; Frąś, 2014; Urbaniak, 2014; Wolniak, Skotnicka-Zasadzień, 2008; 2009).

The development of models describing the understanding of service quality has led to the development of methods for assessing this quality. In the field of management, the most popular methods for assessing service quality include SERVQUAL (Service Quality), the Importance-Performance analysis by Martilla and James, the Critical Incident Technique (CIT), and SERVPERF (Service Performance) (Bielawa, 2011; Frąś, 2015, 2013; Wolniak, Skotnicka-Zasadzień, 2008).

It is worth mentioning that in the literature, examples of modifications of the SERVQUAL method can be found for various service sectors through the development of new instruments for measuring service quality. Among the examples of modifications are the E-QUAL method

– online tourism services, the ECOSERV method – ecotourism, and others (Biesok, 2013; Blikle, 2019; Frąś, 2013).

In the early 1990s, two researchers, J. Joseph Cronin and Steven A. Taylor, criticized the SERVQUAL method. They argued that the suggested Parasuraman study of the relationship between expected and experienced quality by customers and, on this basis, indicating which quality elements are not sufficiently developed, is a good understanding of quality in terms of the direction of the assessment. Like Parasuraman, they assumed that this assessment belongs to the service purchaser.

However, Cronin and Taylor stated that comparing experienced quality to expected quality and examining both using similar questionnaires is a mistake. They presented a simplified version of the SERVQUAL method as the SERVPERF method, which they based on a survey of only experienced quality and comparing it to expected quality, which in their opinion is "perfect quality" (Urbaniak, 2014; Wolniak, Skotnicka-Zasadzień, 2008). They assumed that checking customer expectations is not necessary, as it is known that they will always desire the highest quality. They measured service quality based on the quality experienced by customers and referred the results to perfect quality. In this way, the study became simpler to apply and less time-consuming in practice compared to the SERVQUAL method.

In summary, the quality of services in logistics is a very important and current issue. Taking into account the requirements and needs of customers, also in the sphere of services, and striving for their continuous improvement is becoming more and more often a norm and standard that must be met in order to effectively compete in the current economic conditions (Panasiuk, Dobska, Urban, 2016; Urbaniak, 2014; Wolniak, Skotnicka-Zasadzień, 2009).

3. Methodology of qualitative research of services in logistics

There are methods in the literature for assessing the quality of services in various types of sectoral activities, including the TSL sector (freight forwarding, courier, warehousing, etc.). Such methods include SERVQUAL and SERVPERF (Coulthard, 2004, Frąś, 2014, 2015; Wolniak, Skotnicka-Zasadzień, 2009). In both methods, the definition of additional universal criteria and their determinants for assessing the level of service quality in logistics is a very complex, multi-threaded undertaking that requires a longer period of time, as it covers three different but coherent areas of activity, which is the TSL sector. For the purposes of the research, a methodlogy of the research process was developed, presented in Figure 1.

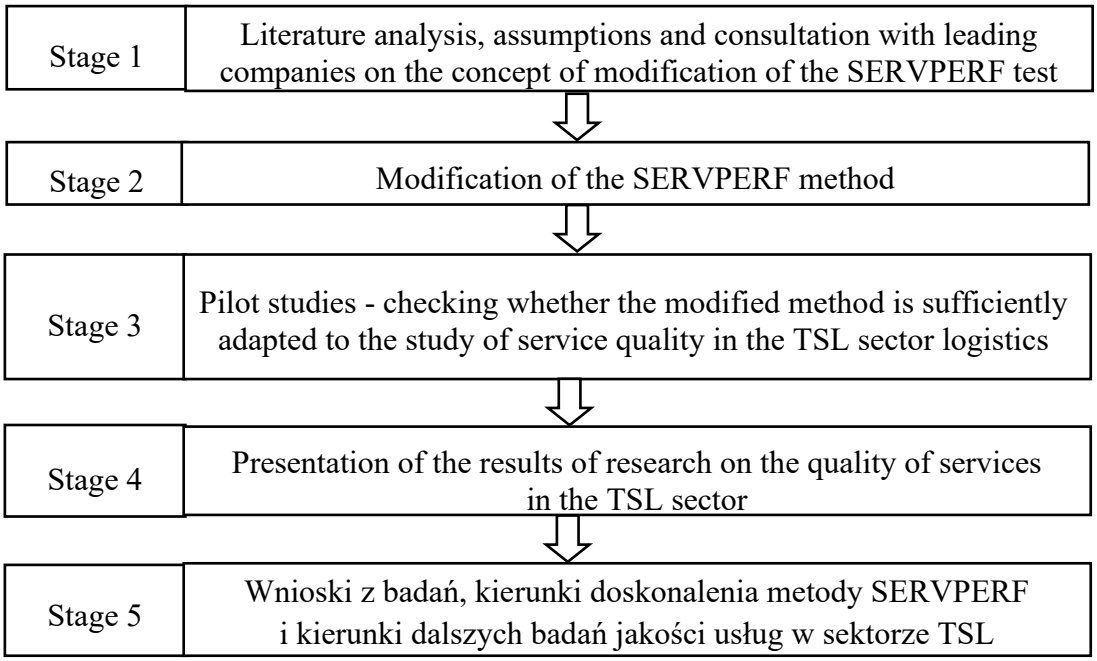

Figure 1. Methodology of the research tool construction process and measurement of logistics service quality using the modified SERVPERF method.

Source: own study.

Based on a review of the literature, own reflections, ISO 900 quality system procedures, ISO 28000 supply chain security management system and consultations with the operational management of the purposefully selected logistics companies, the authors developed a modification of the SERVPERF method with a new criterion of "cooperation (cooperation/ coopetition)" and its 4 determinants for assessing the quality of logistics services in the TS sector. According to the authors, the developed method will allow for comprehensive qualitative research in 3 areas of the TSL sector, showing areas of low quality that will require improvement or refinement. The SERVPERF method itself will be improved. The modified SERVPERF method is presented in Table 1.

The names of the 5 basic criteria of the SERVPERF method and its 26 determinants have been modified, adapting them to the specificity of the TSL sector. An open question was included at the end of the research questionnaire with the possibility of entering other criteria and determinants by the respondents of the surveyed companies. The method developed in this way was used to conduct pilot studies to check the usefulness of the method for examining the quality of logistics services in the surveyed enterprises. Traditionally, a 5-point Likert scale was used, where 1 meant "very weak influence" and 5 - "very strong influence" of determinants on the quality of services. Respondents were asked to answer the following question: to what extent do the criteria listed below and their determinants affect the quality of logistics services in your enterprises (see the method questionnaire, as further set out in Table 1).

The authors undertook this type of research because there is no literature on the subject that would define a common, universal and up-to-date tool for assessing the quality of TSL sector

services, tailored to the challenges and ongoing economic processes of the 21st century. Qualitative research was conducted among enterprises providing transport-forwarding-logistics services. The authors will continue work to optimize and improve the research tool, as well as conduct further research on the quality of services in the TSL sector in enterprises of the Wielkopolska and Lubuskie Voivodeships.

4. The quality level of TSL sector services - pilot research results

The research conducted by the authors using the modified SERVPERF research tool was aimed at the preliminary evaluation of the research tool, expanded with a new criterion and its determinants (Frąś, 2013; Gulc, 2020; Wolniak, Skotnicka-Zasadzień, 2009). The proper research was conducted in 2023. The study was a static study, not aimed at assessing the dynamics of the growth of service quality in a specific period of time, but only at generating, with the help of respondents, currently occurring phenomena regarding the level of service quality in the TSL sector, i.e. determining the level of service quality, or finding additional criteria and their determinants, common to the three areas of the TSL sector. Pilot studies confirmed the usefulness of the modified method, and the obtained results turned out to be very promising, showing the overall level of service quality in the TSL sector at 4.18 on a 5-point Likert scale. conducted with the SERVPERF tool.

In addition to the measurement of the quality of logistics services, the modified research tool allowed us to obtain, in an open question, a lot of valuable information and tips on the direction of modification of the research method, as well as areas of improving the quality of services in TSL sector enterprises, which will be taken into account in the authors' further research.

Thanks to the collection of the results of the pilot study conducted among customers of selected TSL sector enterprises in the Wielkopolska and Lubuskie Voivodeships, it was possible to detect the so-called gaps, by examining 30 determinants. These gaps are nothing more than quality levels, particularly important for the final assessment of the quality of services. They indicate areas that require improvement, as well as the extent to which the change should be introduced. By calculating the arithmetic mean of the ratings of all respondents and comparing them to the ideal situation (i.e. the maximum point value marked in the study as 5). The data obtained allow us to immediately see how large the discrepancy is in each case between the expectations of customers of services in the TSL sector and the level of quality of a given element of the service they received, expressed by a specific determinant of a given criterion. The results of the average values of the criteria from the 120 questionnaires are presented in the form of a column chart in Figure 2, and the average values of the determinants of each criterion in tabular form are presented in Table 1, Part B.

Figure 2. Average value of TSL sector logistics service quality criteria according to the customer as determined by the modified SERVPERF TSL method.

Source: own study.

Analysing the values of the individual criteria, the criterion of empathy had the highest score, with an average value of 4.56, and the criterion of cooperation, newly introduced into the SERVPERF method, had the lowest score, with an average value of 3.70 on a 5-point scale. The other criterion values fell between the two: the responsiveness criterion had a value of 4.02, the reliability criterion had a value of 4.14, the assurance criterion had a value of 4.22 and the material dimension criterion had a value of 4.42. The average of the service quality criteria is 4.18. Analysing the results of the study of determinants of service quality, in the scope of the criterion of cooperation, below the value of 4.0, the following were evaluated: mutual confidence in partners, the level of risk and certainty of cooperation of partners, openness, honesty and good communication in cooperation, in the scope of the criterion of reliability, below the value of 4.0, service costs were evaluated, in the scope of the criterion of certainty, below the value of 4.0, reliability and standardisation of work, and in the scope of the criterion of responsiveness, below the value of 4.0, reaction to reported problems and disruptions in service performance, flexibility in the approach to the customer and time of reimbursement. In these areas of the TSL sector's activities, remedial or improvement work should be started as a matter of priority, preceded by an in-depth analysis of the reasons that influenced the lower ratings by customers.

Table 1.
Modified SERVPERF survey questionnaire and pilot results of the TSL sector

Criteria and determinants of service quality of the SERVPERF method - Part A								Part B	
To what extent do the determinants listed below influence the quality of services ?								Average values	
Please place an X in the appropriate place on each line *		1	2	3	4	5	**	***	
MATERIAL DIMENSION									
1.	the location and condition of the company's facilities						4,53	**4,42**	
2.	modern equipment and its state						4,38		
3.	modern transport and forwarding systems						4,61		
4.	efficient data communication systems						4,49		
5.	diversified distribution channels						4,31		
6.	appearance of staff and information material						4,22		
COOPERATION, COOPETITION									
7.	brand, modernity and a positive corporate image						4,28	**3,70**	
8.	mutual confidence in the partners						3,61		
9.	level of risk and communication in cooperation between partners						3,36		
10.	openness, honesty and good communication in cooperation						3,54		
RELIABILITY									
11.	timeliness and efficiency of service provision						4,03	**4,14**	
12.	the conformity and completeness of the service provision						4,32		
13.	clear procedures, documents and standards for service provision						4,21		
14.	safety guarantees						4,17		
15.	cost of service						3,97		
CONFIDENCE AND COMPETENCE									
16.	knowledge and qualifications of staff						4,58	**4,22**	
17.	kompetenz, confidence in service delivery						4,36		
18.	inspiring confidence in clients						4,04		
19.	reliability and standardisation of work						3,91		
REACTION ABILITY									
20.	service delivery conditions, completeness						4,53	**4,02**	
21.	response time and service delivery time						4,21		
22.	response to reported problems and service disruptions						3,87		
23.	monitoring, handling complaints						4,02		
24.	flexibility in the approach to the customer (returns)						3,91		
25.	recovery time						3,59		
EMPATHY									
26.	individual customer approach, professional advice						4,46	**4,56**	
27.	meeting customer requirements is a priority						4,48		
28.	inspiring trust and understanding of customer needs						4,55		
29.	convenient service hours and the necessary information						4,62		
30.	kindness and courtesy in customer relations						4,67		
OTHER (open question)									
	Please provide other criteria and their determinants ……								

* Please use a 5-point scale, where 1 means a very weak impact and 5 a very strong impact on service quality
** Average values of determinants, *** Average values of criteria.

Source: Own study based on research.

Finally, it is necessary to refer to the open question posed to the survey respondents. The respondents indicated the advisability of separating the cooperation criterion and creating two independent criteria, i.e. cooperation and coopetition, pointing to coopetition as a new phenomenon in services in the TSL sector. Thus, the possibility of misjudging this criterion by respondents who may not be fully familiar with the entire mechanism of this contemporary phenomenon in the TSL sector.

5. Conclusions and summary

The study of quality in the TSL sector is an ongoing process that requires a comprehensive approach. With appropriate assessments by means of criteria and their determinants, weaknesses can be identified, corrective actions can be implemented to improve service quality and to increase the competitiveness of companies.

In their study, the authors applied modified quality assessment criteria, taking into account the specifics of the TSL sector. The most important criteria for customers were found to be cooperation/ coopetition, responsiveness, reliability and assurance and the least important were the material dimension and empathy (in the study, customers rated these criteria highly). The research showed that, considering all criteria, the quality of services in the TSL sector is above a good rating, i.e. the quality of services in the sector is good, and the research yielded inspiring directions for further research. This direction is the criterion of coopetition, i.e. companies enter into cooperative relationships while competing with each other.

In conclusion, it should be noted that the SERVPERF method developed by J. J. Cronin and S. A. Taylor, in contrast to the SERVQUAL method, does not make reference to the customer's expectations, relying only on the customer's experience of evaluating a particular service. Its positive features include the clarity and ease with which the survey can be carried out and the possibility, in a short time, to collect the results and draw conclusions. The SERVPERF method makes it possible to answer which quality elements are at or close to the expectations of logistics service customers.

The main disadvantage of both methods, i.e. SERVQUAL and SERVPERF, is the reliance on the subjective perceptions of customers, who often do not have the appropriate qualifications and experience to assess the level of service quality in the TSL sector. On the other hand, however, from an economic perspective, a high evaluation of the quality of services in the TSL sector given by a customer, usually translates positively into company revenue, so paying attention to the perception of service quality by potential customers of the TSL sector, is highly justified.

The authors conclude that in order to carry out a comprehensive study covering all areas of the TSL sector in a short period of time, in anticipation of adequate allowing to take immediate corrective measures, the modified SERVPERF method can be fully used to assess the quality of logistics services. However, for a more in-depth analysis of the phenomena, it should be complemented by research carried out using other methods, e.g. by applying the CSI (Castomer Satisfaction Index) method.

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UNDERSTANDING HEDONIC MOTIVATION IN THE CONTEXT OF SMART TRANSPORTATION

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Purpose: This study aims to investigate the role of hedonic motivation in shaping the intention to use smart transportation (ST) solutions. The research focuses on hedonic motivation as a critical, yet often underexplored, factor influencing the adoption of ST solutions.
Design/methodology/approach: The study employs a quantitative research design, utilizing a structured questionnaire distributed via CAWI method. A sample of 539 urban residents in Poland was analyzed, with measurement scales for hedonic motivation and intention to use ST derived from validated frameworks like the UTAUT. Statistical analyses, including Pearson and Spearman's rho correlations, were conducted to explore the relationships between the variables.
Findings: The results confirm a statistically significant moderate positive relationship ($r = 0.46$, $p < 0.001$) between hedonic motivation and the intention to use smart transportation solutions. Key hedonic factors, such as enjoyment, entertainment, and pleasure, were found to significantly influence user intentions. The findings highlight the consistent role of hedonic motivation across demographic and socio-economic groups.
Research limitations/implications: The study is limited to urban residents in Poland and employs self-reported data, which may restrict the generalizability of the findings. Future research should explore cross-cultural comparisons and longitudinal designs to examine sustained adoption behaviors over time.
Practical implications: The findings provide actionable insights for ST's policymakers, system designers, and operators. Integrating hedonic elements such as gamification, aesthetically pleasing designs, and personalized features into smart transportation systems can enhance user engagement and adoption rates. These strategies are crucial for developing user-centered solutions that balance functionality with emotional appeal.
Social implications: Promoting the adoption of ST solutions through hedonic motivation contributes to sustainable urban mobility, reducing carbon emissions and encouraging environmentally friendly behaviors. By making transportation systems both efficient and enjoyable, these solutions can improve quality of life and support the transition to smarter, greener cities.

Originality/value: This study offers a novel contribution by focusing exclusively on the role of hedonic motivation in ST adoption, particularly in the underexplored context of Central and Eastern Europe.
Keywords: hedonic motivation, smart transportation (ST), technology adoption, UTAUT, gamification, urban mobility
Category of the paper: research paper, empirical study.

1. Introduction

Smart transportation (ST) is a critical component of modern urban development, addressing pressing challenges such as traffic congestion, environmental sustainability, and the growing demands of urban populations. As cities worldwide experience rapid growth, with projections indicating that 68% of the global population will reside in urban areas by 2050 (UN, 2018), the need for efficient, sustainable, and user-centric transportation systems has become paramount. Smart transportation systems (STS) leverage advanced technologies such as artificial intelligence, the Internet of Things (IoT), and big data to optimize mobility, reduce carbon emissions, and enhance the overall commuter experience.

In this context, hedonic motivation plays a pivotal role in driving the adoption of smart transportation solutions. Beyond their functional benefits, such as efficiency and convenience, ST systems that offer enjoyment, entertainment, and emotional satisfaction are more likely to engage users and encourage consistent usage. Research has shown that hedonic factors, such as gamification, aesthetic appeal, and interactive design, significantly influence user behavior, making transportation not only practical but also pleasurable. Understanding the role of hedonic motivation is crucial for designing systems that resonate with users' emotional and experiential needs, ultimately ensuring higher adoption rates and long-term satisfaction with smart.

This paper explores the relationship between hedonic motivation and intention to use smart transportation solutions, examining theoretical foundations, key technologies, and implications for policymakers and designers.

The study also seeks to validate the hypothesis that hedonic motivation positively influences the intention to use ST, providing actionable insights for enhancing the design, implementation, and user experience of smart transportation solutions.

This article is structured into six sections. The Introduction provides an overview of the research problem and objectives, highlighting the significance of hedonic motivation in the context of smart transportation. The Theoretical Framework explores the conceptual foundations of hedonic motivation and the technological advancements in smart transportation systems. The Literature Review examines prior studies on user motivation and smart transportation, identifying research gaps and setting the stage for the research question and hypothesis.

The Methodology details the research design, data collection process, and measurement scales used for hedonic motivation and intention to use ST solutions. The Findings and Discussion section present the results of the analysis, interpreting them within the context of existing literature and providing implications for stakeholders. Finally, the Conclusion and Limitations summarize the study's contributions, address its constraints, and propose directions for future research.

2. Theoretical framework

2.1. Definition and importance of hedonic motivation

Hedonic motivation refers to the intrinsic joy, excitement, and pleasure derived from engaging in activities that provide sensory gratification and emotional fulfillment, rather than solely meeting practical or utilitarian needs (Arnold, Reynolds, 2003).

Unlike utilitarian motivations, which are task-oriented and focused on fulfilling functional goals, hedonic motivations emphasize emotional and experiential aspects of consumption. These motivations are driven by the aesthetic pleasure and enjoyment of the process itself, such as sensory stimulation, fantasy, and amusement (Hirschman, Holbrook, 1982). For example, hedonic motives may lead consumers to seek experiences of fun and escapism, describing shopping as an adventure or mood-enhancing activity (Babin, Darden, Griffin, 1994; Fischer, Arnold, 1990).

Hedonistic values prioritize enjoyment and emotional fulfillment, often shaping users' decision-making processes by appealing to their desire for pleasure. For example, studies show that "hedonic motivation significantly impacts consumers' behavioral intentions when adopting innovative technologies, such as artificial intelligence-based services or gamified platforms" (Siddiqui et al., 2024). These motivations are particularly relevant in contexts where users seek experiences beyond mere functionality, such as in the use of smart transportation systems that integrate gamification, aesthetically pleasing designs, or personalized features.

Research further emphasizes that "hedonic content inspires consumers more effectively than utilitarian content, driving higher levels of engagement and intention to act" (Swaroop et al., 2024). This is evident in contexts where sensory appeal or gamified incentives enhance the user experience, making services like smart transportation not just practical but enjoyable.

Hedonic motivations contrast with utilitarian motivations, which focus on practical benefits such as efficiency, convenience, and necessity. While utilitarian motivations address functional needs, hedonic motivations fulfill emotional and psychological desires. As Kumar and Singh (2024) argue, "hedonic motivation relates to experiential gratification, whereas utilitarian motivation emphasizes task completion and rational benefits."

In the realm of consumer behavior, the two motivations often coexist, but their relative influence varies depending on the context. For instance, in adopting e-pharmacies, utilitarian factors like convenience dominate; however, "hedonic motivations, such as the pleasure of exploring new platforms or the aesthetic design of the interface, play a subtle yet significant role" (Kumar, Singh, 2024). Similarly, in smart transportation, users may initially prioritize efficiency but are more likely to engage deeply with systems offering enjoyable and rewarding experiences.

This differentiation underscores the importance of integrating both motivational aspects into the design and marketing of smart transportation systems. As Jakubowska and Grzywińska-Rąpca (2024) highlight, a balanced approach that merges utilitarian functionality with hedonistic appeal can maximize user satisfaction and adoption rates.

2.2. Smart transportation: a key component of urban innovation

Smart transportation, a core component of urban innovation, integrates advanced technologies to optimize mobility, improve efficiency, and reduce environmental impact. As cities grow rapidly – projected to house 68% of the global population by 2050 (UN, 2018) – urban planners face increasing challenges in managing traffic congestion, environmental sustainability, and commuter demands. The rise of smart cities, powered by technologies like artificial intelligence (AI), the Internet of Things (IoT), and data analytics, has led to transformative changes in urban transportation systems.

Smart transportation systems (STS) aim to modernize mobility through innovations like intelligent traffic management, real-time route optimization, and the integration of electric and autonomous vehicles. These systems use IoT devices to gather data on traffic patterns, road conditions, and commuter behavior, enabling dynamic adjustments to improve flow and efficiency (Monzon, 2015). According to the US Department of Transportation, STS leverages tools like advanced sensors, communication systems, and data-driven algorithms to enhance safety and operational performance. Below are Key Technologies and Their Current Adoption.

2.2.1 Autonomous vehicles (AVs)

Autonomous vehicles are at the forefront of smart transportation. These vehicles rely on AI, machine learning, and sensor technologies to navigate roads without human intervention. Their adoption is progressing, with pilot programs active in cities across the globe. For instance, ride-hailing companies such as Waymo and Cruise have deployed AV fleets in limited areas, demonstrating their potential to reduce accidents and traffic congestion (Dwivedi et al., 2024). However, regulatory and technical challenges still impede widespread adoption.

2.2.2. Electric vehicles (EVs) and charging infrastructure

EVs are a cornerstone of sustainable transportation, with governments worldwide incentivizing their use. Smart charging stations, powered by IoT technologies, optimize charging times

and energy consumption. For example, "smart and user-friendly electric vehicle charging infrastructure" encourages EV adoption while contributing to reduced emissions (Kamal, 2024).

2.2.3. Intelligent traffic management systems

Real-time traffic monitoring and optimization systems use IoT devices, cameras, and data analytics to manage traffic flow efficiently. These systems aim to reduce congestion and improve safety. In cities like Singapore, traffic control centers employ data-driven algorithms to dynamically adjust traffic signals and reroute vehicles, significantly enhancing urban mobility (Ngossaha et al., 2024).

2.2.4. Shared mobility solutions

Shared mobility systems, including bike-sharing, car-sharing, and micro-mobility options like e-scooters, are gaining traction as eco-friendly alternatives to personal vehicles. These systems alleviate traffic congestion and promote active transportation, particularly in densely populated urban areas. Studies show that shared urban bicycles significantly reduce urban emissions while encouraging healthier commuting habits (Ahmed et al., 2024).

2.2.5. Mobility-as-a-service (MaaS)

MaaS platforms integrate various modes of transportation, such as buses, trains, ride-sharing, and bike-sharing, into a unified app. This system enhances user experience by providing seamless trip planning, booking, and payment options. Cities like Helsinki and Los Angeles have adopted MaaS solutions to streamline mobility and reduce dependency on personal vehicles (Schwinger et al., 2024).

2.2.6. IoT-driven parking systems

Smart parking technologies use sensors to detect and communicate real-time parking availability. These systems not only reduce the time spent searching for parking spots but also lower emissions from idling vehicles. Pilot programs in urban areas have shown promising results in reducing traffic congestion and improving parking efficiency (Xing et al., 2024).

These innovations promote sustainable urban mobility by reducing reliance on traditional automobiles, minimizing emissions, and encouraging the use of public transit and non-motorized transport.

For example, shared urban bicycle systems reduce traffic congestion and pollution while promoting active lifestyles. Similarly, intelligent parking systems use sensors to display real-time information on available spaces, cutting search times and lowering emissions from idling vehicles. Traffic light countdown displays and city travel time signage improve navigation efficiency and reduce travel uncertainty.

Smart transportation not only enhances the commuter experience but also supports broader sustainability goals, such as reducing carbon emissions and energy consumption. By integrating renewable energy sources and promoting electric vehicle adoption, STS contributes to a greener urban environment. As cities worldwide invest in transforming their transit networks, smart transportation emerges as a critical driver of sustainable urban development and improved

quality of life. Smart transportation, along with IoT, AI and blockchain technologies, play a key role in shaping smart cities. As noted by Wolniak et al. (2024), the integration of these technologies with appropriate business models allows for effective management of urban resources and improvement of the quality of life of residents.

Despite the promising potential of smart transportation technologies, their adoption varies globally. Factors such as regulatory hurdles, high implementation costs, and data privacy concerns continue to pose challenges. Additionally, infrastructure disparities in developing regions limit the scalability of these solutions (Hinga et al., 2024). Nonetheless, advancements in AI, IoT, and big data analytics are paving the way for accelerated adoption in the coming decade.

2.3. Connection between hedonic motivation and technology adoption

In the context of smart transportation, hedonic motivation has become increasingly significant as systems evolve beyond mere functionality to offer users engaging and emotionally fulfilling experiences. Modern transportation technologies, such as gamified public transit apps, aesthetically pleasing ride-sharing interfaces, and personalized travel suggestions, are designed to elicit pleasure and excitement, enhancing user engagement. As Sherry (1990, 27) emphasizes, the "seeking of such experiences is often far more significant than the mere acquisition of products". This underscores the importance of integrating hedonic elements into the design of smart transportation systems.

By catering to both utilitarian and hedonic motivations, smart transportation systems enhance user satisfaction and adoption rates. Hedonic motivation drives individuals to value not only the efficiency of their commute but also the enjoyment and emotional appeal of the journey itself. Consequently, it plays a key role in the success of these systems by transforming routine transportation into an engaging and enjoyable experience.

2.3.1. Hedonic motivation and technology adoption

Hedonic motivation—the pursuit of pleasure and enjoyment in using technology—is a significant driver of technology adoption. This is particularly evident in theoretical models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which provide frameworks for understanding how hedonic motivation influences user behavior and acceptance of innovative technologies.

2.3.2. Technology acceptance model (TAM)

The TAM, introduced by Davis (1989), identifies two primary factors influencing technology adoption: perceived usefulness (PU) and perceived ease of use (PEOU). Hedonic motivation intersects with TAM through its impact on PEOU, as users perceive technology to be not only easy to use but also enjoyable. Research demonstrates that hedonic enjoyment significantly enhances the overall appeal of technology, motivating users to engage with it despite potential learning curves (Dwivedi et al., 2024). For instance, gamified learning platforms or immersive virtual reality tools rely heavily on enjoyment to encourage user adoption.

2.3.3. Unified theory of acceptance and use of technology (UTAUT)

The UTAUT model, proposed by Venkatesh et al. (2003), builds on TAM by incorporating additional constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT2 further integrates hedonic motivation as a critical factor influencing behavioral intention to adopt technology. Studies show that hedonic motivation directly and substantially impacts users' decisions, particularly in consumer-oriented technologies like e-wallets or ride-sharing applications (Boomer et al., 2022).

2.3.4. Empirical evidence of hedonic motivation in technology adoption

Empirical evidence underscores the significant role of hedonic motivation in technology adoption across various domains, as it enhances user engagement, perceived value, and overall experience. In digital health platforms, research utilizing the UTAUT model highlights how enjoyment boosts adoption by increasing user involvement and perceived benefits (Alojail, 2024).

Similarly, in educational technologies, studies integrating TAM and UTAUT2 demonstrate that hedonic motivation fosters the adoption of AI-powered tools by enriching learning experiences through enjoyment and excitement (Al-Dokhny et al., 2024).

In the realm of shared mobility services, hedonic motivation plays a crucial role in user acceptance by making commuting enjoyable, with gamified elements and intuitive interfaces significantly improving user satisfaction (Ngossaha et al., 2024).

These findings collectively emphasize the universal importance of hedonic motivation in driving the acceptance and integration of innovative technologies. Hedonic motivation is not merely an ancillary factor but a central driver of user engagement and technology adoption, particularly in the realm of smart transportation. By addressing both utilitarian and hedonic needs, modern transportation systems can create more engaging, efficient, and user-centric experiences. This dual focus ensures higher adoption rates and greater satisfaction, paving the way for a smarter, more connected future in urban mobility.

3. Literature review, research question and hypothesis

Research on motivation in the context of smart transportation systems has highlighted how user preferences and behaviors are shaped by emotional and functional factors. A significant focus has been placed on hedonic motivations, which emphasize the enjoyment and pleasure derived from engaging with transport technologies. These motivations are contrasted with utilitarian motivations, which focus on efficiency, cost-effectiveness, and practicality (Anschütz, 2024).

Studies have shown that user engagement with smart transportation systems, such as public transit apps and shared mobility platforms, increases when gamified elements and user-friendly

interfaces are integrated. For example, gamification, as seen in shared mobility services, has been demonstrated to enhance user satisfaction by creating enjoyable experiences that encourage repeated use (Hamid, Kuppusamy, 2017). Additionally, systems that offer real-time updates and intuitive designs improve perceived convenience, further influencing adoption rates (Liu et al., 2024).

3.1. Examples of hedonic factors in smart transportation

3.1.1. Enjoyment in interface design

Studies emphasize the role of visually appealing and interactive interfaces in enhancing user satisfaction. Interfaces that incorporate playful design elements or gamified features not only make the experience enjoyable but also encourage continued use. For instance, gamified public transit apps reward users for sustainable travel choices, fostering long-term engagement (Gajdzik et al., 2024).

3.1.2. Convenience and gamification

Convenience remains a central motivator in smart transportation. However, when combined with gamification elements, such as points or leaderboards, it enhances the hedonic appeal of transportation technologies. This dual focus has been found to significantly impact user behavior, particularly among younger demographics who value both fun and ease of use (Wut et al., 2021).

While the role of hedonic motivation in technology adoption has been explored, it is often treated as a secondary factor in broader models like TAM or UTAUT, overshadowed by utilitarian considerations such as efficiency and cost. There is a lack of dedicated research focusing exclusively on hedonic motivation and its unique contribution to the intention to use smart transportation. Moreover, most studies are conducted in Western or Asian contexts, leaving Central and Eastern Europe significantly underrepresented. Cultural differences, particularly in hedonic preferences and the perception of pleasure derived from using smart technologies, could influence the results in this region.

Additionally, while gamification, convenience, and aesthetic enjoyment have been broadly discussed, empirical evidence that links hedonic motivation specifically to smart transportation systems, such as Mobility-as-a-Service (MaaS) platforms or shared mobility, is sparse. This lack of focus on hedonic factors presents an opportunity to delve deeper into understanding how enjoyment and emotional appeal drive adoption in underexplored regions like Central and Eastern Europe.

Therefore, the following research question was posed:

1. How does hedonic motivation influence the intention to use smart transportation systems?

Based on the literature review and the proposed research question, the following hypothesis was formulated:

H1: Hedonic motivation has a positive influence on the intention to use smart transportation systems.

This research will fill a critical gap by providing insights into the specific role of hedonic motivation in the context of smart transportation adoption, with a focus on Central and Eastern Europe. Poland is an ideal case for studying hedonic motivation in smart transportation due to its rapid urbanization, EU-supported smart city initiatives, and cultural diversity. As a leading economy in Central and Eastern Europe, Poland has significantly invested in intelligent transport systems (ITS) and sustainable urban mobility projects (Masik et al., 2021). EU funding has driven the integration of smart transportation technologies, such as real-time traffic management and shared mobility solutions (Sikora-Fernandez, 2018). Additionally, Poland's mix of traditional values and growing openness to gamified and user-centric designs highlights its cultural relevance in exploring hedonic motivations (Zawieska, Pieriegud, 2018). Despite advancements, the region remains underrepresented in research, making Poland a pivotal focus for understanding how hedonic factors influence smart transportation adoption.

4. Methodology

This research employed a Computer-Assisted Web Interviewing (CAWI) method to gather data, leveraging its wide reach and ability to target respondents residing in Polish cities with populations exceeding 200,000. Data collection was conducted between May and June 2024 using the Biostat Opinion Research Panel, which includes 200,000 respondents. A sample of 1460 individuals was randomly selected, ensuring participants met the criteria of living in Polish cities with a population above 200,000.

To ensure the quality and validity of the research instrument, a pilot study was carried out with 25 respondents during the initial phase. Feedback from this pilot allowed for linguistic adjustments to enhance the readability and clarity of the questionnaire, resulting in an improved final version. Before participating, respondents were presented with a declaration of anonymity and confidentiality, outlining the study's objectives and providing an email contact for further inquiries. After formal validation, 541 questionnaires were qualified for further processing. Following additional verification to ensure participants met the criteria of using smart transportation solutions, a final sample of 539 responses was included in the analysis. The research sample consisted of over 56% of women and nearly 44% of men. Every third respondent was between 18 and 30 years old, almost the same number were aged 31 to 40 and over 40. More than half of the respondents are residents of very large cities. A detailed description of the sample is presented in Table 1.

The construct of hedonic motivation in this study was assessed using a validated scale derived from the work of Venkatesh et al. (2012) and Debesa et al. (2023). Respondents evaluated

their hedonic experiences related to smart transportation solutions by rating their agreement with the following statements on a five-point Likert scale ranging from "strongly disagree" to "strongly agree":

1. Using ST solutions entertains me.
2. Using ST solutions is a form of entertainment for me.
3. Using ST solutions gives me pleasure.

Table 1.
Structure of the research sample

Characteristic	Item	%
Gender	Female	56.3
	Male	43.7
Age (years)	18–30	33.5
	31–40	31.9
	41 and above	34.6
Role in the household	Dependent on other household members	6.8
	One of the breadwinners of the household	69.4
	Sole breadwinner of the household	23.8
Place of residence	City, 201,000–500,000 residents	43.7
	City, over 501,000 residents	56.3
Use of a car at the place of residence	Yes	77.5
	No	22.5

Source: own study.

This scale captures the emotional and experiential dimensions of hedonic motivation, such as enjoyment, entertainment, and pleasure, which are critical factors influencing user engagement and the intention to adopt smart transportation technologies.

The construct of intention to use ST solutions was measured using a validated scale derived from the works of Bestepe and Yildrim (2019) and Das et al. (2024) . Respondents rated their agreement with the following statements on a five-point Likert scale ranging from "strongly disagree" to "strongly agree":

1. I intend to use ST solutions in the future.
2. I will try to use ST solutions in my daily life.
3. I plan to use ST solutions in the future.

This scale captures the behavioral intention of respondents to adopt and incorporate smart transportation solutions into their routines, providing insights into their willingness and likelihood of future usage.

In this study, reliability of the measurement scales was assessed using Cronbach's Alpha. A threshold value of 0.7 was established as the minimum acceptable level for internal consistency, ensuring the reliability of the scales used to measure constructs such as hedonic motivation and intention to use smart transportation solutions. Scales with Cronbach's Alpha values below this threshold were not considered acceptable for further analysis.

To examine the relationships between variables, Pearson's correlation coefficient was used for normally distributed data, while Spearman's rho was applied for non-normally distributed data. These methods allowed for robust measurement of both linear and monotonic relationships, ensuring accurate analysis of the associations between constructs in the study.

5. Findings and discussion

5.1. Findings

The reliability analysis confirmed that the measurement scales used in the study demonstrated high internal consistency. The Cronbach's Alpha value for the hedonic motivation scale (comprising three items) was 0.869, indicating strong reliability. Similarly, the intention to use ST (also comprising three items) achieved a Cronbach's Alpha of 0.944, reflecting excellent reliability.

These results confirm that both scales meet the threshold of 0.7, indicating their suitability for further analysis and providing confidence in the consistency of the responses across the study sample. The results from the correlation analysis indicate statistically significant positive relationships between hedonic motivation and the intention to use smart transportation (ST) solutions across all three measured aspects (Table 2).

Table 2.
Correlations

Hedonic Motivation	Intention to Use ST		
	I intend to use ST solutions in the future	**I will try to use ST solutions in my daily life**	**I plan to use ST solutions in the future**
Using ST solutions entertains me	,355**	,345**	,331**
Significance (Two-tailed)	<,001	<,001	<,001
Using ST solutions is a form of entertainment for me	,571**	,573**	,571**
Significance (Two-tailed)	<,001	<,001	<,001
Using ST solutions gives me pleasure	,384**	,394**	,378**
Significance (Two-tailed)	<,001	<,001	<,001
N	539	539	539

**Correlation significant at the 0.01 level (two-tailed).

Source: own study.

All the correlations in the analysis are statistically significant at the 0.01 level, confirming strong relationships between hedonic motivation and the intention to use smart transportation solutions. The strongest correlation was found between the statement "Using ST solutions is a form of entertainment for me" and "I will try to use ST solutions in my daily life" (r = 0.573,

$p < 0.001$). Conversely, the weakest correlation was observed between the statement "Using ST solutions entertains me" and "I plan to use ST solutions in the future" ($r = 0.331$, $p < 0.001$). These results highlight the varying degrees of influence of hedonic motivation factors on different aspects of user intentions.

The Pearson correlation coefficient was chosen because it measures the strength and direction of linear relationships between continuous variables, making it particularly suitable for analyzing relationships in social science research where such associations are commonly assumed (e.g., Abu-Bader, 2021). This method is widely accepted for its ability to provide a straightforward interpretation of the degree to which two variables are linearly related, especially in datasets without significant outliers or skewness.

The Pearson correlation coefficient was calculated for the variables hedonic motivation and intention to use smart transportation (ST), resulting in a value of 0.46, indicating a moderate and statistically significant relationship. This analysis was conducted to verify the proposed hypothesis that hedonic motivation has a positive influence on the intention to use ST solutions.

Table 3.
Correlations by gender of respondents

Hedonic Motivation		Intention to Use ST		
		I intend to use ST solutions in the future	**I will try to use ST solutions in my daily life**	**I plan to use ST solutions in the future**
Using ST solutions entertains me	Female	,268**	,261**	,247**
	Male	,451**	,433**	,423**
Significance (Two-tailed)		<,001	<,001	<,001
Using ST solutions is a form of entertainment for me	Female	,518**	,503**	,550**
	Male	,624**	,637**	,651**
Significance (Two-tailed)		<,001	<,001	<,001
Using ST solutions gives me pleasure	Female	,307**	,322**	,320**
	Male	,475**	,472**	,445**
Significance (Two-tailed)		<,001	<,001	<,001

**Correlation significant at the 0.01 level (two-tailed).

Source: own study.

Additionally, the Pearson correlation was calculated by dividing the respondents by gender (Table 3). In examining the correlation between hedonic motivation and the intention to use smart transportation (ST), it is evident that the male group generally shows a higher correlation index compared to the female group. Specifically, for the statement "Using ST solutions entertains me," the data reveals differing levels of relationship. In females, the relationship between hedonic motivation and the intention to use ST is weak, while in males, it is moderate.

The Pearson correlation was also calculated based on the respondents' roles within their family households (Table 4). The analysis indicates that respondents who rely on other household members indicate the highest of correlation. This is particularly evident for the statement,

"Using smart technology solutions gives me pleasure." The data reveals varying levels of correlation. For sole breadwinners, the relationship between hedonic motivation and the intention to use smart technology is moderate or even weak. For a group of one of the breadwinners, this relationship is moderate, while for respondents who depend on other household members, the correlation is strong.

Table 4.
Correlations by gender of respondents

Hedonic Motivation		Intention to Use ST		
		I intend to use ST solutions in the future	**I will try to use ST solutions in my daily life**	**I plan to use ST solutions in the future**
Using ST solutions entertains me	Sole breadwinner of the household	,274**	,268**	,209**
	One of the breadwinners of the household	,379**	,369**	,356**
	Dependent on other household members	,435**	,445**	,556**
Significance (Two-tailed)		<,001	<,001	<,001
Using ST solutions is a form of entertainment for me	Sole breadwinner of the household	,505**	,569**	,593**
	One of the breadwinners of the household	,583**	,579**	,555**
	Dependent on other household members	,668**	,575**	,681**
Significance (Two-tailed)		<,001	<,001	<,001
Using ST solutions gives me pleasure	Sole breadwinner of the household	,277**	,307**	,328**
	One of the breadwinners of the household	,408**	,414**	,375**
	Dependent on other household members	,560**	,541**	,590**
Significance (Two-tailed)		<,001	<,001	<,001

** Correlation significant at the 0.01 level (two-tailed).

Source: own study.

Additionally, the Spearman's rho correlation was calculated to validate the robustness of the findings. Spearman's rho, which evaluates monotonic relationships, showed similar trends and relationships, confirming that the results are consistent across different correlation methods and are not overly dependent on the assumptions of linearity.

5.2. Discussion and implications

The findings of this study provide robust evidence supporting the role of hedonic motivation in shaping the intention to use smart transportation (ST) solutions. The results align with theoretical frameworks such as the Unified Theory of Acceptance and Use of Technology (UTAUT), which highlights the importance of emotional and experiential factors, including

enjoyment, in technology adoption (Venkatesh et al., 2012). Specifically, the strongest correlation was observed between the statement "Using ST solutions is a form of entertainment for me" and "I will try to use ST solutions in my daily life" ($r = 0.573$, $p < 0.001$), reinforcing the idea that hedonic experiences significantly influence behavioral intentions.

Interestingly, the weakest correlation was between "Using ST solutions entertains me" and "I plan to use ST solutions in the future" ($r = 0.331$, $p < 0.001$). This could suggest that while immediate entertainment impacts daily decisions, long-term planning may depend more on utilitarian factors like cost-effectiveness and reliability rather than purely hedonic ones. These findings highlight the nuanced role of hedonic motivation in short-term versus long-term behavioral intentions.

Furthermore, additional analysis revealed no significant differences in the relationships between hedonic motivation and intention to use ST solutions across demographic (e.g., age) or socio-economic variables (e.g., role in the household). This consistency suggests that the influence of hedonic motivation transcends demographic and socio-economic boundaries, making it a universal factor in promoting ST solutions.

The implications of this study are directed toward policymakers, system designers, and operators of smart transportation solutions, providing actionable insights to enhance user engagement, promote adoption, and ensure the long-term success of these systems.

Policymakers should recognize the importance of hedonic motivation in encouraging the adoption of smart transportation systems. Integrating gamification, rewards, and entertainment-focused features into public transit and mobility platforms can enhance user engagement, making these systems more appealing to diverse user groups. For example, designing city-wide challenges or incentive programs tied to environmentally friendly commuting could drive broader adoption.

Smart transportation systems should prioritize user experience design that incorporates elements of fun, engagement, and aesthetic appeal. For instance, gamified interfaces, personalized travel suggestions, and interactive visualizations can increase user satisfaction and retention. The strong correlation between entertainment and daily usage intentions suggests that frequent users, such as commuters, may particularly benefit from such features.

Operators should focus on real-time feedback mechanisms that enhance the pleasurable aspects of transportation, such as providing accurate arrival times, seamless ticketing systems, or even integrated music or media streaming. These features can make commuting not just a necessity but an enjoyable experience.

The lower correlation observed in long-term intentions points to a potential gap in ensuring the sustained use of ST solutions. Operators and policymakers should address this by aligning hedonic features with utilitarian benefits, such as cost savings and reliability, to secure long-term user commitment.

In summary, the findings emphasize the critical role of hedonic motivation in shaping user behavior toward smart transportation solutions. By leveraging these insights, stakeholders can

design systems that are not only efficient and sustainable but also emotionally engaging, ensuring widespread adoption and satisfaction.

6. Conclusion, limitations and future research

6.1. Conclusion

The findings of this study confirm the hypothesis that hedonic motivation has a moderate positive influence on the intention to use smart transportation (ST) solutions. Across all analyzed aspects, hedonic factors such as enjoyment, entertainment, and pleasure demonstrated statistically significant correlations with user intentions, with the strongest relationships observed for daily usage. These results reinforce existing theoretical frameworks, such as the Technology Acceptance Model (TAM) and UTAUT, which underscore the importance of emotional and experiential factors in technology adoption.

This study also highlights the universal nature of hedonic motivation, as no significant differences were found across demographic or socio-economic variables. These findings suggest that incorporating hedonic elements, such as gamification and engaging design, can be effective across diverse populations, providing critical insights for the development of user-centered smart transportation solutions.

6.2. Limitations

Despite its contributions, this study has several limitations. First, the data were collected using the CAWI method, which, while efficient, may exclude individuals without regular internet access, potentially limiting the generalizability of the findings. Second, the study focused exclusively on urban residents in Poland, which may limit the applicability of the results to rural areas or other cultural contexts. Further research in different geographic and cultural settings is needed to validate the findings.

Additionally, while the study confirms the role of hedonic motivation in shaping intentions, it does not directly measure actual usage behavior. Future studies should incorporate longitudinal designs to explore whether these intentions translate into sustained adoption of smart transportation solutions over time.

6.3. Future research

While this study sheds light on the role of hedonic motivation in influencing the intention to use smart transportation solutions, several areas remain open for further exploration. Future research should investigate how cultural differences shape the relationship between hedonic

motivation and the adoption of smart transportation, particularly through cross-cultural comparisons. Such studies could help identify universal versus culturally specific aspects of user engagement, especially in less explored regions.

Additionally, longitudinal research is needed to bridge the gap between intention and actual behavior. Tracking users over time could provide insights into whether hedonic motivation sustains long-term adoption and continued use of smart transportation solutions. Understanding the interplay between hedonic and utilitarian motivations also represents an important avenue for further study, as exploring how emotional and practical factors interact may yield more comprehensive models of user behavior.

The rapid integration of emerging technologies, such as artificial intelligence (AI), virtual reality (VR), and augmented reality (AR), into smart transportation systems also offers exciting opportunities for future research. These technologies have the potential to significantly enhance hedonic experiences, and understanding their impact on user engagement could guide the design of more effective systems. Moreover, examining how hedonic motivation can be aligned with sustainability goals is critical, particularly in encouraging environmentally friendly commuting behaviors through gamification or rewards.

By addressing these directions, future research can build on the current findings to deepen our understanding of user motivations and improve the development and adoption of smart transportation systems worldwide.

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LOGISTICS SUPPLY CHAIN STRATEGIES OF MANUFACTURING AND TRADING ENTERPRISES: IMPACT OF COVID-19 AND WAR IN UKRAINE

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Purpose: The aim of the article is to analyze and assess the influence of the Covid-19 pandemic and the war in Ukraine on the supply chain logistics strategies in the context of shaping the results of enterprises implementing them that form the supply chain on the example of the selected Polish manufacturing and trading enterprises.
Design/methodology/approach: The article is based on the study of literature and own empirical research. The results of own empirical research presented in the study are the effects of more extensive research on the analysis of logistics systems and logistics processes management in Polish manufacturing and trading enterprises in years 2020-2022 in the context of building the competitiveness of the enterprise. The research was being conducted from January 2023 to April 2024 among 459 randomly selected small, medium and large Polish manufacturing and trading enterprises.
Findings: The Covid-19 pandemic and the war in Ukraine had a huge influence on logistics strategies in the vast majority of the surveyed manufacturing and trading enterprises. The most effective logistics managers made changes to logistics strategies that were appropriate to the conditions during the Covid-19 pandemic and the war in Ukraine. The conducted research confirmed that the implementation of a logistics strategy in the supply chain that is appropriate to the conditions enables the reduction in the likelihood of disruptions in the logistics system, quick and effective response to disruptions in logistics processes in the conditions of the Covid-19 pandemic and the war in Ukraine, appropriate response to the market challenges, achievement of the set goals, increase in sales revenues at the same or even better financial liquidity than the competition and reduction in costs, and consequently, creation and maintenance of competitive advantage of the enterprises that form the supply chain.
Research limitations/implications: This article presents only selected aspects of the influence of the Covid-19 pandemic and the war in Ukraine on the supply chain logistics strategies.
Practical implications: The article offers practical suggestions for logistics managers on how to apply supply chain logistics strategies in the conditions of the Covid-19 pandemic and the war in Ukraine.
Originality/value: The article fills the cognitive gap regarding the issue of supply chain logistics strategies. It provides an extensive review of the literature on supply chain logistics strategies in the conditions of the Covid-19 pandemic and the war in Ukraine. The article also fills the empirical gap. It presents the results of author's own research on selected aspects of the influence of the Covid-19 pandemic and the war in Ukraine on supply chain logistics strategies.
Keywords: supply chain, logistics, logistics supply chain strategies, enterprise, Covid-19

Category of the paper: research paper.

1. Introduction

In the conditions of unprecedented dynamics of changes in the contemporary global economy, complexity, uncertainty and high risk, the flows of various types of products, information and money on the scale of the enterprise and the entire market system are particularly susceptible to disruptions (Hohenstein et al., 2015; Snoeck, Udenio, Fransoo, 2019; Zhang et al., 2020; Baghersad, Zobel, 2021; Choi et al., 2023; Adana et al., 2024; Wang, Zhou, Zhao, 2024). Logistics is responsible for managing the streams of physical flows, services and related with them information in the enterprise and between economic entities participating in the delivery of a product or service to the customer in order to ensure the desired level of customer service at the lowest possible costs. In the current circumstances, the key challenge for the logistics managers is to limit the likelihood of disruptions of logistics processes in the entire logistics system, quickly take actions to reduce the severity of the effects of the occurred event, and create and maintain competitive advantages of the enterprise.

Contemporary enterprises increasingly compete with supply chains. In the literature, the term "supply chain" is interpreted ambiguously (Carter, Rogers, Choi, 2015; Wieland, 2020). In this article, it is assumed that the supply chain includes enterprises that cooperate with other companies participating in the process of delivering a product or service to the customer and their customers, between which physical flows, services, information and financial resources flow. The above-mentioned flows in the supply chain are related to one product or a group of products, as a result, particular enterprises can be perceived as participants in many supply chains. The supply chain can include both all flows from the beginning of value creation to the final customer, as well as a smaller scope of flow, e.g. from one entity to another (Gąsowska, 2018, pp. 107-108). Supply chain management refers to the activities of enterprises participating in the delivery of a product or service to the customer of a logistical and non-logistical nature. Logistics plays a key role in the supply chain (Świerczek, 2019; Song et al., 2022).

The Covid-19 pandemic, declared on March 11, 2020 by the World Health Organization, disrupted the flow of materials and products and caused a great number of new challenges in supply chains around the world. This unprecedented situation forced managers and researchers to evaluate the existing supply chain management and search for solutions to deal with these challenges (Handfield, Graham, Burns, 2020; van Hoek, 2021; Raj et al., 2022; Aljuneidi, Bhat, Boulaksil, 2023; Dwivedi et al., 2023; Maharjan, Kato, 2023; Rinaldi, Bottani 2023; Granillo-Macías et al., 2024; Kauf, Pisz, Tłuczak, 2024, Khare, 2024). The Russia's invasion of Ukraine on February 24, 2022, resulted in unprecedented sanctions on Russia and military support for Ukraine, and severe supply chain disruptions, which compounded the negative effects of

the pandemic (Srai et al., 2023; Czupryna-Nowak, Banasik, Bartnicki, 2023; Duong et al., 2024; Haessner P., Haessner J., McMurtrey, 2024; Nugroho et al., 2024). The Covid-19 pandemic and Russia's invasion of Ukraine have resulted in unprecedented and massive changes to the conditions under which supply chains operate.

The supply chain management process has evolved along with the changing market conditions (Brandao, Godinho Filho, 2024). The challenges in the supply chain management caused by the Covid-19 pandemic and the war in Ukraine have many common features. However, it should be emphasized that disruptions in the supply chains during the pandemic were associated with actions that were intended to prevent the spread of the virus. In the case of the war in Ukraine, disruptions in supply chains are caused by armed conflicts and restrictions due to security and political stability (Grondys, Kot, 2023). Conditions related to the Covid-19 pandemic and the war in Ukraine have influenced the strategic and operational decisions made by the supply chain managers (Kumar, Sharma 2021; Mishra, Pande Sharma, Chaudhary, 2024). The impact of the Covid-19 pandemic on supply chain logistics strategies has not been comprehensively described or thoroughly studied so far. The war in Ukraine is ongoing and its influence on supply chain logistics strategies is complex. The aim of the article is to analyze and assess the influence of the Covid-19 pandemic and the war in Ukraine on the logistics strategies of the supply chains in the context of shaping the results of enterprises implementing them that form the supply chain on the example of selected Polish manufacturing and trading enterprises.

2. Literature review

In a constantly changing environment, achieving above-average results by an enterprise is conditioned by the recognition of the change and implementation of the adequate adjustment measures by the enterprise. Changes in the conditions of the functioning of enterprises require strategic and/or operational responses. Strategic decisions concern a long-term horizon, they come down to the selection of some options of action from an incomplete set of possibilities in an imperfectly perceived environment and the accompanying ambiguity and uncertainty (Czakon, 2020). At the strategic level, decisions are made concerning solving the basic problems of the enterprise; first of all, the enterprise's strategy is formulated. At the operational level, managers make short-term decisions resulting from the implementation of strategic decisions and responding to current disruptions and problems.

Currently, the conditions for the functioning of enterprises have changed radically. The synergistic effect of the influence of contemporary economic determinants poses a major challenge in terms of changes in the methods of the enterprise management (Kafel, Ziębicki, 2021; Mishra, Singh, Subramanian, 2022; Paul et al., 2023). This article focuses primarily on

the analysis of the impact of the Covid-19 pandemic and the war in Ukraine on the supply chain logistics strategies.

The first outlines of the concept of corporate strategy were created at the turn of the 1950s and 1960s. Since then, the company's strategy has been the subject of numerous scientific studies and debates undertaken by both scientists and practitioners (Drucker, 1954; Krupski, Niemczyk, Stańczyk-Hugiet, 2009; Ronda-Pupo, Guerras-Martin, 2012; Martín-de Castro, Amores-Salvadó, Díez-Vial, 2023; Musilová et al., 2023; Vrontis et al., 2024). The essence of the strategy concept is the dynamics of the enterprise's relationships with its environment, expressed by the necessary actions to achieve goals and/or increase results through the rational use of resources (Ronda-Pupo, Guerras-Martin, 2012). When serious disruptions occur in the environment, such as a pandemic or war, managers should make strategic decisions appropriate to the conditions, regarding the reallocation of resources, reconfiguration of structures and processes, and strategy.

Logistics strategy is most often defined as a composition of long-term, internally and externally coordinated logistics activities and solutions aimed at achieving competitive advantage (Witkowski, 1995, 46). Logistics strategy in the enterprise can be a functional strategy or a key element of the enterprise strategy (Autry, Zacharia, Lamb, 2008; McGinnis, Spillan, Virzi, 2012; Gąsowska, 2018; Rakyta et al., 2022). Logistics as a key element of the enterprise strategy has a significant influence on the management system and subsystems. Nevertheless, a functional logistics strategy must be consistent with the enterprise strategy. Logistics strategies can create the competitive advantage or support building and/or maintaining the competitive advantage (Gąsowska, 2018; Spillan, Mintu-Wimsatt, Kara, 2018; Matwiejczuk, 2021; Dadzie et al., 2023; Flanagan, McGovern, 2023). Logistics strategies that are adequate to the conditions enable contemporary enterprises to achieve the desired economic and market results.

The logistics competition strategy of the enterprise is a method of gaining the selected competitive advantage using coordinated actions and logistics solutions in order to achieve the intended competitive position (Gąsowska, 2018, p. 122). The logistics competition strategy implemented by the enterprise determines the boundaries of the logistics system, relations between its elements and management system and subsystems. In order to win the competitive battle, contemporary enterprises join into groups of two or more partners. This level is referred to as the network or multi-organizational level. Regardless of the nature and scope of cooperation, the strategy developed for a group of enterprises is a network level strategy (de Wit, Meyer, 2007).

The supply chain logistics strategy constitutes a composition of long-term activities and logistics solutions implemented by all enterprises that are the links in the supply chain and are used to achieve the competitive advantage (Gąsowska, 2016). Creating and implementing the logistics strategy in the supply chain is a very complex process as it involves many decision-makers and is associated with complex politics, conflicts, many challenges, pressure in the process of formulating goals and methods of their implementation.

Supply chain strategies are usually competitive strategies. They are focused on the final customer and are demand-driven. They differ in the degree of adaptation to changes in demand and in what attributes and to what extent they are used in the competition (Ciesielski, 2010, p. 42). The logistics competition strategy of the supply chain is a way of gaining the selected competitive advantage through coordinated actions and logistics solutions implemented by all enterprises that are the links in the supply chain in order to achieve the intended competitive position (Gąsowska, 2018, p. 123).

Enterprises can compete with supply chains that consist of companies operating only within a specific country or entities operating in many countries. The Covid-19 pandemic and the war in Ukraine have significantly affected global supply chains and revealed their high vulnerability to disruptions (Roscoe et al., 2022; Colon, Hochrainer-Stigler, 2023; Sheth, Uslay, 2023; Srai et al., 2023). Some researchers indicate that the Covid-19 pandemic and the war in Ukraine may be a turning point for global supply chains. At the beginning of the pandemic, domestic supply chains were more resistant to the crisis than global supply chains. R.B. Handfield, G. Graham, L. Burns (2020) state that contemporary supply chains are undergoing a natural evolution. Currently, many enterprises are creating unique competitive advantages by creating global supply chains.

According to many scientists, in conditions of extreme uncertainty, enterprises should create resilient supply chains (Adobor, McMullen, 2018; Pettit, Croxton, Fiksel, 2019; Aslam et al., 2020; Cinti et al., 2024). The resilient supply chains are ready to respond quickly and effectively to emerging threats, maintaining the continuity of operations at the desired level and control over the structure and functions (Ponomarov, Holcomb, 2009). The attributes of the resilient supply chains are flexibility and adaptability. The most effective factor building the supply chain resilience in the pandemic conditions was innovation (Ozdemir et al., 2022). Building resilience to supply chain disruptions was also made possible by systemic supply chain risk management, strengthening position, building strong relationships with suppliers, recipients and employees, adequate forecasting and product design (Ozdemir et al., 2022; Browning et al., 2023; Gurbuz et al., 2023).

The literature emphasizes that if demand is predictable and the total delivery time is long, conditions for applying the lean management concept are created. On the other hand, when demand is unpredictable and the total delivery time is short, the agile management strategy should be used. Lean management aims to eliminate all waste. The concept of lean management is closely related to the price leadership strategy. Supply chains implementing the lean management concept strive to reduce costs and offer lower prices than competitors. In contrast, supply chains implementing the agile management strategy strive to provide excellent service to the end customer; flexibility and time compression are of a fundamental importance to them. Some supply chains use the lean management and agile management (leagile) concepts together, adopting specific rules for the division of products into those manufactured in accordance with lean management and agile management (Trojahn, 2018; Da˘gdeviren, Erturgut, 2024).

Recent research focuses on how these three strategies can be used synergistically in an increasingly dynamic and complex business environment to provide greater flexibility in dealing with market demand variability and supply chain uncertainty (Riska, 2024).

Supply chain agility is cited by scientists as one of the fundamental features that should characterise contemporary supply chains (Irfan et al., 2020; Patel, Sambasivan, 2022). Agile supply chains respond faster and better to unforeseen changes in the environment due to their better ability to synchronize demand with supply.

The literature indicates that in the current conditions, enterprises should create sustainable supply chains that develop resilience and consider the integration of goals resulting from the concept of sustainable development as a critical success factor and develop resilience (Sarkis, 2021; Sajjad, 2021). Logistics managers in sustainable supply chains strive to achieve the competitive advantage through coordinated actions and logistics solutions, balancing economic, ecological and social goals to achieve the intended competitive position.

More and more companies are competing by creating a socially responsible supply chain. Socially responsible supply chains undertake voluntary actions aimed at combining care for economic interests with care for the natural environment and compliance with ethical standards in relations with stakeholders (Jastrzębska, 2021). Social responsibility focuses on a single organization and concerns responsibility towards society and the environment. The concept of sustainable development presents the directions of actions taken by enterprises. Supply chains implementing the concept of corporate social responsibility, participate in the process of balancing the economy, and thus pursue the goals of sustainable development.

The Covid-19 pandemic has contributed to the acceleration of digital transformation in enterprises and supply chains (Soto-Acosta, 2020; Gavrila Gavrila, De Lucas Ancillo, 2022; Tiwari et al., 2024). Contemporary supply chains use digital technologies to improve customer service, increase efficiency, visibility, resilience, reduce risk and uncertainty, improve performance in terms of achieving sustainable development goals and shape the competitiveness of the enterprises that are their links (Al-Talib et al., 2020; Modgil, Singh, Hannibal, 2022; Zhao, Hong, Lau, 2023; Belhadi et al., 2024; Ivanov, 2024; Atieh Ali et al., 2024). Digitalization has the influence on the strategic and operational management of supply chains (Hanelt et al., 2021; Verhoef et al., 2021; Paul et al., 2024). Research shows that the implementation of digital technologies is primarily related to technological, economic, financial and organizational barriers (Gupta et al., 2022). In the digital supply chain, it is important to manage supply chain processes using a wide range of innovative technologies (Büyüközkan, Göçer, 2018; Yang et al., 2021).

The agile, resilient, innovative and sustainable supply chains can respond quickly and effectively to emerging opportunities, short-term supply chain disruptions and long-term global crises such as the Covid-19 pandemic (Ivanov, 2022).

Supply chain managers are increasingly implementing the concept of a green supply chain, which emphasizes the environmental protection and minimizing the negative influence

of chains on the environment (Famiyeh et al., 2018; Heydari, Govindan, Basiri, 2020; Rane et al., 2021). Green supply chain management includes all pro-ecological decisions and activities related to synchronizing the main streams of product and information flows in a closed cycle (Banaszyk, Kauf, Szołtysek, 2021). The appropriate use of digital technologies contributes to the improvement of the results of the green supply chain (Feng, Lai, Zhu, 2022). Some researchers emphasize that the implementation of the green supply chain concept strengthens resilience to disruptions.

3. Research methodology

The results of own empirical research analyzed in the article come from more extensive research on the analysis of logistics systems and logistics process management in Polish manufacturing and trading enterprises in years 2020-2022 in the context of building the competitiveness of the enterprise. The research was being conducted from January 2023 to April 2024 using the direct interview method with managers responsible for logistics in the surveyed companies and the computer-assisted interview method using the Internet with logistics managers. During the interviews a detailed survey questionnaire consisting of 38 questions was used.

459 randomly selected small, medium and large Polish manufacturing and trading enterprises (based in Poland) were examined. The study covered enterprises from the following provinces: Masovian, Lesser Poland, Kuyavian-Pomeranian, Lublin, Łódź, Opole, Subcarpathian, Podlaskie, Pomeranian, Silesian, Świętokrzyskie, Warmian-Masurian, Greater Poland and West Pomeranian. In the examined population, the largest group constituted the enterprises from the Mazovian Province. The examined enterprises were characterized by a diversified competitive position on the market.

The largest group among the surveyed companies constituted small enterprises (51.2%). The share of medium-sized enterprises in the surveyed population was 27.5%. The smallest percentage of the surveyed companies constituted large companies (21.3%). Manufacturing and trading companies had a similar share in the surveyed population. Manufacturing enterprises accounted for 52.1% of the surveyed companies (24.0% small manufacturing enterprises, 15.5% medium-sized manufacturing enterprises, 12.6% large manufacturing enterprises), while trading enterprises accounted for 47.9% of the surveyed population (27.2% small trading enterprises, 12.0% medium-sized trading enterprises, 8.7% large trading enterprises).

In the structure of the surveyed enterprises, from the point of view of the sales revenue criterion, the largest group constituted companies achieving sales revenues of up to PLN 10 million in 2022 (45.3%). The second largest surveyed group were enterprises achieving sales revenues from PLN 10 to 50 million (20.0%). The next group constituted enterprises achieving sales revenues from PLN 100 to 500 million (10.7%). Enterprises achieving sales revenues

from PLN 500 million to PLN 1 billion accounted for 8.5% of the surveyed population. 8.1% of the surveyed companies constituted enterprises achieving sales revenues above PLN 1 billion. The smallest share in the surveyed population constituted enterprises achieving sales revenues from PLN 50 to 100 (7.4%).

The majority of the surveyed enterprises (64.9%) conducted international operations in 2022. 73.3% of the surveyed enterprises with a national scope constituted small companies. Among international enterprises, the largest group were companies with an export share in sales value of up to 10% (23.3% of the surveyed sample of the enterprises). The second largest group among international enterprises were companies with an export share in sales value in the range of 10-30% (15.2% of the surveyed sample of the enterprises). Companies with an export share in sales value above 50% constituted 13.5% of the surveyed population. A similar share in the surveyed population constituted enterprises with an export share in sales value in the range of 30-50% (12.9% of the surveyed sample of the enterprises). The surveyed companies with an international scope of operations exported their products primarily to the European Union.

The research results presented in the article concern selected aspects of the supply chain logistics strategies used in practice in the surveyed enterprises in years 2020-2022.

4. Supply chain logistics strategies of the surveyed enterprises and the Covid-19 pandemic and the war in Ukraine – selected aspects

In years 2020-2022, the surveyed enterprises operated in the conditions of the Covid-19 pandemic. The subject of the research were the determinants of logistics strategies used in practice by the surveyed enterprises in years 2020-2022. The analysis of the research results shows that in 2020, in the majority of the surveyed enterprises, the logistics strategy was determined by: constant adaptation of logistics processes to the market conditions related to the Covid-19 pandemic (71.0%), striving to improve customer service (67.8%), building customer trust (53.4%), constant adaptation of logistics processes to the changing market conditions (53.2%).

The analysis of the respondents' declarations allows for the conclusion that in 2021, in over 50% of the surveyed companies, the following aspects significantly influenced the use of the logistics strategy: striving to improve customer service (70.6%), constant adaptation of logistics processes to the market conditions related to the Covid-19 pandemic (69.5%), striving to increase sales revenues (61.0%), constant adaptation of logistics processes to the changing customer wishes and expectations (60.6%), constant adaptation of logistics processes to the changing market conditions (60.3%), constant adaptation of logistics processes to the growing customer requirements (58.8%), building customer trust (55.8%), logistics creates the competitive advantage (51.9%), striving to acquire new customers (51.0%).

The last year of the examined period covers the first months of the war in Ukraine. In 2022, over 50% of the respondents indicated that in the surveyed enterprise, the logistics strategy was determined by: striving to improve customer service (77.1%), constant adaptation of logistics processes to the market conditions related to the war in Ukraine (68.4%), constant adaptation of logistics processes to the changing market conditions (64.9%), striving to increase sales revenues (63.6%), constant adaptation of logistics processes to the growing customer requirements (62.1%), constant adaptation of logistics processes to the changing customer wishes and expectations (61.4%), logistics creates the competitive advantage (59.7%), building customer trust (57.5%), striving to acquire new customers (56.2%), striving to reduce costs – competing with price (54.0%). The analysis of the respondents' declarations shows that in 2022, in almost every fifth surveyed enterprise, the logistics strategy was determined by the market conditions related to the Covid-19 pandemic (19.8%).

In order to check whether there are significant differences in frequency distributions between subsequent periods in the case of responses concerning determinants of logistics strategies used in the surveyed enterprises, chi-square tests were performed. The limit of statistical significance was assumed to be $p < 0.05$. In the subsequent years, a statistically significant increase in the frequency of selecting the following response variants concerning the logistics objectives of the surveyed enterprises: striving to increase sales revenues ($p < 0.001$), constant adjustment of logistics processes to the growing customer requirements ($p < 0.001$), constant adjustment of logistics processes to the changing customer wishes and expectations ($p < 0.001$), striving to acquire new customers ($p < 0.001$), logistics creates the competitive advantage ($p < 0.001$), striving to reduce costs – competing with price ($p < 0.001$), striving to respond faster and better than competitors to the changes in the environment – agility ($p < 0.001$), striving to increase resistance to disruptions ($p < 0.001$), striving to increase sensitivity to the customer needs ($p < 0.001$), striving to increase the innovativeness of the enterprise ($p < 0.001$), balancing economic, social and ecological goals – sustainable development ($p < 0.001$), constant adaptation of logistics processes to the changing market conditions ($p = 0.001$), striving to increase the enterprise adaptability ($p = 0.004$), optimization of logistics personnel management ($p = 0.006$), striving to increase the enterprise flexibility ($p = 0.02$), the logistics strategy is in a constant stage of creation and formation and is characterized by a quick response to the changing customer requirements, environmental conditions and competitors' operations ($p = 0.02$), reducing uncertainty and risk of the conducted business ($p = 0.026$). The answer 'constant adaptation of logistics processes to the market conditions related to the Covid-19 pandemic' had $p < 0.001$. In years 2020-2021, there was an increase, and in 2022, a decrease in the frequency of choosing this response option. The answer 'striving to improve customer service' had $p = 0.05$.

All the surveyed companies in years 2020-2022 had clearly defined logistics goals. The logistics goals of the enterprise should be supported by an appropriate logistics strategy. The analysis of the research results allowed for the conclusion that in 2020, in the majority

of the surveyed enterprises the logistics goals were: improving customer service (68.6%), building customer trust (65.8%), maximizing sales revenues (57.5%), shaping the enterprise's competetive advantage (53.9%), shortening the order processing time (51.4%).

In 2021, the respondents most often indicated that the logistics goals of the enterprise were: improving customer service (73.4%), building customer trust (66.9%), shaping the enterprise's competitive advantage (62.3%), maximizing sales revenues (59.7%), shortening the order processing time (52.5%), faster and better response to the changes in the environment – agility (51.9%), building the effective information system (50.8%).

The analysis of the respondents' declarations allows for the assumption that in 2022, in the vast majority of the surveyed enterprises, the logistics goals were: improvement of customer service (80.4%), shaping the enterprise's competitive advantage (77.8%), building customer trust (70.1%), maximizing sales revenues (68.2%), reduction in logistics costs (65.4%), reliability of deliveries (63.4%), shortening the order processing time (63.2%), faster and better response to the changes in the environment – agility (62.1%). The majority of the participants of the survey indicated that the logistics goals of the enterprise were: increasing the enterprise flexibility (56.9%), building the effective information system (56.4%), increasing the enterprise adaptability (53.6%), building resistance to disruptions (52.3%), increasing sensitivity to customer requirements (50.8%), reducing uncertainty and risk of the conducted business (50.3%).

In the following years, a statistically significant increase in the frequency of selecting the following response options regarding the logistics objectives of the surveyed enterprises in 2020-2022 were: improving customer service ($p < 0.001$), shaping the competitive advantage of the enterprise ($p < 0.001$), shortening the order processing time ($p < 0.001$), reducing logistics costs ($p < 0.001$), increasing the enterprise flexibility ($p < 0.001$), building the effective information system ($p < 0.001$), increasing the enterprise adaptability ($p < 0.001$), increasing sensitivity to customer requirements ($p < 0.001$), faster and better response to the changes in the environment – agility ($p < 0.001$), building resistance to disruptions ($p < 0.001$), developing distribution channels ($p < 0.001$), supporting the process of shaping the enterprise's competitive advantage ($p < 0.001$), increasing the number of distribution channels ($p < 0.001$), increasing resource productivity ($p < 0.001$), increasing logistics innovation ($p < 0.001$), making logistics sustainable ($p < 0.001$), maximizing sales revenues ($p = 0.021$), optimizing logistics personnel management ($p = 0.03$), increasing financial liquidity ($p = 0.04$).

The research shows that not all the surveyed enterprises supported their logistics goals with the appropriate strategy. In years 2020-2022, not all the surveyed enterprises, whose goals included improving customer service, building customer trust, maximizing sales revenues, shaping the enterprise's competitive advantage, shortening the order processing time, reliability of deliveries, reducing uncertainty and risk of the business operations, reducing logistics costs, increasing the enterprise flexibility, building the effective information system, increasing the enterprise adaptability, increasing sensitivity to customer requirements, responding faster and better to the changes in the environment – agility, building resistance to disruptions and

making logistics sustainable, took those goals into account to a sufficient extent in their logistics strategy.

The key barriers in the process of building enterprise competitiveness were examined. The largest number of the respondents indicated that the key limitation in the process of building the enterprise competitiveness in years 2020-2021 were unfavourable conditions related to the Covid-19 pandemic (74.9% in 2020, 74.1% in 2021). In 2022, the largest number of the survey participants indicated that the key barrier in the process of building the enterprise competitiveness were unfavourable conditions related to the war in Ukraine (72.8%). According to the majority of the respondents, the key barriers in the process of building the enterprise competitiveness in years 2020-2022 were: dynamically changing market conditions (70.8% in 2020, 71.5% in 2021, 69.9% in 2022), unfavourable market conditions (69.1% in 2020, 70.1% in 2021, 65.1% in 2022), demand fluctuations (65.8% in 2020, 64.7% in 2021, 64.3% in 2022), insufficient competitive potential of the enterprise (64.9% in 2020, 66.0% in 2021, 64.5% in 2022), supply fluctuations (62.5% in 2020, 63.2% in 2021, 61.2% in 2022), inability to respond quickly to the emerging opportunities (57.3% in 2020, 60.1% in 2021, 59.9% in 2022), inconsistent priorities (53.6% in 2020, 54.9% in 2021, 53.8% in 2022), high costs of running business (51.2% in 2020, 57.5% in 2021, 63.2% in 2022).

In subsequent years, a statistically significant increase in the frequency of selecting the following response options was observed regarding key barriers in the process of building the enterprise competitiveness in years 2020-2022: high costs of running business ($p < 0.001$), problems with maintaining financial liquidity ($p = 0.007$). The response to the unfavourable conditions related to the Covid-19 pandemic had $p < 0.001$. In years 2020-2021, there was an increase, and in 2022, a decrease in the frequency of selecting this response option.

The subject of the study were the logistics strategies used in practice by the surveyed enterprises in years 2020-2022. The analysis of the research results showed that in 2020, 75.2% of the surveyed companies had a formalised logistics strategy thus they had developed a coherent concept of systemic action in the area of logistics, whose implementation was to achieve the competitive advantage. In the analyzed period, the percentage of the surveyed enterprises with a formalised logistics strategy increased year by year (79.9% in 2021, 81.2% in 2022). In years 2020-2022, the percentage of the surveyed enterprises without a formalised logistics strategy was definitely higher in small enterprises than in medium and large enterprises.

The analysis of the respondents' declarations allows for the assumption that in years 2020-2022, less than half of the surveyed companies had a formalised global logistics strategy (41.0% in 2020, 42.9% in 2021, 44.4% in 2022). In 2020, 27.0% of the surveyed companies had a formalised supply chain management strategy (69 manufacturing enterprises, 55 trading enterprises). In 2021, the number of the surveyed manufacturing enterprises with a formalised supply chain management strategy increased to 76, and trading companies to 60. In 2022, 32.9% of the surveyed companies implemented a supply chain management strategy (85 manufacturing enterprises, 66 trading enterprises). In years 2020-2022, in the majority of the surveyed

medium and large manufacturing and trading enterprises in which logistics created the competitive advantage implemented a supply chain management strategy that was in a constant stage of creation and formation, characterized by a rapid response to the changing customer requirements, environmental conditions and competitors' operations.

The results of the conducted research gave the bases for the conclusion that in years 2020-2022, more than the third of the surveyed enterprises did not have a formalised global logistics strategy, but had developed partial strategies regarding procurement, production and distribution (18.7% in 2020, 20.3% in 2021, 19.8% in 2022), partial strategies regarding procurement and distribution (12.4% in 2020, 13.7% in 2021, 14.0% in 2022), partial strategies regarding distribution (2.4% in 2020, 1.7% in 2021 and 2022), partial strategies regarding procurement and production (0.7% in 2020, 0.4% in 2021 and 2022) or partial strategies regarding procurement (0.9% in 2021 and 2022).

The largest number of the surveyed enterprises used the agile management strategy in the supply chain management in the analyzed period. In 2020, 66 out of 124 surveyed companies with a formalised supply chain management strategy (53.2%) implemented the agile management strategy (37 manufacturing enterprises and 29 trading enterprises). In 2021, the agile management strategy was implemented by 71 surveyed companies (39 manufacturing enterprises and 32 trading enterprises, which constituted 52.2% of the surveyed enterprises with a formalised supply chain management strategy), and in 2022, this strategy was implemented by 61 surveyed companies (35 manufacturing enterprises and 26 trading enterprises, which constituted 40.4% of the surveyed enterprises with a formalised supply chain management strategy).

In 2020, the lean management strategy was applied by 38 surveyed enterprises, including 21 manufacturing enterprises and 17 trading enterprises (30.7% of the surveyed enterprises with a formalised supply chain management strategy). In 2021, the lean management strategy was applied by 40 surveyed enterprises (24 manufacturing enterprises and 16 trading enterprises, which constituted 29.4% of the surveyed enterprises with a formalised supply chain management strategy). In 2022, 53 surveyed enterprises applied the lean management strategy (33 manufacturing enterprises and 20 trading enterprises, which constituted 35.1% of the surveyed enterprises with a formalised supply chain management strategy).

The analysis of the research results allowed for the conclusion that some of the surveyed enterprises used the lean management and agile management (leagile) concepts together in years 2020-2022. In 2020, 20 surveyed enterprises used the lean management and agile management concepts together (11 manufacturing enterprises and 9 trading enterprises, which constituted 16.1% of the surveyed enterprises with a formalized supply chain management strategy). In 2022, 25 surveyed enterprises implemented lean management (13 manufacturing enterprises and 12 trading enterprises, which constituted 18.4% of the surveyed enterprises with a formalised supply chain management strategy), and in 2022, 37 surveyed enterprises used

lean management (17 manufacturing enterprises and 20 trading enterprises, which constituted 24.5% of the surveyed enterprises with a formalised supply chain management strategy).

On the basis of this study it has been assumed that in years 2021-2022, in nearly 70% of the surveyed enterprises, the logistics strategy was determined by the constant adaptation of logistics processes to the market conditions related to the Covid-19 pandemic. In 2022, in approximately 70% of the surveyed companies, the logistics strategy was determined by the constant adaptation of logistics processes to the market conditions related to the war in Ukraine. In almost every fifth surveyed company, the logistics strategy was determined by the market conditions related to the Covid-19 pandemic in 2022. The logistics strategies used in the surveyed companies were adapted to external and internal conditions. During the Covid-19 pandemic and the war in Ukraine the most effective logistics managers made changes in logistics strategies that were appropriate to the conditions. The enterprises achieving the best economic and market results implemented the supply chain management strategy. In the analyzed period, 27 surveyed enterprises implemented the supply chain management strategy (7 manufacturing enterprises and 5 trading enterprises in 2021, 9 manufacturing enterprises and 6 trading enterprises in 2022). The majority of the enterprises achieving the best results in the analyzed period implemented the supply chain management strategy that was in a constant stage of creation and formation, and was characterized by a rapid response to the changing customer requirements, environmental conditions and competitors' operations, respecting, at the same time, the principles of sustainable development. The supply chain logistics strategies enabled the best enterprises to incessantly adapt logistics processes to the market conditions related to the Covid pandemic and the war in Ukraine, changing market conditions, changing customer wishes and expectations, and growing customer requirements, improve customer service, increase flexibility, adaptability, resilience to disruptions and innovation, respond to the changes in the environment faster and better than competitors, and reduce costs, respecting, at the same time, sustainable development goals, and consequently, achieve above-average economic and market results.

5. Conclusion

The Covid-19 pandemic and the war in Ukraine had a huge influence on logistics strategies in the vast majority of the surveyed manufacturing and trading enterprises. The examined enterprises had to face many challenges related to logistics in the analyzed period, which resulted in a significant increase in the influence of logistics on their economic and market results. The logistics strategies used in the surveyed companies were adapted to external and internal conditions. The majority of the enterprises achieving the best results in the analyzed period implemented the supply chain management strategy that was in a constant stage of creation and

formation, and was characterized by a rapid response to the changing customer requirements, environmental conditions and competitors' operations, respecting, at the same time, the principles of sustainable development. The supply chain strategies and other global logistics strategies implemented by the examined enterprises constituted competitive strategies. The largest number of surveyed companies in the analyzed period used the agile management strategy in the supply chain management. In years 2020-2022, the percentage of the enterprises that combined the concepts of lean management and agile management (leagile) increased the most. A large group constituted enterprises in which, during the pandemic and the war in Ukraine, logistics goals were defined adequately to the conditions, but they were not supported by the appropriate logistics strategy.

During the Covid-19 pandemic and the war in Ukraine the most effective logistics managers made changes in logistics strategies that were appropriate to the conditions. The conducted research confirmed that implementing the logistics supply chain strategy that was appropriate to the conditions allowed for a greater adaptation of operations to the conditions related to the Covid-19 pandemic and the war in Ukraine. The enterprises that were links in the agile, resilient, innovative and sustainable supply chains reduced the likelihood of disruptions in the logistics system, responded quickly and effectively to disruptions in logistics processes during the Covid-19 pandemic and the war in Ukraine, responded appropriately to the market challenges, achieved the set goals, increased sales revenues with the same or better financial liquidity than the competition, reduced costs, and consequently, created and maintained competitive advantages.

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EVALUATING THE EFFECTIVENESS OF THE PROCESS MANAGEMENT MODEL IN COORDINATED PATIENT CARE

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Purpose: The aim of this article is to provide a preliminary analysis of the benefits regarding the implementation of coordinated care mechanisms for patients with multiple sclerosis. On the basis of a literature review, the analysis was carried out on the example of a selected department in a clinical hospital.
Design/methodology/approach: The research was conducted by using a case study combined with the use of direct observation by the co-author of the article. The selection of a clinical hospital in the discussed scope allows for the formulation of appropriate final conclusions.
Findings: The analysis of the case study allows preliminary conclusions to be drawn regarding projects for the implementation of coordinated medical care for multiple sclerosis patients.
Research limitations/implications: Using a case study of one hospital confirms a limitation in the complete generalization of the final conclusions
Originality/value: The article points out important aspects of conducting research on the effects of coordinated care using a selected example. management. For practitioners involved in the health sector, the article can serve as a reference in seeking inspiration for in-depth research in this area.
Keywords: coordinated care; hospital, organizational change, process management
Category of the paper: case study.

1. Introduction

The problem of coordination of medical care is currently very strongly emphasized on the strictly medical ground, but also on the theory and practice of management in the health care sector (Guzek et al., 2023). In Poland, these experiences are primarily related to the area of cardiology (Wita et al., 2020), oncology (Różalska, Czech, 2017) and primary health care (Czerska, 2018).

Fragmentation and lack of continuity of care, resulting from the deepening division into narrow specializations, are perceived as one of the most serious imperfections of modern health care systems and pose challenges in the processes of improving the health care system at the national and regional level and in the context of the functioning of individual healthcare entities. Poor coordination between the sphere of treatment and the sphere of patient care seems to be particularly acute (Hermanowski, Rutkowski, 2015).

The authors of the article identified the problem in the context of care for patients with multiple sclerosis. The postulate to introduce activities in the field of coordinated care for patients with multiple sclerosis appeared taking into account medical (Wiktorzak et al., 2019) and technological aspects (Hogervorst et al., 2023), along with the identification of key success factors in this area (Kroll, Neri, 2003) and analyses of financial effectiveness (Weinstein et al., 2022). An attempt to analyze the basic effects associated with the introduction of mechanisms of coordinated care for patients with multiple sclerosis seems to be an inspiring research intention.

2. The essence and objectives of coordinated medical care

Currently, Polish society allocates most of its funds to restorative medicine, with a small share of expenditure on broadly understood prevention. Taking into account the aging of the society and the development of medical technologies, it is assumed that in the future Poles will not be able to afford to maintain these proportions. Therefore, it is necessary to introduce coordinated health care, from building a health-promoting foundation to coordinating the treatment process at all its levels. The so-called compliance, i.e. cooperation between the patient and the doctor, is also very important. Guiding the patient through the treatment process and the healthcare system will reduce costs and improve the patient's standard of living. Therefore, attention should be paid to the patient's cooperation both in the prevention of diseases and during the disease. To this end, it is worth creating supporting mechanisms in the public and private systems (Fal, 2013, pp. 50-51). Therefore, the subject of coordinated medical care is becoming an important trend in modern medicine, but also in health care management (Kowalska, 2008).

The specific objectives of coordinated care identified in many programs around the world are: to improve the design and delivery of patient-centered healthcare; to improve the quality of services for the elderly, chronically ill and disabled; to reduce fragmentation, fill gaps and remove surplus/increase resource efficiency; to ensure continuity and coordination of treatment; to prevent medical errors; to increase public satisfaction with the health care system and treatment processes; increasing the cost effectiveness of the processes carried out (Kozieł et al., 2017, p. 253).

Coordinated health care is a set of activities aimed at achieving a high level of health care while reducing unnecessary costs of health care through the use of a number of mechanisms, which include: economic incentives for doctors and patients to choose optimal forms of care; assessment of the medical necessity to provide selected services, balancing the distribution of costs borne by the beneficiary, control of hospital admissions and length of stay, Establish incentives for outpatient treatments, selective contracting of health care providers, and intensive management in cases of high healthcare costs (Różalska, Czech, 2017). In the literature, it is also sometimes called integrated health care, as well as comprehensive, holistic and shared care. This approach to the patient is the opposite of the currently popular form of fragmented care – focused on episodic provision of medical services. In the coordinated model, the scope of the patient's needs should first be identified: health and related to everyday functioning, and then services should be planned aimed at structured activities aimed at satisfying these needs. Care is provided by interdisciplinary teams of healthcare providers in a way that allows you to achieve your medical goals and daily life goals (Kieszkowska-Grudny, 2018).

The main principle of coordinated care is active involvement and strengthening the role of the patient, which translates into the effects of health care, patient and service provider satisfaction, and cost effectiveness. It is important to take a holistic approach that takes into account, in addition to the patients themselves, also caregivers, local communities, as well as minorities and more vulnerable groups (Czerska et al., 2019). As a result of coordination, the patient ceases to be a petitioner and becomes the center of attention. In a system without coordination, the patient's health problem is only his problem (Zawalski, 2016, p. 47). Coordinated care should ensure the continuity and consistency of the implemented health interventions. She is expected to have a planned, proactive and results-oriented care plan. The doctor, on the other hand, should determine the procedure that will allow to achieve the best therapeutic effect, maintain the best possible health condition for the patient, minimize the risk of exacerbations, inhibit or slow down the progression of the disease and, at the same time, limit the effects of deterioration of the patient's health both for himself and for society, including the health care system (Kozierkiewicz, 2017, pp. 23-24).

More attention should be paid to detailed monitoring and analysis of the results of the implementation and application of a coordinated system of organization of the provision of health services, not only in terms of justifying the investments incurred, but also in terms of considering the quality of care offered (Kozieł et al., 2017, p. 255). Healthcare management that takes into account coordination processes can be one of the ways to meet demographic, epidemiological, technological challenges or patient expectations, while at the same time facing economic pressure (Rudawska, 2011).

3. Research method

The motivation for the analysis was the assumption that uncoordinated health care in the treatment of patients with multiple sclerosis means a lack of effective cooperation between different service providers in the health care system. This can lead to a number of problems that have a negative impact on both patients and the system as a whole. Here are the top drawbacks of uncoordinated healthcare:

1. Communication problems - lack of information flow between doctors, specialists and hospitals can lead to diagnostic and therapeutic errors. Patients have to repeat the same information multiple times in different facilities, which is cumbersome and increases the risk of inaccuracies.
2. Unnecessary repetition of tests - uncoordinated care can result in ordering the same tests by different doctors, which generates unnecessary costs and burdens the patient.
3. Lack of continuity of treatment - when a patient is treated by different specialists without proper exchange of information, the therapy may be inconsistent, which reduces the effectiveness of the treatment.
4. Increased medical risk – without central access to full medical records, the risk of drug interactions, incorrect dosage or other medical errors increases.
5. Longer waiting times - patients may be referred for unnecessary consultations or tests, which increases the time it takes to get the right diagnosis and treatment.
6. Stress for patients – patients often feel frustrated and anxious when they have to coordinate different aspects of their healthcare on their own.
7. Higher costs – lack of effective coordination leads to wasted resources (e.g. repeat tests, unnecessary procedures), which puts a strain on both the patient and the healthcare system.

Currently, despite the equipment and personnel capabilities of the medical unit, the patient cannot use all the services that are necessary for his treatment to bring the expected medical results in one place on an outpatient basis. The lack of a contract in the field of outpatient rehabilitation means that patients are occasionally admitted to the hospital for one-day stays related to the treatment of multiple sclerosis and can also use the modern equipment at the disposal of the unit. The same problem is with the care of a psychologist. The patient can use it only during a hospital stay. Outpatient rehabilitation currently does not function in the hospital only or even due to the lack of a contract with the National Health Fund.

The study used data on the organization of the treatment process of patients with multiple sclerosis on the example of a selected neurological ward of a teaching hospital. The analysis concerned basic data from 2019-2023 in the field of medical statistics in terms of waiting time for admission, average length of stay in the ward and the number of patients treated as part of outpatient specialist care. In addition, data on drug programs implemented in this area by hospitals from the Silesian Voivodeship are presented.

4. Analysis of empirical findings

The National Health Fund finances drug programmes for patients with multiple sclerosis (Table 1).

Table 1.
Drug programs dedicated to patients with multiple sclerosis

Code	Name
03.0000.329.02	Drug program - treatment of multiple sclerosis
03.0000.346.02	Drug program - treatment of multiple sclerosis after failure of first-line drug therapy or rapidly developing severe multiple sclerosis or primary progressive multiple sclerosis
03.0001.329.02	Drugs in the drug program - treatment of multiple sclerosis
03.0001.346.02	Drugs in the drug program - treatment of multiple sclerosis after failure of first-line drug therapy or rapidly developing severe multiple sclerosis or primary progressive multiple sclerosis

Source: register of contracts of the National Health Fund.

The drug program - treatment of multiple sclerosis after failure of first-line drug therapy or rapidly developing severe multiple sclerosis or primary progressive multiple sclerosis was financed until the end of 2022. However, from 2023, all patients are treated under a single drug program called multiple sclerosis treatment.

Table 2.
Drug program – treatment of patients with multiple sclerosis (03.0000.329.02) – the largest implementers in the Silesian Voivodeship

	2019	2020	2021	2022	2023
Prof. Leszek GIEC Upper Silesian Medical Centre of the Medical University of Silesia in Katowice	11 146 666,72	11 181 192,68	12 603 424,00	12 883 293,47	15 852 778,04
Provincial Specialist Hospital No. 4 in Bytom	4 306 101,00	4 634 461,00	4 967 700,00	6 032 299,15	7 747 834,80
Prof. K. GIBIŃSKI University Clinical Centre of The Medical University of Silesia in Katowice	8 889 604,00	10 184 996,00	10 707 330,00	7 319 344,29	16 604 388,70
KMK-Clinical Limited Liability Company	5 878 355,00	6 106 501,00	5 625 109,00	5 494 884,89	7 085 951,44
Complex Of Health Care Facilities in Cieszyn	3 595 941,00	3 758 284,00	4 375 186,00	4 814 285,21	5 377 794,40
Independent Public Health Care Institution Provincial Specialist Hospital No. 3 in Rybnik	3 575 148,00	3 400 152,00	4 377 526,00	5 055 202,68	5 787 662,07
Independent Public Clinical Hospital No. 1 Named After Prof. Stanisław Szyszko Sum in Katowice	9 781 080,00	10 935 157,00	12 237 234,00	16 105 040,10	19 189 284,20
Total Expenditure in the Silesian Voivodeship	53 842 079,84	58 215 793,64	68 606 257,77	93 192 735,34	105 704 598,70

Source: Own work based on NFZ data.

The final financial plan of the National Health Fund for 2023 - the costs of health care services - drug programs amounted to PLN 10,128,272 thousand. of which 6.15% is expenditure on the drug program – treatment of multiple sclerosis (excluding children's centers).

The table below presents hospitals from the Silesian Voivodeship with contracts in 2023 above 5 million. PLN.

Moving on to the detailed analysis at the level of a specific neurological ward, the first analysis of the number of patients in outpatient health care and hospitalisation in the neurology ward was carried out in the unit.

Table 3.
Number of patients in 2019-2023

Number of patients in each year	2019	2020	2021	2022	2023
Branch	37	64	91	166	291
Clinic	301	324	368	427	532

Source: own study based on the data of the analyzed hospital.

The table below shows the number of outpatient visits and ward stays in 2019-2023.

Table 4.
Number of outpatient visits and ward stays in 2019-2023

Number of visits/stays in each year	2019	2020	2021	2022	2023
Branch	232	268	365	450	542
Clinic	3 217	1 746	1 498	1 630	2 050

Source: own study based on the data of the analyzed hospital.

In addition, analysed data on the number of days of stay in the ward in 2019-2023.

Table 5.
Number of days of stay in a hospital ward in 2019-2023

Number of days of stay	2019	2020	2021	2022	2023
1 day	217	211	248	254	416
2 days	1	18	62	126	55
3 days	3	14	19	30	17
4 days		5	10	19	15
5 days	2	4	15	10	7
6 days	2	6	9	3	19
7 days		5	1	5	5
8 days	2	1	1	2	3
over 8 days	5	4		1	5
together	**232**	**268**	**365**	**450**	**542**

Source: own study based on the data of the analyzed hospital.

The neurology department, which houses the Multiple Sclerosis Treatment Centre, can play a key role in diagnosing and treating patients with multiple sclerosis (MS) as a coordinated care centre. MS is a chronic autoimmune disease in which the immune system attacks the myelin sheaths of the nerves in the brain and spinal cord, leading to neurological disorders. Neurology departments are specialized in comprehensive care for these patients.

The introduction of coordinated care mechanisms in the analysed area would allow patients to be provided with an efficient treatment process by:

1. Diagnosis - imaging tests: magnetic resonance imaging (MRI) is crucial in detecting demyelinating lesions in the brain and spinal cord. Laboratory tests: analysis of cerebrospinal fluid (CSF) to detect oligoclonal bands, characteristic of MS. Neurological tests: assessment of motor, sensory and cognitive functions to confirm the clinical signs of MS.
2. Pharmacological treatment - disease-modifying therapies.
3. Treatment of relapses.
4. Symptomatic treatment: spasticity, neuropathic pain, bladder problems, fatigue or cognitive disorders – medications adapted to the symptoms.
5. Rehabilitation - physiotherapy: supporting motor functions, improving balance and muscle strength. Occupational therapy: help in adapting daily activities to the patient's abilities.
6. Psychological support: coping with depression, anxiety, and other emotional issues related to the disease.
7. Patient monitoring - regular check-ups to assess the effectiveness of the therapy and monitor the progression of the disease. Detection and treatment of complications, such as infections, that can exacerbate symptoms.
8. Multidisciplinary support - Neurologists often work with psychologists, speech therapists, urologists, and nutritionists to provide holistic care.
9. Participation in clinical trials: neurology departments can conduct research into new therapies for MS.

Enabling the centres to conduct outpatient rehabilitation should reduce the number of hospitalisations within the Department by about 30%. Such a situation in 2023 would reduce the number of man-days for patients with multiple sclerosis by 125 man-days.

Analyzing patients from the neurology ward who were enrolled in the stable queue, the average hospitalization time is 7.13 days. The lowest value was 6.07 in July and the highest in September was 8.61 days. The average waiting time is 32.6 days (the lowest in April 28, the highest in November 39).

On this basis, it can be concluded that the introduction of the analyzed organizational solution would allow to admit about 18 more patients each month and reduce the waiting time by about 2 days on average.

With advances in medicine and a multidisciplinary approach, neurology departments are able to significantly improve the quality of life of patients with multiple sclerosis as part of coordinated care for patients with multiple sclerosis.

5. Conclusions

Coordinated care for patients with multiple sclerosis (MS) has many benefits for both patients and the healthcare system. With an integrated approach that focuses on collaboration between different specialists, case management and an individual approach to the patient, it is possible to improve the quality of life of patients, optimize treatment and increase the efficiency of care.

Here are the main benefits of coordinated care for MS patients:

1. Coordinated care provides an integrated approach that takes into account all aspects of a patient's MS life:
   - physical: regular monitoring of health, adjustment of pharmacological and rehabilitation treatment,
   - psychological: access to psychological support, which is especially important due to depression, anxiety and other mental problems that often accompany MS,
   - social: assistance in the integration of the patient into social life, support in obtaining social assistance, benefits and advice on work.
2. Improving coordination between specialists:

a) patients with multiple sclerosis require care from various specialists, such as neurologists, physiotherapists, psychologists, dieticians or nurses specializing in MS,

b) Coordinated care: Increases the efficiency of collaboration between these professionals, preventing duplication of testing, delays in diagnoses, and unnecessary hospitalizations.

c) It enables rapid exchange of information between care team members, leading to better therapy consistency and tailoring treatment to the patient's current needs.

3. Faster response to changes in health:

a) In the coordinated care model, there is systematic monitoring of the patient's health. This allows you to react faster to exacerbations of symptoms or changes in your health, which prevents serious complications and reduces the need for hospitalization. Patients have easier access to doctors and specialists, which reduces the waiting time for needed interventions and reduces the stress associated with the disease.

4. Improving patients' quality of life:

a) Coordinated care improves patients' lives in many ways:
   - better control of the disease means fewer episodes of exacerbations and less need for hospitalization,
   - reduces the number of exacerbations and hospitalizations.

b) Improves symptom management – With better coordination, patients can better manage symptoms such as fatigue, balance disorders, pain, and cognitive problems.

c) supports patient autonomy – with tailored support, patients can maintain their independence and self-reliance for longer, resulting in a better quality of life.

5. Reducing the burden on caregivers, as a disease such as multiple sclerosis often places a heavy burden on patients' families and carers. Coordinated care:
   - relieves caregivers - by organizing medical and social care in a more coherent and predictable way,
   - It provides psychological and informational support for caregivers, which helps them to better cope with the challenges of daily care for patients.
6. Optimize treatment and reduce costs of care:

a) Coordinated care can lead to treatment optimization and savings in the health care system by:
   - reduction of the number of complications - better control of the disease allows for a reduction in the number of complications, such as infections or injuries caused by falls,
   - Reduce unnecessary medical interventions – patients receive coordinated care, reducing duplication of diagnostic tests and unnecessary hospital visits
   - Resource savings – Reducing hospitalizations and emergency interventions translates into lower long-term care costs.

7. Increased patient involvement in the treatment process:

a) Coordinated care gives patients more control over their treatment because patients are more involved in making decisions about their care. Their awareness of the disease increases, which improves cooperation with the medical team and leads to better adherence to therapeutic recommendations.

8. Increase patient satisfaction, as patients in coordinated care often express greater satisfaction with the quality of care because:
   - They feel more cared for, they feel that their needs are better understood and taken into account in the treatment plan. Care is more personalized. A patient-centred approach makes care more responsive to the individual needs of patients.

The above-mentioned benefits could, if further analyses are carried out in this respect, be the subject of in-depth analyses from the point of view of benefits for: the patient, the hospital ward, the entire hospital, the entire health care system including the social security system.

According to the few existing studies in this area, most have shown a beneficial economic impact of integrated care models. Nevertheless, there is still a high demand for well-designed models of economic evaluation of integrated healthcare models, also from the perspective of quality of care, to support informed decision-making (Desmedt et al., 2016).

Above all, the benefits of coordinated care for patients with multiple sclerosis are numerous and range from improved health outcomes to improved patient quality of life (Marrie et al., 2024; Petrin et al., 2023) and the efficiency of the healthcare system (Heinzlef et al., 2020). Thanks to an integrated model that focuses on cooperation between specialists, an individual approach to the patient and a quick response to changes in the state of health, patients with MS can count on more comprehensive and effective care.

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LOGISTICS CAPABILITIES OF FIRMS ON THE RESEARCH CONCERNING LOGISTIC CAPABILITIES OF FIRMS. THE RESULT OF THE EMPIRICAL RESEARCH

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Purpose: The aim of this article is to present the results of a research conducted on logistics capabilities in the context of achieving firm's success.
Design/methodology/approach: The research results presented were conducted using literature review and the Delphi method.
Findings: The results of the research present the degree to which the individual identified logistics capabilities of the firm contribute to market and economic effects.
Research limitations/implications: Further research in the field of firm logistics capabilities should focus on identifying differences in the degree of impact on the indicators of success depending on the profile of the firm and the relationship between logistics capabilities.
Practical implications: The results of the research provide guidance for firms that are interested in achieving success by developing logistics capabilities.
Originality/value: The results of the research present previously unheard-of studies assessing the extent to which logistical capabilities have an impact on market and economic effects as a determinant of a firm's success.
Keywords: logistics capabilities, success
Category of the paper: research paper.

1. Introduction

Companies conduct certain processes and activities related to their operations in order to, among other things, acquire and retain customers, increase sales level and make a profit. Achieving the above market and economic outcomes, especially in a competitive environment, can be a challenge for firms that can be overcome by leveraging logistics capabilities.

The aim of this article is to present the results of empirical research conducted into the impact of logistics capabilities on expected market and economic outcomes as determinants of firm's success.

The article presents: 1) the characteristics of logistics capabilities as one type of firm's capabilities, 2) the assumptions of the research conducted and 3) the results of the empirical research conducted.

2. Logistics capabilities as a type of firm's capabilities

The firm's capabilities are characterised by the fact that they cannot be acquired, but can only be shaped within the firm on the basis of the processes implemented and the resources possessed. The consequence of this view of the firm's capabilities is that they are highly differentiated. According to the criterion of distinguishing capabilities by their function, we can differentiate logistics capabilities.

Logistics capabilities are a complex set of skills created as a result of a firm's knowledge (Gligor, Holcomb, 2012). They are the firm's unique skills, developed and strengthened within the framework of time- and quality-based competition (Morash, Droge, Vickery, 1996) or sets of skills relating to the integration and use of logistics resources (Matwiejczuk, 2014).

Logistics capabilities are also considered by some authors as a specific type of resource that enables the realization of any activity leading to an increase in the firm's competitive position (Daugherty, Stank, Elinger,1998) or the achievement of the firm's fundamental goals in the area of logistics (Mathien, 2020).

Logistics capabilities can contribute to the achievement of goals if they are difficult to imitate and recreate (Olavarrieta, Ellinger, 1997) and are rare and of high value (Gligor, Holcomb, 2014). Moreover, they are related to both internal and external processes of the firm. Internally, they are related to the planning, coordination and integration of activities, while externally, they are related to the realisation of activities to ensure proper customer service and supplier relations (Gligor, Holcomb, 2014). By integrating the internal and external nature of logistics capabilities, they ensure the coordination of activities within the firm and the complex systems in the environment.

3. Methods

Logistics capabilities of firms are the subject of many management and logistics studies, while their contribution to firm success has not been fully explored. Therefore, the aim of this research was to identify logistics capabilities which have an impact on the expected market and economic outcomes by assessing the degree of influence of logistics capabilities on the determinants of success. The Delphi method was chosen for this study, which is a method that uses

the knowledge and opinion of experts on the issue under investigation (Walasek, Woźniakowski, 2011). The Delphi method research was chosen because it allows the opinions of independent experts to be known in studies where there are insufficient empirical findings, as is the case with the role of logistics capability in achieving determinants of success.

The research was conducted by using the CAWI technique with a questionnaire as the tool. The use of this technique allowed experts who belonged to different centres and firms within the country to participate in the study.

The questionnaire consisted of two main parts. The first part related to defining the profile of the experts, with questions about the place of employment, professional seniority as well as the degree of familiarity with the subject matter of the study. The second part of the questionnaire contained two matrix questions regarding the degree of impact of logistics capabilities on the expected market and economic outcomes. The degree of impact was assessed by the experts according to a 7-point Likert scale, according to the assumption that a score of '1' means a very low degree of impact, while a score of '7' is a very high degree of impact.

The experts participating in the research belonged to two groups: (1) academics and (2) firm employees. The academics were those belonging to the discipline of management science and quality, employed in departments of logistics and/or supply chain management and who were authors or co-authors of publications in the area of logistics and/or supply chain management. In contrast, experts from the entrepreneurial group are employees employed at various levels and positions involved in the implementation of logistics processes in manufacturing firms.

Table 1.
Identified logistics capabilities with acronyms

Distribution service performance	EUD	Quality capabilities	ZJ
Post-sale customer service	POK	Widespread distribution coverage capabilities	ZZSD
Pre-sale customer service	PSOK	Responsiveness capabilities	ZZSR
Flexibility capabilities	ZE	Time management capabilities	ZZC
Innovation capabilities	ZI	Cost management capabilities	ZZK
Information focus capabilities	ZKI	Agility capabilities	ZZ
Evaluation capabilities	ZOPC	Information technology capabilities	ZTI
Supplier appraisal	ZOD	Information management capabilities	ZZI
Organization capabilities	ZO	Supply management interface capabilities	ZZŁD
Capabilities to respond to target markets	ZRRD	Demand management capability	ZZP
Standardization capabilities	ZS	Integration capabilities	ZIN
Learning capabilities	ZU	Measurement capabilities	ZP
Simplification capabilities	ZUP	Information exchange and sharing capabilities	ZWIU
Collaboration capabilities	ZW	Supply management capabilities	ZZD
Capabilities to ensure transport reliability	ZZNT	Customer focus capabilities	ZKK

Source: Own elaboration based on the research conducted.

The subject of the study was logistics capabilities and the market and economic outcomes identified through the analysis and critique of the literature. The literature review enabled

the recognition of 192 logistics capabilities, which were then narrowed down to 30 logistics capabilities that were the subject of further research. Due to the extensive names of the logistics capabilities, they have been coded using the acronyms developed to enable the presentation of the research findings (Table 1).

The literature research led to the identification of six market outcomes and seven economic outcomes, which are presented below (Table 2).

Table 2.
Identified market and economic outcomes

Market outcomes	Economic outcomes
Customer satisfaction	Sales revenue
Customer loyalty	profit
Customer confidence	Net profit margin
Absolute market share	Return on assets
Relative market share	Return on invested capital
Market share served	Return on equity
	Return on investment

Source: Own elaboration based on the research conducted.

The first recognised market outcome is customer satisfaction, which is identified with satisfaction with the consumption of purchased goods and services (Dziduch, Blicharz, 2014, Leninkumar, 2017). Satisfaction can be considered from a marketing point of view as a state in which the product features are identical to the customer's expectations (Kotler, 1999) or in a psychological context as an emotional reaction to the comparison of the consumption experience with the customer's individual needs (Mazurek-Łopacińska, 2003). Customer satisfaction maintained over a long period of time can lead to the emergence of customer loyalty, which is a state in which the customer, fully accepting the terms of the purchase and sale transaction, is indifferent to the actions taken by competitors (Studzińska, 2015, Dick, Basu, 1994). The characteristic of a loyal customer is loyalty created on the basis of satisfaction (Hill, Alexander, 2003). Customer loyalty, in turn, can be a factor in the development of trust (Ryciuk, 2016, Reichheld, Schefter, 2000), being an opportunity to become sensitive to the other party based on credibility (Sankowska, 2011), which relates to the product, brand or manufacturer.

Another market outcome is market share, which can be considered in three dimensions: 1) absolute, 2) relative and 3) share of the market served. Absolute market share is the percentage of sales in the entire market in which the firm operates, while relative market share presents the volume of sales as a percentage of sales of competitors in a given market (Kozielski, Pogorzelski, Dziekoński, Urbanek, 2006). In contrast, market share in the market served refers to the specific segment in which a firm operates (Lambin, 2001).

The identified economic outcomes include sales revenue and the associated profit, which is the positive financial result of the firm, which is the fundamental purpose of doing business, ensuring ongoing operations, investments and development (Gontarczyk-Skowrońska, 2016).

Linked to profit, in turn, is the net profit margin defined by the return on sales ratio. This is an indicator that shows what level of profit after tax has been generated by the revenues from business activities (Wędzki, 2006). Another economic outcome is the return on assets, which presents the ratio of net profit to the total level of assets, representing the ability of assets to create profit (Prędkiewicz, Węgrzyn, 2014). In turn, the profitability of invested capital shows what the ratio of profit from the firm's current activities is to the capital employed in the firm's activities (Pomykalska, Pomykalski, 2010). On the other hand, the profitability of equity, related to the creation of the firm's value, illustrates what the amount of profit per unit of equity involved is (Gołębiowski, 2020). Finally, the last economic outcome is the profitability of investments, which represents the profitability of the firm's investment decisions (Rachlin, 2019).

4. Results

The research involved 40 experts, including 27 experts from the academic community and 13 employees of manufacturing firms. The experts from the academic community represented a full cross-section of academic titles and degrees. They were characterized largely by work experience of more than 10 years and were employed in both public and non-public universities across Poland. Experts from the entrepreneurial group were mostly employed in large firms operating in the market for more than 10 years. Moreover, these individuals were characterised by considerable work experience. The survey was conducted in two rounds. In the first round, the experts were asked to determine the degree of impact of logistics capabilities on market outcomes (Figure 1) and economic outcomes (Figure 2).

Experts attributed the highest importance scores for market outcomes to responsiveness capabilities, flexibility capabilities and collaboration capabilities. These capabilities achieved the highest importance ratings among the logistics capabilities studied (Table 3).

Such expert assessments suggest that in order for a firm to achieve customer satisfaction, loyalty and trust, and adequate market share, it is first and foremost necessary to develop capabilities aimed at adapting to rapidly changing environments.

Collaborative capabilities, which should be developed through cooperation both within and outside the firm, will also contribute to market outcomes. Cooperation between organizational units improves the flow of information and streamlines processes. On the other hand, cooperation with external partners contributes to the development of positive relationships with the environment.

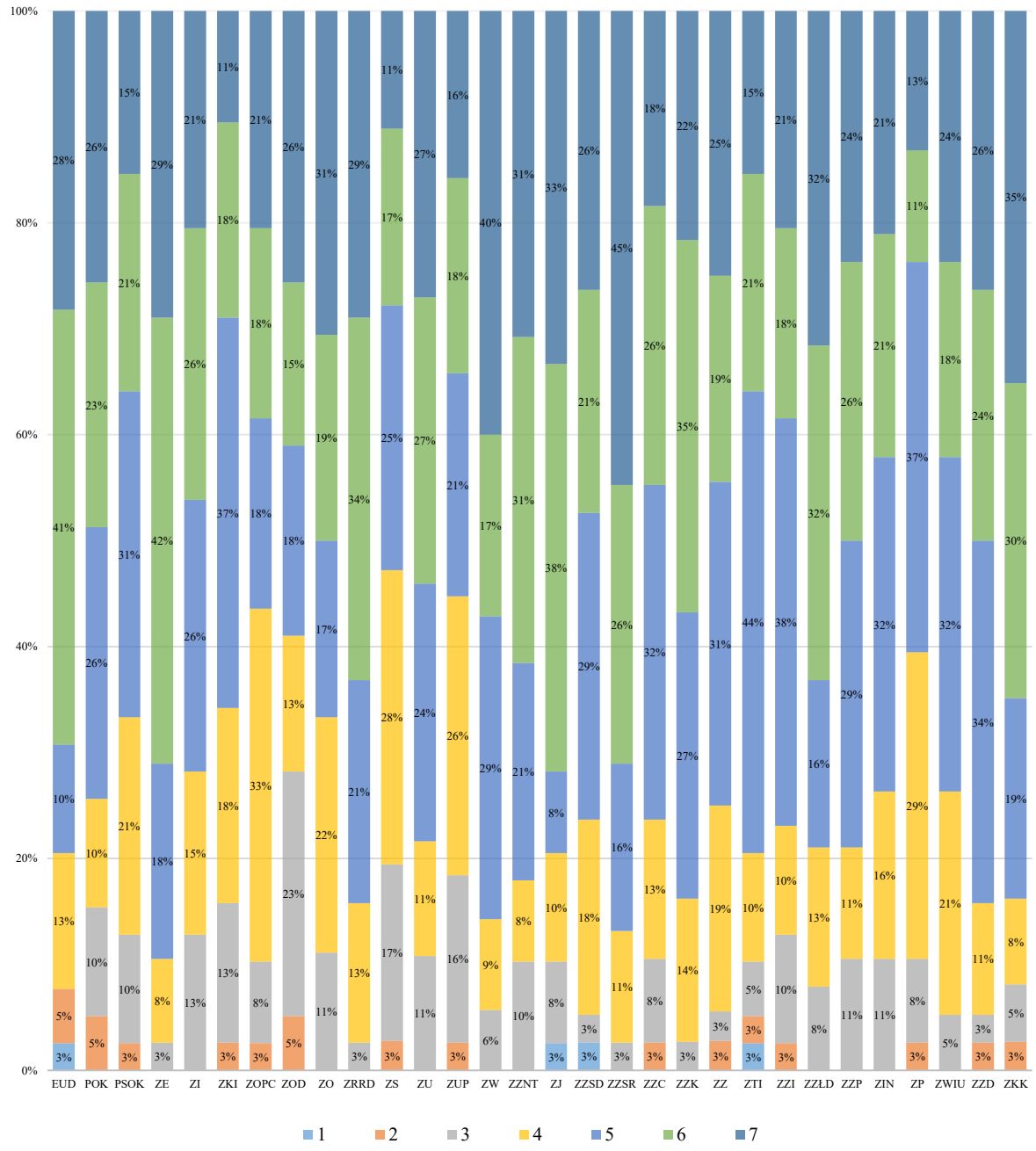

Figure 1. Assessing the degree of impact of logistics capabilities on market effects:
Source: Own elaboration based on the research conducted.

The research shows that according to the experts, simplification capabilities, measurement capabilities and standardization capabilities have the least impact on market outcomes. The low importance indicators of these capabilities show that, according to the experts, logistics capabilities related to the firm's core business enable the expected market outcomes to a lesser extent than capabilities directed at the environment.

In the study, experts were also asked to assess the degree of impact of logistics capabilities on economic outcomes (Figure 2).

Table 3.
Indicators of importance for logistics capabilities interacting on market outcomes

Logistics capabilities	Value of indicators of importance
Responsiveness capabilities	75,00
Flexibility capabilities	71,71
Collaboration capabilities	69,29
Customer focus capabilities	68,92
Capabilities to respond to target markets	68,42
Quality capabilities	67,59
Supply management interface capabilities	66,45
Distribution service performance	66,31
Capabilities to ensure transport reliability	66,03
Cost management capabilities	64,86
Supply management capabilities	63,82
Learning capabilities	62,16
Demand management capabilities	60,53
Widespread distribution coverage capabilities	60,18
Agility capabilities	59,72
Organization capabilities	59,03
Information exchange and sharing capabilities	58,55
Post-sale customer service	58,33
Time management capabilities	57,24
Integration capabilities	56,58
Innovation capabilities	56,41
Information management capabilities	55,77
Information technology capabilities	54,13
Pre-sale customer service	51,28
Evaluation capabilities	51,28
Supplier appraisal	49,36
Information focus capabilities	47,37
Simplification capabilities	46,71
Measurement capabilities	46,71
Standardization capabilities	43,06

Source: Own elaboration based on the research conducted.

The highest index of importance was achieved by cost management capabilities (Table 4). Such results confirm that in order for a firm to achieve profits and profitability rates at a satisfactory level, it must focus on activities related to proper cost management.

Supply chain management capabilities and demand management capabilities were also rated relatively highly by the experts, which signals the importance of management aspects in achieving economic outcomes. The lowest importance ratings for economic outcomes according to the experts should be attributed to pre-sales customer service, simplification capabilities and measurement capabilities. The low importance ratings for the indicated capabilities indicate that the capabilities that are least important for achieving economic outcomes are those relating

to pre-sales customer service and those aimed at measuring and eliminating complex and elaborate activities.

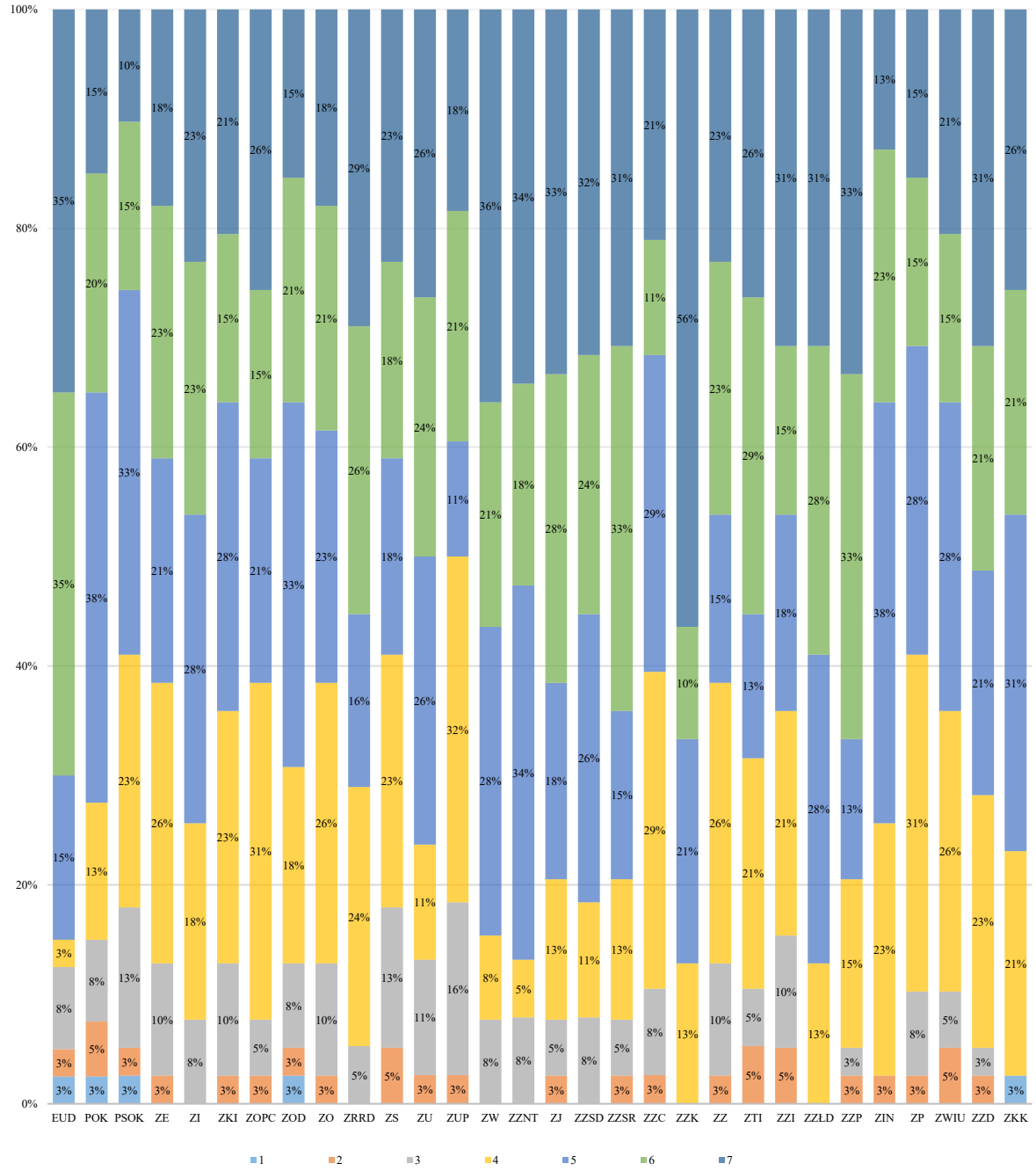

Figure 2. Assessing the degree of impact of logistics capabilities on economic effects.

Source: Own elaboration based on the research conducted.

Table 4.
Indicators of importance for logistics capabilities interacting on economic outcomes

Logistics capabilities	Value of indicators of importance
Cost management capabilities	77,56
Supply management interface capabilities	69,23
Demand management capability	68,59
Distribution service performance	68,38
Collaboration capabilities	67,31
Quality capabilities	66,67
Responsiveness capabilities	66,67
Capabilities to ensure transport reliability	66,45
Widespread distribution coverage capabilities	65,13
Capabilities to respond to target markets	62,50
Supply management capabilities	62,18
Customer focus capabilities	60,54
Learning capabilities	59,87
Information technology capabilities	59,87
Innovation capabilities	58,97
Information management capabilities	56,41
Evaluation capabilities	55,13
Integration capabilities	55,13
Agility capabilities	54,49
Information exchange and sharing capabilities	52,56
Flexibility capabilities	51,92
Information focus capabilities	51,92
Organization capabilities	51,28
Standardization capabilities	51,28
Supplier appraisal	50,92
Post-sale customer service	50,88
Time management capabilities	50,66
Measurement capabilities	48,72
Simplification capabilities	47,37
Pre-sale customer service	43,23

Source: Own elaboration based on the research conducted.

Analysing the results of the study, it can be seen that there are some differences in the assessment of the degree of impact of logistics capabilities on market and economic outcomes (Table 5). The biggest differences between the experts' assessments are found in the case of flexibility capabilities, responsiveness capabilities and cost management capabilities. The remaining capabilities show relatively similar assessments of the degree of impact on market and economic outcomes. It should also be noted that all surveyed logistics capabilities were rated medium, high or very high by the experts, which confirms the importance of logistics capabilities in achieving success determinants in the form of market and economic outcomes.

Table 5.
Indicators of importance for logistics capabilities interacting on economic&market outcomes

Logistics capabilities	Indicators of importance on market outcomes	Indicators of importance on economic outcomes
Distribution service performance	66,31	68,38
Post-sale customer service	58,33	50,88
Pre-sale customer service	51,28	43,23
Flexibility capabilities	71,71	51,92
Innovation capabilities	56,41	58,97
Information focus capabilities	47,37	51,92
Supplier appraisal	49,36	50,92
Evaluation capabilities	51,28	55,13
Organization capabilities	59,03	51,28
Capabilities to respond to target markets	68,42	62,50
Standardization capabilities	43,06	51,28
Learning capabilities	62,16	59,87
Simplification capabilities	46,71	47,37
Collaboration capabilities	69,29	67,31
Capabilities to ensure transport reliability	66,03	66,45
Quality capabilities	67,59	66,67
Widespread distribution coverage capabilities	60,18	65,13
Responsiveness capabilities	75,00	66,67
Time management capabilities	57,24	50,66
Cost management capabilities	64,86	77,56
Agility capabilities	59,72	54,49
Information technology capabilities	54,13	59,87
Information management capabilities	55,77	56,41
Supply management interface capabilities	66,45	69,23
Supply management capabilities	60,53	68,59
Integration capabilities	56,58	55,13
Measurement capabilities	46,71	48,72
Information exchange and sharing capabilities	58,55	52,56
Supply management capabilities	63,82	62,18
Customer focus capabilities	68,92	60,54

Source: Own elaboration based on the research conducted.

In the first round of the research, the experts were also asked to suggest other logistics capabilities than those indicated that may contribute to market and economic outcomes. The experts indicated that to the group of logistics capabilities affecting market outcomes should be added the capabilities for risk management and the capabilities for seeking alternative suppliers. And, to the group of logistics capabilities impacting on economic outcomes should be added risk management capabilities.

In the second round of the study, the experts verified the results of the first round of the research and reassessed the degree of impact of logistics capabilities on market outcomes and

economic outcomes. In reassessing the degree of impact of logistics capabilities on the determinants of success, the experts maintained their previous ratings for most logistics capabilities. The experts only pointed out the need to indicate higher ratings for process and activity evaluation capabilities and standardisation capabilities in terms of impact on market outcomes. In the case of the impact on economic outcomes, the experts again found that cost management capabilities were the most important in achieving them, confirming the relevance of this group of logistics capabilities in achieving economic outcomes.

In a second round of the study, the experts also assessed the degree of impact for the two new groups of logistics capabilities identified in round one of the study. In terms of the impact on market outcomes, the experts assessed the degree of impact of the risk management capabilities at a very high level, while the new supplier search capabilities according to the experts have a high degree of impact on market outcomes. In contrast, the degree of impact of risk management capabilities on economic outcomes according to the experts is at the highest level.

5. Conclusion

Logistics capabilities are an important factor in achieving the expected market and economic outcomes that are determinants of success, as evidenced by the results of studies conducted on the impact of logistics capabilities.

Research illustrates that the logistics capabilities identified have a significant impact on both market and economic outcomes. Moreover, the degree to which each group of capabilities influences a particular group of outcomes varies, so logistics capabilities should be considered in the context of a group of both market and economic outcomes. The research conducted has practical implications for firms aiming to achieve competitive advantage as a result of the determinants of firm success. The research also shows which logistics capabilities should be developed to influence market and economic outcomes as determinants of firm success.

The results of the study support the arguments of J.T. Mentzer, S. Min and L.M. Bobbitt (2000) and D.F. Lynch, S.B. Keller and J. Ozment (2000) about the contribution of logistics capability to the success of the firm. Logistics capabilities have a significant impact on market outcomes, the most important being responsiveness capabilities and flexibility capabilities, which confirms the thesis of D.J. Bowersox, D.J. Closs and T.P. Stanek (1999). Research conducted on the impact of logistics capabilities on economic outcomes indicate that these capabilities have a significant impact on profit, revenue and profitability indicators, which supports the arguments of L. Liu and D. Luo (2012), E.A. Morash, C.L.M. Droge and S.K. Vickery (1996) and P.J. Daugherty, T.P. Stank and A.E. Elinger (1998).

The main limitations of the research are the variability and diversity of logistics capabilities developed within firms, which affects the dynamism of capabilities and their impact on firm success.

The research carried out into the impact of logistics capabilities on firm success can form the basis for further research into logistics capabilities, in particular to verify if and how the sets of capabilities affecting firm success in given industries change and how the degree of impact of logistics capabilities changes in different market situations.

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FOOD TRANSPORT MANAGEMENT IN A SELECTED LOGISTICS COMPANY

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Purpose: According to data from the National Center for Agriculture Support, food product transport is the most common type of transport, as food is essential for everyone. Therefore, organizing and implementing such transport must meet the highest standards. At this point, it is worth mentioning the standards and regulations governing food transport. Strict regulations govern food transport, and any violations can have serious consequences. As is commonly known, transport generally involves the movement of people or loads from point A to point B, using appropriate means, with the cargo type and transport method being key factors of consideration in this article.
Design/methodology/approach: The article contains a SWOT and TOWS analysis of a transport company specializing in road transport of goods under controlled temperature and additionnal food trade services. The aim of the article is to analyze a logistics company in organizational and technical terms in the area of road refrigerated transport.
Findings: The tool used to conduct the analysis will be a matrix in the form of a four-field table, and the results of the SWOT and TOWS analysis will also be presented.
Research limitations/implications: The research used SWOT and TOWS analysis, i.e. research methods that present the research results very clearly and legibly and are perfect for the issue of logistics services.
Practical implications: Enhancing food transport processes is crucial. If the examined company stopped at the stage of identifying its strengths, there would be a high probability that transports would not be carried out with the appropriate quality of cargo, because failure to address possible threats in any way would bring results that would be counterproductive. The permanent development of the examined company in the examined aspects bodes well for the future of the organization.
Social implications: The issue of food transport in general, but also in the context of technical and organizational conditions, is important because it directly or indirectly affects every population that depends on products from the food sector.
Originality/value: There are not many studies on the transport of food products in the context of technical and organizational conditions, which makes the article original.
Keywords: transport of food products, technical and organizational conditions, SWOT and TOWS analysis
Category of the paper: research paper.

1. Introduction

The aim of the research article is to analyze a selected logistics company in terms of organizational and technical aspects in the area of road refrigerated transport. Food logistics is a vital element of the food supply chain (Fredriksson, Liljestrand, 2015). To do this more reliably, the characteristics of individual processes were related to a real company that transports products with a short expiry date. When carrying out the analysis, the main guideline was to solve the research problem, which was a reference point for confirming or denying the hypothesis, according to which the company had the necessary tools and knowledge at an optimal level to carry out food transports at an appropriately high level, while maintaining attention to quality values. and safety of fresh products.

2. Research group and course of study

The transport of perishable products is regulated by many standards and regulations. In this respect, every company providing specialized transport is obliged to comply with them. However, the implementation and organization of transport by individual units may differ in terms of the solutions used, innovative ideas and devices, or their lack in the entire chain. Therefore, the aim of the work is to analyze a logistics company in organizational and technical terms in the area of road refrigerated transport. The question that will be answered after analysis is whether the company has the necessary tools and knowledge in the area of functioning of the food sector to ensure that the transport is carried out at an appropriately high level in terms of quality. In this case, quality depends on the company's own resources, but above all on the ability to use them when faced with such a demanding type of transport as the transport of products with a short shelf life. In the analyzed case, external factors are also of great importance, as they can slow down the processes related to the movement of loads, but can also act in the opposite way - that is, provide an opportunity to develop and improve certain solutions, depending on the method of verification and use of given opportunities and elimination of threats by examined entity. It was assumed as a hypothesis that, thanks to extensive experience in the food industry, the company has the necessary knowledge about the transportation of this type of cargo and that the organization's fleet is able to meet the requirements of such transportation through the use of innovative systems, the company should not experience any difficulties in carrying out food transportation.

The hypothesis may be verified after the analysis. The conclusions drawn from the study will allow for a full diagnosis of the company. In the article, the authors will also attempt to analyze SWOT and TOWS for the discussed logistics company providing road transport of goods

under controlled temperature conditions and additional services related to food trade. The tool used to carry out the analysis will be a matrix in the form of a four - field table.

SWOT analysis is one of the most frequently used analytical techniques in a company (Szmitka, 2015). It involves determining the strengths (S) and weaknesses (W) of the examined organization, product or venture, as well as opportunities (O) and threats (T) appearing in the environment of a given entity 70 (Tylińska, 2005). It is important to optimally determine all the above-mentioned factors, as this will enable a more accurate analysis of the company. Strengths are reflected in internal factors, i.e. those that will enable the company to stand out on the market. Weaknesses, just like strengths, refer to internal factors. When determining weaknesses, it is necessary to objectively assess the company's shortcomings, which may allow them to be reduced in the future. Opportunities appear in the company's external environment. These include specific factors that, if properly used, can bring tangible benefits to the functioning of the organization. Threats also occur as an external stimulus. It is necessary to analyze what threats arise from the company's immediate environment. When determining all internal and external dependencies, you should focus on the measurable and most important ones, which will affect the quality of the analysis. In the next stage, it is necessary to assign weights to each strength /weakness and each emerging opportunity and possible threat. The sum of the weights for individual categories should be equal to 1. In the next stage, a TOWS analysis will be performed. It is the opposite of SWOT analysis. This means that the research begins with factors arising from the company's environment, i.e. opportunities and threats, as well as their impact on the company's strengths and weaknesses. It is mainly used to determine whether and to what extent external factors influence the company's resources.

In both cases, conducting a reliable analysis requires asking a sequence of questions that differ in form. For a SWOT analysis, the questions that will allow you to determine the existence of connections between individual factors are (Szmitka, 2015):

- Will specific strengths allow you to take advantage of existing opportunities?
- Will specific strengths help overcome existing threats?
- Whether specific weaknesses will negatively impact the use of available weaknesses chances?
- Do specific weaknesses magnify threats?

Referring to the information that the TOWS analysis is used to examine the company's environment and resulting dependencies on internal resources, questions that will allow they will be defined as:

- Will emerging opportunities support strengths?
- Will specific threats limit strengths?
- Do emerging opportunities weaken weaknesses?
- Will specific threats amplify the impact of weaknesses?

Factors affecting the company are divided into external and internal attitude towards the organization and having a negative or positive impact. Crossing the two the resulting divisions, the following groups of factors are obtained:

- external positive nature - opportunities,
- external negative nature - threats,
- internal of a positive nature - strengths,
- internal of a negative nature - weaknesses.

In both cases discussed, when determining the dependencies that occur in the result of asking specific questions, it is helpful to summarize them in tabular form, giving them appropriate values from 0 to 1. If a specific factor influences another, you should assign them a value of 1, but if one factor does not influence the other, they are assigned a value value equal to 0. The final stage of strategic analysis is the summary of collective results. They will also be presented in tabular form, as it is the most readable. The next step will be to compare the results and place the logistics company in one of the four possible strategies. The first one is an aggressive strategy, according to which the examined organization is in the most favorable position in relation to its environment. If the examined entity is assigned to this strategy, it will mean that it is at the optimal moment of its activity and does not require any changes or improvements. The second possible strategy is a conservative strategy, which states that the company has a stable position on the market, but does not have the possibility of development. In this situation, it will be necessary to propose solutions that will have a positive impact on the company's external environment. The third - competitive, according to which the entity, despite the lack of development opportunities, has a chance to survive, but it will be necessary to present solutions that will allow for the elimination of weaknesses. The last possible one is a defensive strategy, according to which the company assigned to it is in the survival phase. If the examined company is assigned to this strategy, it will be necessary to propose solutions that will allow for a complete change of the system of activities undertaken.

3. Organization and problems related to the transport of perishable products on the example of the examined logistics company

The specificity of transporting perishable products has its source in the properties of these products, namely their instability. Low resistance to damage, sensitivity to temperature changes, low transportability and demanding storage conditions make the most difficult task to plan and organize the supply chain in a way that will ensure the safety of the cargo throughout the entire process cycle (Leleń, 2014). Even though the analyzed company is technically adequately prepared for this type of specialized transport, this does not mean that such transports do not require involvement in the organizational aspect and that there are no problematic situations

that need to be solved before commencing the transport, and also many times during its implementation. The main goal during transport is to maintain a constant temperature. One way to save energy in a refrigeration device is to appropriately select the groups of products being moved. Small shops located near the organization are supplied using smaller vehicles. In the company in question, these are buses. When delivering goods to small stores, it is grouped so that it is possible to select the temperature that will be appropriate for each product. If the goods transported at a given time include specific types of fruit and vegetables, the temperature is adjusted accordingly so that each product group is provided with appropriate transport conditions at a given time.

In order to prevent the interruption of the cold chain, which is the reference point for all food-related operations, the company focuses on situations that threaten its maintenance. Factors that may negatively affect the cold chain include operations directly related to the loading or reloading of goods - i.e. situations in which the operator changes. The organization places great emphasis on temperature control during these activities. Immediately after loading the trailer, the driver is obliged to check whether the temperature of the cargo has not exceeded the upper limit of the spectrum. It is also necessary for the trailer's loading surface to be properly cooled beforehand, as the company tries to prevent the goods from being loaded into an uncooled room. If a situation arises in which the temperature of the product increases to limits that result in a loss of quality and properties of the product, it is necessary for the driver to write down an appropriate report and dispose of the damaged load, as the delivery of such goods could pose a threat to the health of potential consumers.

To reduce the possibility of contamination of sensitive products, the company attaches importance to the cleanliness of trailers. Before each transport begins, the trailer space is checked for any possible mold growth, which is very likely in the case of transports using vehicles such as refrigerated vehicles due to the temperature and air humidity conditions prevailing there. It is also checked whether there are any foreign odors that are absorbed by fresh products in the trailer. Possible traces that would indicate the presence of rodents, which pose a significant threat to food due to the bacteria they carry, are also taken into account. After completing a specific transport process, the trailers are also checked and cleaned of any remains of previously transported food. In order to avoid damage to fresh products, the company uses specialized containers to transport them. They are appropriately adapted to transport fruit and vegetables. They have been designed in a way that allows them to stay fresh longer and optimally ripen, thanks to the holes that allow air exchange. They also provide protection against mechanical damage due to the rounded internal edges. They are made of material approved for contact with food. Specialized containers made of Styrofoam are also used to transport meat and fish. If these are short-distance transports, the meat is transported without additional coolants. However, if these are long-distance transports, even though the cargo is transported by an appropriate means of transport, the meat is placed in closed containers, and for additional protection, an additional source of coolant in the form of dry ice is used. Products such as butter, kefir

or yogurt require specially selected protection - it is not enough to use optimal cooling systems in means of transport, but appropriately selected containers with appropriate protective coatings must be provided. Therefore, the unit in question uses bulk packaging, which is useful when grouping products such as butter into larger batches. Yogurts are packed in low cardboard containers with appropriately sized holes cut out in them, thus protecting the product against tipping over. Cardboard packaging is additionally covered with a laminate, which increases its resistance. Chicken eggs are transported within the company using "eggs cargo system" containers.

These are packaging in the shape of an ordinary egg tray, but they are made of polypropylene, which is one of the safest materials in terms of food contact. Despite the fact that the company carries out transports using specialized containers, it is also necessary to secure the entire pallet on which the load is piled. For this purpose, the company uses stretch foil. The finished, palletized unit is wrapped in several layers of foil before the main loading operation. It is necessary to stretch it first, because only then can the foil fulfill its function. By stretching it, adhesive compounds are released, thanks to which it is possible to properly secure the pallet. In addition to foil protection, the company also uses poles to secure the pallet in the trailer, but this topic has already been discussed in chapter three. When transporting different types of products, they must be separated from each other. This is also what happens within the organization in question (Cieślikowska, Caban, 2017).

In a situation where, for example, fruit, vegetables and meat products are transported in one transport, they are separated onto two pallets. Vegetables and fruit constitute one pallet unit, while meat constitutes a separate unit. The same palletizing and loading scheme applies to other product groups, i.e. dairy products, fish and chicken eggs. Fish and meat, due to the type of animal products, can be combined into one palette, just like vegetables and fruits, as well as dairy products and eggs. However, in the case of eggs, the company transports them as a separate unit due to their fragility and susceptibility to damage. When transporting fresh products, time is an important issue. The company plans the logistics chain in a way that will limit the time of individual operations to a minimum. Many factors matter in this aspect. The key phase is planning. At this stage, the company optimizes routes that will allow for quick delivery of the cargo. During this process, it must be taken into account that the vehicle must not exceed the maximum load capacity and pallet spaces. However, if properly planned, it allows the company to transport loads from several orders, without breaking the standards regarding the weight and physical properties of the means of transport. Telematics - based devices also play a role in this process, thanks to which the information stream flows faster. Since the journeys themselves take place between specific loading and unloading points, the means of transport, after the last transport, waits at the final point for further instructions. Thanks to mobile devices operating on the basis of telematics solutions, the generated information efficiently reaches the driver, who is informed about subsequent actions, thanks to which the entire process is accelerated. All processes taking place in the company comply with the standards regarding driver's working time. Another initiative of the company, in order

to limit the loss of time, is to establish a pallet turnover system methodology with customers from nearby retail chains and stores.

In order to save time that the driver would have to spend waiting until the pallet is unloaded, the company agrees with individual units that the pallets will be collected during the next delivery. This is a practical solution because the driver can start another delivery right after unloading. This solution allows the company to improve and shorten the transport cycle. In terms of time, on-time delivery is equally important.

Automation is becoming more widespread and affect the entirety of the supply chain, spanning all of the food industry's sectors. Despite the promising benefits of automation and robotics, many companies hesitate to adopt them in logistics, mostly due to the lack of understanding of the technology, and their concerns regarding the cost of investment and maintenance of such systems (Dekhne, Hastings, Murnane, Neuhaus, 2019). Therefore, there is a need to disseminate information on the benefits of automation and robotics within the food logistics sector (Jagtap, Bader, Garcia-Garcia, Trollman, Fadiji, Solonitis, 2021).

For manufacturers who entrust transport to external companies, timely deliveries are very important, as any delay generates losses. Failure to meet deadlines may have various sources, including traffic jams, road accidents, unexpected detours or unfavorable weather conditions. These are factors that no organization can influence, but the examined company has tools that make it possible to determine some threats in advance and find an alternative solution early enough to avoid delays in deliveries. Moreover, the company employs a team of logistics experts who constantly monitor ongoing transportation operations. This team cooperate with drivers in real-time to resolve unforeseen issues and optimize delivery performance. Their expertise, combined with advanced systems, allows for more accurate and immediate problem resolution, improving overall efficiency. Thanks to the use of telematics solutions, the company is able to generate information about traffic intensity in a given area or a road incident that involves detours. The information is immediately transferred to the company's headquarters. This allows for a quick reaction, which involves setting a different route for the driver. After establishing new guidelines, the driver is informed about the route change, which does not mean that there will be no delays in delivery, but it gives the company a chance to reduce or completely eliminate them.

4. Logistics company in the future

The subject of the analysis will be to determine the perspective of transporting fresh products by the examined company, in terms of its organization and technical conditions. Conducting the analysis will allow you to determine the correctness of the current strategy companies in the scope of services offered. Based on the information collected about the logistics company,

Table 1 proposes the strengths and weaknesses of the organization in terms of transport, as well as opportunities and threats resulting from the impact of the environment.

Table 1.
Identified strengths, weaknesses, opportunities and threats

Internal factors	External factors
Strengths (S)	**Chances (O)**
1. Many years of experience in the field of food transport. 2. Specialized fleet of vehicles. 3. Constant space control cargo. 4. Optimum protection load. 5. Modern devices refrigeration. 6. On-time delivery. 7. Respecting standards and regulations.	1. Constantly increasing demand for food transport. 2. Exploiting smart packaging during transport. 3. Establishing cooperation with countries outside the EU. 4. Technology development. 5. Improving road condition. 6. Possibility to expand transport for intermodal transport.
Weaknesses (W)	**Threats (T)**
1. Carriage only road transport. 2. Basing many tasks on IT systems that may turn out to be an emergency. 3. Empty runs appearing. 4. No shipping services.	1. Big competition. 2. External factors hindering implementation of transport. 3. Damage sensitive loads and temperature changes. 4. High fuel costs. 5. Possibility of breaking the chain refrigeration.

Source: Own study.

As the table shows, when determining individual factors, the focus was largely on those that directly affect the transport of fresh products. Referring to the purpose of the study, this is the most important relationship that will allow for the assessment of the current strategy of a logistics company. Table 1 shows the preponderance of strengths over other factors. This proves that the company is well prepared to carry out this type of transport. Problems that may arise during transport are largely influenced by external factors. Therefore, in order to determine the interrelationships and between individual factors, it is necessary to conduct a thorough analysis that will enable the assessment of the interdependence between strengths and weaknesses, as well as emerging opportunities and threats.

Table 2 presents the weights assigned to each factor affecting the analyzed logistics company. The size of the scales was determined in relation to the importance of a given factor for the transport of perishable products. The table shows that the strengths that have the greatest impact on transport are S2 and S3, i.e. a specialized fleet of vehicles and constant control of the cargo space. Referring to the weaknesses, the most significant is W2, i.e. basing many activities on IT solutions that may prove to be unreliable. The highest rated opportunities are O2 and O4, i.e. the possibility of using intelligent packaging and technology development. However, the most threatening factors are T3 and T6, i.e. the sensitivity of cargo to damage and temperature changes, as well as the possibility of interrupting the cold chain.

Table 3 presents the course of the SWOT analysis, which involves determining the relationship between the strengths of the examined logistics company and factors emerging from the environment. The table shows that strengths largely allow for the use of emerging

opportunities, as the sum of factor interactions amounted to 32/2. However, to an even greater extent, strengths allow you to limit possible threats because the sum of their mutual interactions was 56/2. Already at this stage of the analysis, it can be concluded that the analyzed logistics company has sufficient strengths to limit emerging threats.

Table 2.
Summary of weights for individual factors

Strengths (S)								
	S1	S2	S3	S4	S5	S6	S7	
Weight	0,10	0,20	0,20	0,15	0,15	0,10	0,10	**∑=1,00**
Weaknesses (W)								
	W1	W2	W3	W4				
Weight	0,20	0,30	0,25	0,25				**∑=1,00**
Chances (O)								
	O1	O2	O3	O4	O5	O6		
Weight	0,10	0,25	0,05	0,25	0,15	0,20		**∑=1,00**
Threats (T)								
	T1	T2	T3	T4	T5	T6		
Weight	0,05	0,15	0,25	0,20	0,10	0,25		**∑=1,00**

Source: Own study.

Table 3.
The impact of strengths on emerging external factors

Will specific strengths allow you to take advantage of existing opportunities ?									
Opportunities/ Strengths	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**Weight**	**Number ***	**Product ****
S1	1	0	1	1	0	1	0,10	4	0,40
S2	1	0	1	1	0	0	0,20	3	0,60
S3	0	1	0	1	0	0	0,20	2	0,40
S4	0	1	0	1	0	0	0,15	2	0,30
S5	0	0	0	1	0	0	0,15	1	0,15
S6	1	0	0	0	1	0	0,10	2	0,20
S7	0	1	0	1	0	0	0,10	2	0,20
Weight	0,10	0,25	0,05	0,25	0,15	0,20			
Number *	3	3	2	6	1	1			
Product **	0,30	0,75	0,10	1,50	0,15	0,20			
Sum								**32/2**	**5,25**
Will certain strengths overcome the threat ?									
Opportunities/Strengths	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**Weight**	**Number ***	**Product ****
S1	1	1	1	1	0	1	0,10	5	0,50
S2	1	1	1	1	0	1	0,20	5	1,00
S3	0	1	1	1	0	1	0,20	4	0,80
S4	0	1	1	1	0	0	0,15	3	0,45
S5	1	1	1	1	0	1	0,15	5	0,75
S6	1	0	1	0	0	0	0,10	2	0,20
S7	0	1	1	1	0	1	0,10	4	0,40
Weight	0,05	0,15	0,25	0,20	0,10	0,25			
Number *	4	6	7	6	0	5			
Product **	0,20	0,90	1,75	1,20	0	1,25			
Sum								**56/2**	**9,40**

Note: * Number of interactions, ** Product of weights and interactions.

Source: Own study.

Table 4 shows the relationships between the company's weaknesses and factors in the environment. Interpreting the data from the table, it can be noticed that the weaknesses have a small impact on the emerging opportunities and possible threats, because the sum of their interactions is 10/2 and 14/2, respectively. Compared to the interactions between strengths and external factors, these values are small, but not low enough to be ignored. With respect to sensitive products, any hazard may prove significant and affect the quality of the cargo.

Table 4.
Relationships between weaknesses and environmental factors

Will specific weaknesses negatively impact the use of available opportunities ?									
Opportunities/ Weaknesses	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**Weight**	**Number ***	**Product ****
W1	1	0	1	0	0	0	0,20	2	0,40
W2	0	0	0	1	0	0	0,30	1	0,30
W3	0	0	0	0	0	0	0,25	0	0,00
W4	0	0	1	0	0	1	0,25	2	0,50
Weight	0,10	0,25	0,05	0,25	0,15	0,20			
Number *	1	0	2	1	0	1			
Product **	0,10	0,00	0,10	0,25	0,15	0,20			
Sum								**10/2**	**2,00**
Do specific weaknesses magnify threats ?									
Threat / Weaknesses	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**Weight**	**Number ***	**Product ****
W1	1	0	0	0	1	0	0,20	2	0,40
W2	1	1	0	0	0	0	0,30	2	0,60
W3	1	0	0	0	1	0	0,25	2	0,50
W4	1	0	0	0	0	0	0,25	1	0,25
Weight	0,05	0,15	0,25	0,20	0,10	0,25			
Number *	4	1	0	0	2	0			
Product **	0,20	0,15	0,00	0,00	0,20	0,00			
Sum								**14/2**	**2,30**

Note: * Number of interactions, ** Product of weights and interactions.

Source: Own study.

Table 5 presents the TOWS analysis, which involves determining how external factors influence the strengths of the examined logistics company. The table shows that emerging opportunities strengthen the strengths of the analyzed logistics company to a large extent, as the sum of their interactions is 30/3. However, the degree of weakening of strengths by possible threats should be assessed as average, because the sum of interactions was 16/2. This means that the company is in a rather unfavorable environment in terms of its operations.

Table 6 presents the relationships between environmental factors and the weaknesses of the examined logistics company. The table shows that emerging opportunities reduce weaknesses to a small extent, as the sum of their interactions is 14/2. With respect to strengthening weaknesses through possible threats, the sum of interactions was 20/2. The degree of impact in this case can be assessed as medium, as this result does not differ significantly from the other values in the TOWS analysis. However, the examined logistics company should focus its attention on threats, as this result should be slightly lower.

Table 5.
The impact of external factors on the company's strengths

Do emerging opportunities enhance strengths ?										
Strengths/ Opportunities	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**Weight**	**Number ***	**Product ****
O1	1	0	0	0	0	0	0	0,10	1	0,10
O2	0	0	1	1	0	0	1	0,25	3	0,75
O3	1	0	0	0	0	0	0	0,05	1	0,05
O4	0	1	1	1	1	1	1	0,25	6	1,50
O5	0	0	0	1	0	1	0	0,15	2	0,30
O6	1	0	0	0	0	1	0	0,20	2	0,40
Weight	0,10	0,20	0,20	015	0,15	0,10	0,10			
Number *	3	1	2	3	1	3	2			
Product **	0,30	0,20	0,40	0,45	0,15	0,30	0,20			
Sum									**30/2**	**5,10**
Do specific threats offset strengths ?										
Strengths/ Threats	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**Weight**	**Number ***	**Product ****
T1	0	0	0	0	0	0	0	0,05	0	0,00
T2	1	1	0	1	0	1	0	0,15	4	0,60
T3	0	0	0	1	0	1	0	0,25	2	0,50
T4	0	0	0	0	0	0	0	0,20	0	0,00
T5	0	0	0	0	0	0	0	0,10	0	0,00
T6	0	0	0	1	0	1	0	0,25	2	0,50
Weight	0,10	0,20	0,20	0,15	0,15	0,10	0,10			
Number *	1	1	0	3	0	3	0			
Product **	0,10	0,20	0,00	0,45	0,00	0,30	0,00			
Sum									**16/2**	**6,65**

Note: * Number of interactions, ** Product of weights and interactions.

Source: Own study.

Table 7 presents the collective results of two analyzes performed, based on which it will be possible to completely assess the current situation of the company and propose an appropriate strategy that will allow for the improvement of processes taking place inside the company. Analyzing the results of Table 7, it can be concluded that the greatest dependencies occur between strengths and threats. This means that despite many strengths, the company operates in a rather hostile environment for its business.

Applying this statement to the transport of perishable products, it is true. The greatest threat to this type of transport are the natural properties of the products being moved, which the company has no influence on. According to the data in Table 7, the SWOT and TOWS analysis shows that the company should follow a conservative strategy in its activities. By optimally using its strengths, the organization can limit the impact of threats arising from the environment. This is also true, because through constant temperature control using telematics technologies, the use of specialized refrigeration equipment, an appropriately equipped fleet of vehicles, optimal load securing, as well as compliance with the standards and guidelines contained in the conventions and standards mentioned in the work, it is possible to limit the impact of unfavourable factors. To optimally use its strengths, the company should also take advantage of emerging opportunities. Thanks to the development of technology, it will be possible to improve IT systems that enable constant control of the cargo space in terms of temperature and air humidity.

Also, diversifying transport with intermodal transport may contribute to reducing fuel costs, which reach high amounts when transporting only by road. Also, the use of intelligent packaging during transport will contribute to energy savings of refrigeration units, which will significantly extend their "life" and more efficient use.

Table 6.
The impact of external factors on the company's weaknesses

Do emerging opportunities limit weaknesses ?							
Weaknesses/ Opportunities	**W1**	**W2**	**W3**	**W4**	**Weight**	**Number ***	**Product ****
O1	0	0	1	0	0,10	1	0,10
O2	0	1	0	0	0,10	1	0,10
O3	0	0	1	0	0,15	1	0,15
O4	0	1	1	1	0,25	3	0,75
O5	1	0	0	0	0,20	1	0,20
O6	1	0	1	0	0,20	2	0,40
Weight	0,20	0,30	0,25	0,25			
Number *	2	2	4	1			
Product **	0,40	0,60	1,00	0,25			
Sum						**14/2**	**3,95**
Will specific threats amplify the impact of weaknesses ?							
Weaknesses/ Threat	**W1**	**W2**	**W3**	**W4**	**Weight**	**Number ***	**Product ****
T1	1	1	1	1	0,05	4	0,20
T2	1	1	0	0	0,25	2	0,50
T3	0	1	0	0	0,25	1	0,25
T4	0	1	0	0	0,25	1	0,25
T5	1	0	1	0	0,10	2	0,20
T6	0	0	0	0	0,10	0	0,00
Weight	0,20	0,30	0,25	0,25			
Number *	3	4	2	1			
Product **	0,60	1,20	0,50	0,25			
Sum						**20/2**	**3,95**

Note: * Number of interactions, ** Product of weights and interactions.

Source: Own study.

Table 7.
Summary of analysis results

	Chances	**Treats**
Strengths	**Aggressive strategy**	**Conservative strategy**
	Number of interactions	Number of interactions
	62/2	72/2
	Weighted number of interactions	Weighted number of interactions
	10,35	12,05
Weaknesses	**Competitive strategy**	**Defensive strategy**
	Number of interactions	Number of interactions
	24/2	34/2
	Weighted number of interactions	Weighted number of interactions
	5,95	6,25

Source: Own study.

5. Summary

From the conducted research analysis of the logistics company, it can be concluded that the examined entity has the necessary tools and knowledge to carry out the transport of fresh products at an appropriately high level - this is the answer to the question that constituted the research problem. The company undoubtedly has an appropriately equipped fleet of vehicles necessary for the implementation of transport processes. The refrigeration devices used also fulfill their role, which is additionally proven and controlled by constant observation of the cargo space. Cargo securing, which is so important when moving damage-sensitive products, is also carried out with appropriate care. An additional factor that works to the company's advantage is many years of experience in the food industry. Thanks to the knowledge acquired over many years of operation of the company, it is able to use its resources more effectively. However, thanks to all the above factors, is it possible to clearly confirm the hypothesis?

The working hypothesis assumed that thanks to its strengths, the company is able to carry out this type of transport, avoiding situations that threaten the quality of the cargo. However, after the analysis is completed, it cannot be fully confirmed. According to the data included in the summary of the conducted research, the company was assigned to the area of a conservative strategy, according to which the examined entity has many strengths, but is exposed to a strong impact of external factors. It is therefore impossible to clearly confirm that the company will not have any difficulties in carrying out transport services. Taking into account the specific nature of food transport, it can be concluded that this is indeed impossible. Even constant control of the cargo space can only speed up the response to emerging threats, which may include, for example, interruption of the cold chain. The partial confirmation of the hypothesis does not mean that the logistics company should not carry out this type of transport, on the contrary. By making optimal use of its strengths, it will be possible to reduce unfavorable factors that will not pose such a great threat that the company will have to give up this aspect of its operations. As already mentioned in the research summary, it will be important to take advantage of emerging opportunities in this process. By using the positive dependencies resulting from the company's environment, it will be possible to intensify the action of the company's strengths, which will ultimately bring measurable results, benefits, both in terms of securing and controlling the cargo, but also in terms of overall functioning of the research entity.

On the other hand, one may ask whether it is advisable to make so many efforts to reduce factors that cannot be completely eliminated? Each company should answer this question itself. However, if you want to transport food, the answer should be yes. Any action that can improve a specific process is intentional. If the examined company stopped at the stage of identifying its strengths, there would be a high probability that transports would not be carried out while maintaining the appropriate quality of cargo, because failure to address possible threats in any way would bring results that would be counterproductive. Failure to determine negative factors

coming from the environment would result in ignorance and, consequently, failure to determine methods of preventing threats and methods of control, which are tantamount to deterioration of the properties of products and even the complete necessity of their disposal. Innovative solutions that could have a positive impact on this type of transport remain an open issue. Due to the topic discussed, the work describes and characterizes existing devices and solutions that allow maintaining appropriate conditions both in organizational and technical terms. However, in the era of continuous development of technology, it would be advisable to research and introduce other improvements that would guarantee greater safety and control over the processes and operations carried out, which in the aspect of food transport are extensive and complicated, and, above all, significant in terms of the quality and durability of products.

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REMOTE WORK AND TECHNOLOGICAL STRESS IN MEDIUM AND LARGE ENTERPRISES IN POLAND

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Purpose: The aim is to investigate the relations between technological stress, digital competence and some organizational variables like type of work, development of the whole organization, software and hardware development, changes in organization and hiding knowledge.
Design/methodology/approach: The aims were reached through verification of hypothesis based on the statistical analysis of data. The data of researched issues were obtained by surveying the employees from medium and large companies in Poland. The topic falls within the scope of theory and research on human-computer interactions and the influence of technology on human well-being.
Findings: The majority of employees experience various aspects of technostress at work. Techno-stress partly correlates with introduction of changes in a company, development of organization or hiding knowledge by employees. Digital competence correlates partly with software and hardware development and hiding knowledge.
Research limitations/implications: Correlations observed were weak or medium in strength. More of organizational conditions and variables could be included in the future analysis (e.g. type of leadership, organizational culture), because present ones were limited due to restricted size of the questionnaire. Further extended research on a larger sample may be suggested.
Practical implications: The results may be useful for managers of Polish companies managing teams of remote employees and facing challenges with their increased level of stress. Increased responsibility of companies in terms of employees' well-being is a prerequisite for effective operating in fast changing environment of modern market.
Social implications: The conditioning of techno-stress for Polish remote or hybrid employees is a significant subject related to lowering well-being of modern employees in Poland. It may start further research and implementing policies aiming at improvement of working conditions to increase level of well-being and interpersonal relations (e.g. cooperation) for remote employees.
Originality/value: The paper presents the study of up-to-date problem of techno-stress and its conditioning in remote and hybrid type of work in medium and large companies in Poland. It may be of use to the managers leading virtual teams and facing the problems stemming from the disturbed well-being of employees.
Keywords: remote work, technological stress, medium enterprises, large enterprises
Category of the paper: research paper.

1. Introduction

Digital transformation and the development of the information society broadly affect the way employees perform their professional tasks. This in turn influences learning necessary skills and work approaches of modern employees. New multimedia technologies and software that enhance collaboration are increasingly accessible to employees. More and more employees can utilize different tools and communication methods, including videoconferencing, online training, and software that supports remote work, such as document management and database access, which can improve organization's efficiency and competitiveness on the market. (Karczewska, 2019). This has enabled increased occurrence of remote working in the last few years.

The key aspects in defining remote work are: preforming work outside the work headquarters and usage of tools and techniques of new ICT (Sobczyk, 2009, pp. 20-21). Employees working remotely are oftentimes a part of virtual teams. Lipnack and Stamps (2000, p.5) define virtual teams as: „a group of people who work interdependently with a common purpose, using technology to communicate and collaborate across space, time, and organizational boundaries. They interact through interdependent tasks guided by a common purpose, and they rely on technology to coordinate their efforts and achieve their goals". Virtual teams can bring a lot of benefits, such as effective allocation of human resources, reduction of commuting time, while also transcending limitations of time and space (Lipnack, Stamps, 2000). However, they also encounter difficulties regarding employee well-being, establishing and maintaining trust between coworkers, as well as effective and satisfactory interpersonal communication in organization.

A study by Wang et al. (2021) highlighted the difficulties that virtual employees encounter in remote work, such as difficulties in maintaining work-life balance, poor communication with coworkers or supervisors, procrastination in executing work tasks. The authors of the study emphasized the importance of social support of the supervisors and on the other side the self-discipline of the employees. This form of collaboration entails some possible negative consequences. In the times of the Covid-19 pandemic, a lot of employees began working online without adequate preparation and training, hence noted various challenges (Albrychiewicz-Slocinska, 2021, p. 44) such as the necessity for interaction and connection with other employees; sustaining a work-life balance; difficulty in addressing urgent issues without delay; the requirement for self-discipline, as well as effective organization of work time and motivation; not all employees have personal competencies to work remotely in an effective way. We can define a type kind of work-related stress present in remote work and caused by the use of new technologies. The term: technostress or technological stress has been coined in the 1980s. It has been described as "a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner" (Brod, 1984) and as a "state of arousal observed in certain

employees who are heavily dependent on computers in their work" (Arnetz, Wiholm, 1997). According to Trafargar et al. (2019) techno-distress is "how individuals perceive information systems as a threat, leading to the experience of subsequent 'negative' stress and primarily resulting in detrimental outcomes".

This article undertakes the subject of techno-stress and a part of its organizational conditioning in medium and large companies in Poland. The aim of the research was to investigate the relations between technological stress and digital competence as well as some organizational variables like type of work (stationary/remote/hybrid), development of the whole organization, software and hardware development in organization, introduction of changes in organization and hiding knowledge as a form of lack of cooperation in teams. Following the introduction, this article is organized as follows: section 2 addresses the literature review and the development of research questions, section 3 presents the methodology; section 4 presents and discusses the results, and section 5 delves into the conclusions and implications of the research.

2. Literature Review

Scientific researchers have shown a growing interest in remote work in the years after Covid-19 pandemics, highlighting flexibility of this kind of work and significance of Information and Communication Technologies allowing people to work all around the globe and at any time (e.g. Atoko, 2021, Singh et al., 2022, Orlandi et al., 2024).

Working remotely is frequently associated in research with a greater sense of autonomy, flexibility or job satisfaction. More flexible schedule of duties and time with family were among benefits most often indicated by the remote employees. (Barbuto et al., 2020) In research of Golden (2006) a curvilinear relationship between telecommuting and job satisfaction was proven, depending on the extent of telecommuting. Bigger amount of remote work may lower the satisfaction e.g. due to the sense of isolation (Golden, 2006).

During the Covid-19 period (2020–2021) a range of various stressors were related to aspects of remote working like inflexibility in this form of working, absence of training and self-efficacy, privacy issues, lack of self-confidence, insufficient organizational communication or technological knowledge, mental-health disorders, including workaholism, absence of intrinsic and extrinsic motivation for work, job-related stress, work-life balance, insufficient organizational support for employees, while also authoritative style of leadership (Bahamondes-Rosado, 2023,

Another significant stressor indicated in the literature is: an endless requirement and expectation of updating one's digital competencies, along with managing work–life balance, while technology distorts the boundaries between them. This increases people's vulnerability to detrimental psychological and health consequences. (Mahapatra and Pati, 2018) At the same time, research shows that developed digital competence tends to mitigate the decrease in performance

due to techno-stress. (Tarafdar et al., 2014) Also self-confidence in own abilities in a specific domain among remote workers may play a protective role against stress (Condiglio et al, 2023) The confidence in individual's abilities may make the increasing requirements more bearable for an employee.

The lack of time for preparation may increase level of techno-stress. Employees who had to adapt suddenly to remote work experienced techno-overload and techno-fatigue in the times of Covid-19 pandemics (Bahamondes-Rosado et al., 2023, p. 10).

Shen and Kuang (2022) highlighted the correlation between technostress, work exhaustion, knowledge hiding, positively moderated by job autonomy among Chinese employees in some professions. The study was limited in terms of occupations and industries studied. Also, recent studies of e.g. Molino et al. (2020) have indicated that technostress may contribute to various issues, including mental fatigue, insomnia, reduced concentration, irritability, memory disturbances, sensations of exhaustion, decreased productivity or level of job satisfaction, as well as lack of work-family life balance. The study analyzed mentioned issues in the Italian context.

Literature of the subject indicates that some organizational characteristics can be connected to technostress like type of culture, leadership style, design of work, and principles and procedures for the use of technology. The research conducted among Chinese employees showed that the lowest level of technostress could be observed in the organizations with low level of centralization and with low level of innovation. (Wang et al., 2008).

Some scientific research indicates that remote work offers employees greater independence and opportunities to handle responsibilities or decrease job-related stress (Delanoeije and Verbruggen, 2020). However, other studies have pointed out that remote workers may face increased stress due to home environments or the heightened use of ICTs (Gualano et al., 2023). When such various outcomes appear, it is worth to continue examining the matter. Also, the conditioning of technostress is oftentimes investigated in one type of national culture (eg. collectivistic like China). It is significant to investigate them in Polish, more individualistic culture. Recognizing this type of stress conditioning is vital for implementing suitable preventive strategies, to alleviate negative results of techno-stress and to facilitate the execution of specific methods for handling techno-stress.

This study aims to fill this gap by analyzing in Polish context the role of some organizational variables like type of work (stationary/remote/hybrid), development of the whole organization, software and hardware development in organization, changes occurring in organization and hiding knowledge as a form of lack of cooperation in teams in medium and large companies in Poland and the level of employees' stress connected to the use of new technologies like ICT or Internet (techno-stress). The conditioning of this phenomena for remote and hybrid employees in Poland is a significant subject in the situation of lowering well-being of modern employees.

Concepts mentioned above were used to ask a few research questions. The following questions have been asked: Are there any differences in level of techno-stress or digital competence of the stationary, hybrid and remote employees? Is the level of technostress affected by the level

of new technologies development in a company, introduction of changes in the company and the development of the company? Is there a relationship between level of technostress or digital competence and knowledge hiding? Is digital competence affected by the level of new technologies development in a company, introduction of changes in the company and the development of a company?

3. Methodology

The presented research was part of a broader study conducted in December 2022 on medium and large companies (employing more than 50 individuals) in Poland. It addressed the topics of social relationships, human capital, and knowledge sharing within organizations during the post-pandemic period. The research employed a survey method utilizing a questionnaire tool. The study was executed using the CATI technique, which stands for computer-assisted telephone interviewing. Random sampling was employed. The sampling frame consisted of REGON database of Polish enterprises. A total of 575 respondents completed the questionnaires (out of 1532 attempts). The respondents were white-collar workers from various sectors, including: higher education, pharmaceuticals, energy, and the automotive industry. The assumed confidence interval was 95%. For the statistical analysis of the acquired data, the Statistica software was utilized. Statistical measures such as the Mann-Whitney U test and Spearman's rho were applied. The following research hypotheses have been set up:

1a There is a positive relationship between the new technologies (software/ hardware) development level in the company and technostress.
1b There is a positive relationship between the new technologies (software/hardware) development level in the company and the level of digital competence of employees.
2a There is a positive relationship between the form of work and technostress.
2b There is a positive relationship between the form of work and the level of digital competence of employees.
3a There is a positive relationship between knowledge hiding and technostress.
3b There is a positive relationship between knowledge hiding and the level of digital competence of employees.
4a There is a positive relationship between introducing changes in the company and technostress.
4b There is a positive relationship between introducing changes in the company and the level of digital competence of employees.
5a There is a positive relationship between the development of the company and technostress.
5b There is a positive relationship between the development of the company and the level of digital competence of employees.

The indicators of technostress were inspired by the wider tools of technostress created by Smith J.M. (1999) and Ragu-Nathan (2008). The adopted indicators of variable technostress included mental as well as physical fatigue. More details are presented in Figure 1 in section of Results and Discussion.

Knowledge hiding indicators took into consideration three facets of knowledge hiding; evasive hiding, "playing dumb" involving deception, and rationalized hiding. Hence 12-item knowledge hiding scale was adopted (Connelly, 2019). The following types of work were identified for selection by the respondents: stationary work, hybrid work, and remote work.

4. Research results and discussion

The surveyed employees assessed the extent to which they agreed with the indicators of researched variables.

The aspects of technostress which the respondents assessed (Figure 1) were as following:

V1 Feeling body pain (e.g. back, head, eyes, wrists) when working with computer equipment.

V2 Feeling more physically tired than when working without a computer due to the use of new technologies.

V3 Feeling mentally tired when working with a computer.

V4 Feeling more mentally tired than when working without a computer due to the use of new technologies.

V5 Feeling unwillingness to cooperate with people when working with a computer.

V6 Being forced to work faster than before due to the use of new technologies (new computers, programs, applications).

The majority of employees acknowledged experiencing nearly all of the researched aspects of technostress (Figure 1). Two aspects were distinctively experienced by fewer employees and these were: feeling unwillingness to cooperate with people and being forced to work faster.

Another researched aspect was the relationship between technostress and digital competence and the form of work. U Mann-Whitney did not show statistically significant differences in techno-stress or digital competence and the form of work which the surveyed performed.

Level of software and hardware development in a company correlated with digital competence (0.13) but not with different aspects of technological stress (Table 1). There were no statistically significant correlations between researched variables.

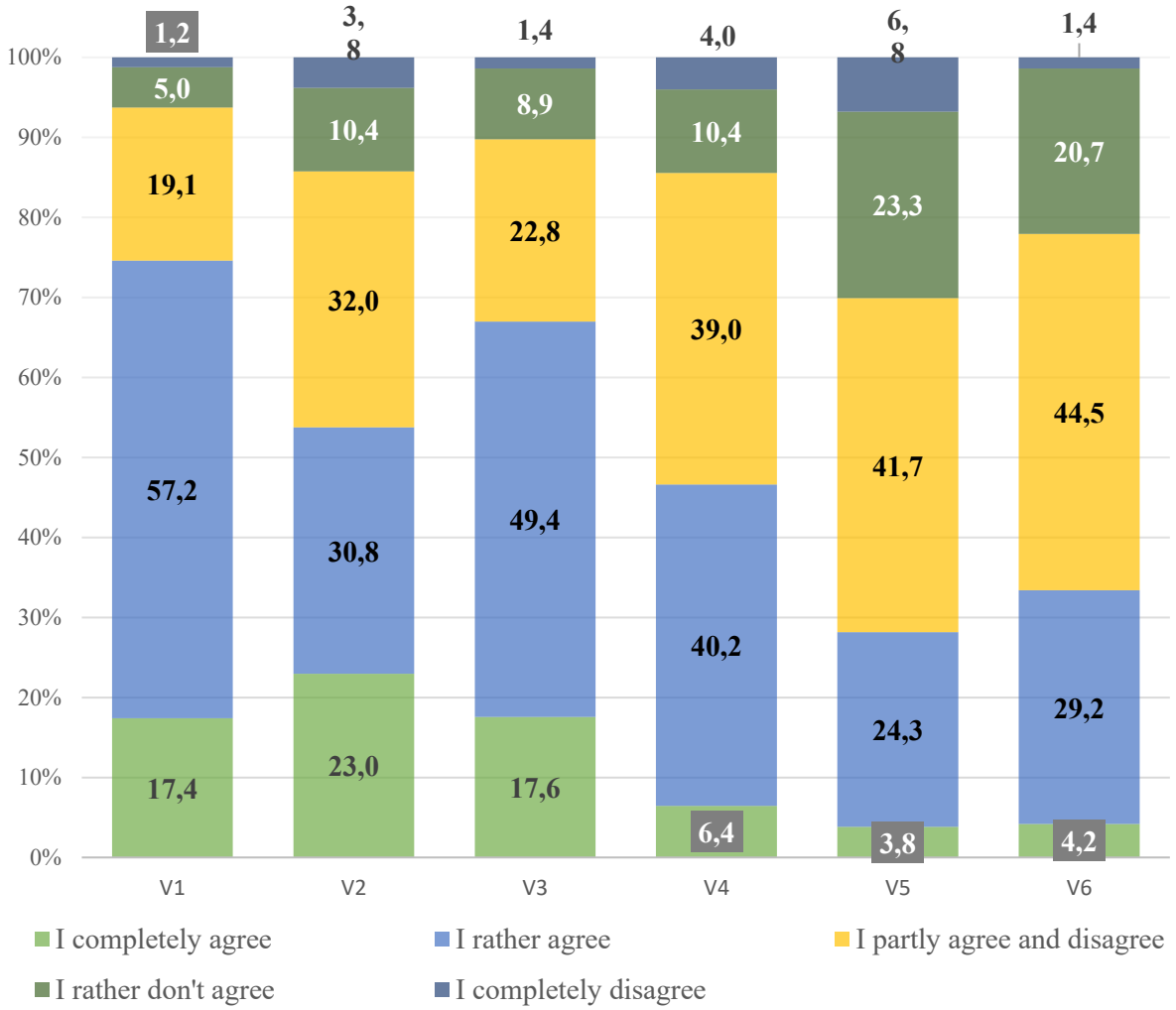

Figure 1. Techno-stress in Polish medium and large companies. In percentage.

Source: Own study.

Table 1.

The development of software and hardware in a company and technological stress and digital competence (p<0,05); Spearman's rho correlation

	Own level of skills in using computer hardware and software	Feeling more mentally tired due to the use of new technologies	Feeling more mentally tired than when working without a computer due to the use of new technologies	Feeling reluctant to cooperate with people when working at the computer	Being forced to work faster than before due to the use of new technologies (e.g. programs, applications)
The level of development of computer hardware and software in own organization over the last two years	**0.13**	0.05	-0.01	0.03	-0.01

Source: Own study.

Level of company's development (like increase in revenue, equity capital) and productivity correlated with some different techno-stress aspects, but not with digital competence. More detailed information is presented in Table 2.

Table 2.
The development of a company and technological stress and digital competence (p<0,05). Spearman's rho correlation

	Own level of skills in using computer hardware and software	Feeling more mentally tired due to the use of new technologies	Feeling more mentally tired than when working without a computer due to the use of new technologies	Feeling reluctant to cooperate with people when working at the computer	Being forced to work faster than before due to the use of new technologies (e.g. programs, applications)
In the last year, the company's revenues increased compared to the previous year	-0.03	0.04	**0.09**	0.06	**0.10**
In the last year, the company recorded an increase in the value of equity capital compared to the previous year	0.01	**0.09**	0.06	0.04	-0.01
In recent years, productivity in the company has been increasing	-0.01	0.04	-0.02	**0.09**	**0.10**

Source: Own study.

Introducing changes in a company by managers correlated weakly with digital competence (0.10) and mental fatigue (0.10) as well as with reluctance to cooperation with people (0.09). The rest of the aspects didn't show any correlation with the introduction of changes (Table 3).

Table 3.
Introducing changes in company and technological stress and digital competence (p<0,05). Spearman's rho correlation

	Own level of skills in using computer hardware and software	Experiencing body pain (e.g. back, head, eyes, wrists) when working with computer equipment	Feeling more physically tired than when working without a computer due to the use of new technologies	Feeling more mentally tired due to the use of new technologies	Feeling more mentally tired than when working without a computer due to the use of new technologies	Feeling reluctant to cooperate with people when working at the computer	Being forced to work faster than before due to the use of new technologies (e.g. programs, applications)
Managers introduce changes in the company	**0.10**	0.07	0.05	**0.10**	0.07	**0.09**	0.06

Source: Own study.

Some of the aspects of techno-stress correlated with various behaviours representing withholding from sharing knowledge. All or almost all of the researched behaviours correlated with mental fatigue and experiencing body pain due to use of new technologies (Table 4).

Table 4.
Technological stress and withholding from sharing knowledge (p<0,05). Spearman's rho correlation

	I offered the person different information than what he or she really wanted	I pretended that I didn't have current information	I said I didn't know, even though I knew	I pretended I didn't know what he was asking	I explained that I would like to tell him/her but I can't
Experiencing body pain (e.g. back, head, eyes, wrists) when working with computer equipment	0.16	**0.21**	**0.23**	**0.22**	**0.24**
Feeling more physically tired than when working without a computer due to the use of new technologies	**0.19**	0.15	0.15	0.17	**0.24**
Feeling more mentally tired due to the use of new technologies	**0.24**	**0.33**	**0.22**	**0.27**	**0.24**
Feeling more mentally tired than when working without a computer due to the use of new technologies	0.10	**0.20**	0.16	**0.20**	0.15

Source: Own study.

As results from the collected data, high digital competence correlated weakly with sharing experience with the employees from own team (0.09) and helping new employees joining own team (0.09). The rest of the indicators did not correlate with level of competence (Table 5).

Table 5.
Digital competence and sharing knowledge (p<0,05). Spearman's rho correlation

	Sharing knowledge with the employees from own team	Sharing experience with the employees from own team	Helping new employees who joined own team	Sharing knowledge with the employees from outside own team	Sharing experience with the employees from outside own team
Own level of skills in using computer hardware and software	0.02	**0.09**	**0.09**	-0.02	-0.02

Source: Own study.

Hypotheses 1b, 3a, 3b, 4a, 5a have been partly confirmed, but the hypothesis 2 (a and b) concerning form of work has been rejected, as well as hypotheses 4b and 5b concerning relationship between digital competence and changes in organization, and development of organization were also rejected (Table 6).

According to the results of this paper's study fast pace of companies' development and introducing changes may become stressors increasing level of techno-stress of employees. The more stressed and fatigued the employees are the less eager they may be to share knowledge and more prone to hide it or not help coworkers (Table 6). Also study by Ayyagari, Grover, and Purvis (2011) shows that the rapid technological advancement in organizations may increase employees' stress levels, especially when employees feel that their abilities or knowledge is insufficient to use new technologies as required. The authors' study revealed that the implementation of complicated digital systems without adequate training may lead to the feelings of inadequacy, anxiety, and frustration, which subsequently elevates employees' stress levels. What is distinctive in this paper's study is the fact that the development of software or hardware in organization contributes to the heightening the level of digital competence and not so much to the techno-stress of employees. Yet, there should be mentioned that, according to the literature of the subject older employees may experience more stress or digital apprehension than the younger ones when facing new software (Seifert et al., 2020; Pang et al., 2021).

Table 6.
Correlations between techno-stress and digital competence and chosen organizational variables. Verification of the hypotheses

		a. Techno-stress	b. Digital competence
1.	Software and hardware development in org.	didn't correlate	**partly correlated**
2.	Form of work	didn't correlate	didn't correlate
3.	Hiding knowledge	**partly correlated**	**partly correlate**
4.	Changes in organization	**partly correlated**	didn't correlate
5.	Organization development	**partly correlated**	didn't correlate

Source: Own study.

People have the ability to adapt to their surroundings, but this process sometimes come with high costs. As a result, in situation of high requirements, they must direct their resources and effort towards personal tasks and individual requirements of the environment, prioritizing their own needs over the group or other's needs. Among others, employees can hide knowledge from coworkers when they are facing too overwhelming techno-complexity. (Shen, Kuang, 2022, p. 2). In this paper's study it was also indicated that the more stressed and fatigued the employees are, the less eager they may be to share knowledge and more prone to hide it and refuse to help coworkers. Therefore, knowledge hiding and other interpersonal problems may occur.

Technostress needs to be properly identified and addressed, because it can have a detrimental influence on employee's health, leading to unfavorable outcomes. It may cause various pathologies, including lower performance resulting from lack of knowledge sharing or other

cooperation between employees. Managers should improve work organization to minimize techno-overload, because work-life conflict is closely linked to work fatigue or even burnout. According to the literature, improving employee's digital literacy can lower level of techno-stress of employees (Torkzadeh, Van Dyke, 2002; Bakker, Demerouti, 2014) Additionally, allowing employees the chance to restore their resources, introducing policies balancing work and private life would be a recommended management practice.

5. Conclusion

New information and communication technologies became an indispensable element of an everyday work landscape. Especially since Covid-19 a lot of the employees experienced remote working, which changed many aspects of their working experience. One of the consequences is techno-stress associated with remote or hybrid work.

As results from the research on medium and large companies in Poland, the majority of employees experience different aspects of technostress at work. Techno-stress partly correlates with the introduction of changes in a company and development of a company. It is also related with hiding knowledge by employees. In turn digital competence correlates partly with software and hardware development and hiding knowledge. However, it should be taken into consideration while interpreting the results that the correlations were of weak and medium strength and occurred in case of some of the researched aspects, not all of them. Hence, it is recommended to investigate these problems in a further, more extended study.

Employees' well-being becomes a significant responsibility of companies and becomes a prerequisite for effective operating in fast changing and demanding environment of modern market. Human resources strategy including the problematics of techno-stress should be a part of CSR of companies. Acknowledging various organizational conditioning of techno-stress of employees is crucial for implementing proper preventive strategies and policies to alleviate the adverse effects of techno-stress and to facilitate the introduction of specific methods for handling the employees' stress.

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EXPERIENCES OF FOREIGN STUDENTS IN SILESIA: KEY CONCLUSIONS FOR THE INTERNATIONALIZATION OF UNIVERSITIES AND THE REGION

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Purpose: The article analyzes the internationalization of Silesian universities and the region, emphasizing the importance of collaboration between academic institutions and the local community. This synergy is essential for creating a supportive environment for international students, facilitating their adaptation and integration. The study of international students' experiences provides insights into the impact of internationalization on fostering an open and diverse academic community.
Design/methodology/approach: The study employed an online survey conducted during the 2024/2025 academic year among international students at Silesian universities. The questionnaire combined closed-ended questions for quantitative analysis with open-ended questions to explore students' experiences in depth.
Findings: The results reveal a variety of experiences among international students, highlighting both opportunities and challenges. Students appreciate the quality of education and affordability in the region but encounter administrative difficulties, language barriers, and challenges with social integration. These findings underscore the need to enhance internationalization strategies and foster a more inclusive academic environment.
Research limitations/implications: The study was conducted on a pilot sample of 54 students, which limits its scope. Further research with a larger sample is required. Additionally, the research tool could be refined by including more detailed and open-ended questions to better capture diverse student experiences.
Practical implications: The findings highlight the need to streamline administrative processes, improve access to English-language information, and develop integration initiatives. These efforts can enhance the experiences of international students and strengthen the region's attractiveness.
Social implications: The study emphasizes the importance of fostering intercultural relationships and understanding the socio-cultural dynamics of the region. These efforts enrich local communities and support the long-term internationalization of the region.
Originality/value: This article combines university and regional internationalization perspectives, demonstrating the importance of academic-community collaboration. It offers unique insights into creating inclusive environments and integrating internationalization strategies with regional development.
Keywords: internationalization of higher education institutions, intercultural integration, international students, internationalisation of the region, regional development

Category of the paper: research paper.

1. Introduction

The definition of internationalization in the context of higher education was proposed by researcher J. Knight, who describes it as "the process of integrating an international, intercultural, and global dimension into the purpose, functions, and delivery of postsecondary education" (Knight, 2003, p. 2). This definition has been widely cited by scholars worldwide for many years. A key element of the internationalization of higher education is mobility, encompassing both the subjective aspect, which includes the mobility of students, academic and administrative staff, and institutions themselves, and the objective aspect, related to the mobility of educational programs (Dymyt, 2018, p. 120). The primary goal of the internationalization of higher education is to introduce changes in the relationships between the university, participants in the educational system (students and academic staff), and the international environment. In this context, internationalization can be seen as a process of increasing institutional awareness of the impact of international activities on its future development and fostering international relationships that bring benefits to all involved parties (Pluta-Olearnik, 2013, p. 74). Internationalization is one of the most significant strategic challenges faced by Polish universities at the beginning of the 21st century, as evidenced by OECD reports highlighting a clear disparity between Polish institutions and European or Anglo-Saxon universities (Domański, 2017, p. 63). The mobility of foreign students who choose Poland as a destination for internships, exchange programs, or full academic cycles is steadily increasing. In the academic year 2022/2023, nearly 89.5 thousand international students from 180 countries studied in Poland. In 2023, according to data from the Central Statistical Office, Polish universities surpassed the milestone of 100,00 foreign students, including participants in exchange programs (Stat.gov.pl, 15.06.2023). By the academic year 2023/2024, the number of international students exceeded 107,000.

As one of the most industrialised and urbanised regions in Poland, the Silesian Voivodship is characterised by a specific socio-economic structure and a rich industrial history. The region's importance in the national economy stems primarily from its traditional links to heavy industry, including coal mining and steelmaking. However, in recent decades Silesia has been dynamically transforming its economic profile, developing modern sectors such as information and communication technologies, the automotive industry, renewable energy or business services. This process is the result of strategic investments in innovation and infrastructure modernisation, which increase the region's competitiveness on the national and international stage. One important element of Silesia's potential is its extensive network of higher education institutions. There are 26 universities in the voivodeship, both public and non-public, which offer a wide range of fields of study, from technical and medical sciences to the humanities and arts.

As a result, the region plays a significant role in educating highly qualified human resources for various branches of the economy, which is conducive to its further development. In the context of globalisation and the internationalisation of higher education, the increase in the number of foreign students choosing Silesian universities as a place to acquire knowledge and skills is particularly noticeable. This trend is part of a wider process of Polish universities opening up to international students, which is an important element in the development of the region (Katowice.stat.gov.pl, 30.05.2023).

Internationalisation has been an important topic of research and discussion for many years, yet most studies focus on the actions of academic institutions while overlooking the role regions can play in this process. A region's openness to cultural diversity and its ability to support the adaptation of foreigners can significantly enhance a university's success in attracting international students. Regions that invest in developing inclusive infrastructure and creating foreigner-friendly environments become appealing not only to young people pursuing higher education but also to skilled professionals seeking career opportunities.

Interaction between university authorities and regional administration can be crucial in creating a comprehensive strategy to effectively encourage foreigners to choose Poland as a place for a full course of study. At the same time, such activities may increase the chance that students will decide to stay in the region after graduation, contributing to the development of the local labour market and enriching its potential with international experience.

This article presents the results of a pilot study conducted among foreign students studying at Silesian universities. The survey was designed to assess the degree of internationalisation of both the universities and the region itself, as well as to identify actions that can further develop these areas. The results offer valuable insights into the students' experiences and point to specific directions in which both universities and regional authorities should take action to effectively attract and retain foreign students while building a strong position for Silesia as a region that is open and welcoming to the international community.

2. Methods

This article examines the experiences of international students studying at Silesian universities, focusing on identifying the key difficulties and challenges they face. Its aim is to develop recommendations that may help improve their situation. In this context, research questions address both academic and social aspects of students' lives to provide a detailed understanding of their experiences. This study is a pilot project, designed not only to collect initial data but also to evaluate the validity of the constructed research tool (Babbie 2004, pp. 281-282).

One of the main objectives is to analyze whether social integration or adaptation to academic requirements poses greater challenges for international students. The study investigates

whether difficulties in forming relationships with local students outweigh problems related to class organization, communication with lecturers, or adjusting to the specifics of the educational system.

A separate research question explores the language competence of the academic and local environment. The analysis focuses on the difficulties students encounter when interacting with lecturers, administrative staff, and public institutions, as well as whether challenges in communicating in English represent their biggest obstacle.

The final research area explores the perception of the educational offerings at Silesian universities. The study evaluates how students rate the quality of education, the availability of teaching materials, and the engagement of lecturers. Additionally, it highlights aspects of the academic offerings that students particularly value and identifies areas requiring improvement.

The research employs an online questionnaire that reaches a diverse group of foreign students studying at Silesian universities. This tool enables the collection of data from students representing different fields of study, levels of education, and countries of origin. The survey yields 54 correctly completed questionnaires, providing both quantitative and qualitative insights.

As a pilot study, the project aims not only to gather preliminary results but also to test the validity of the research tool. The inclusion of closed, semi-open, and open-ended questions allows for an evaluation of whether the questionnaire effectively measures the phenomena under investigation and helps identify potential issues in how respondents interpret the questions.

The study achieves its objectives through the use of diverse question types, enabling both statistical analysis and a deeper understanding of students' experiences. The findings provide valuable insights for verifying hypotheses and drawing conclusions. These data form the foundation for recommendations aimed at enhancing the living and educational conditions of foreign students while strengthening the internationalization strategy of Silesian universities. This, in turn, positively impacts their standing on the global educational map.

3. Research results

A survey of foreign students studying at universities in the Silesian Voivodeship provided valuable information about their motivations, experiences and the challenges they face. Analysis of the responses revealed several key aspects that may be relevant to both the university and the regional internationalisation strategy.

In the pilot study, 54 international students from Silesian universities participated, all of whom are enrolled in the 2024/2025 academic year. The respondents represent 7 universities from Silesia, with the following distribution: (University of Economics in Katowice: 37.5% - 15 students, Katowice Business University: 30% - 12 students), WSB University: 22.5% -9

students), University of Silesia in Katowice: 17.5% -7 students, Silesian University of Technology: 12.5% -5 students, Jan Długosz University in Częstochowa: 10% -4 students, Częstochowa University of Technology: 5% -2 students).

The participants represented a diverse range of countries, with notable variations in gender distribution across nationalities. Among the 13 students from Ukraine, the overwhelming majority were female, with 12 women and only 1 man, highlighting a significant gender imbalance. A similar trend was observed in Belarus, where 3 of the 4 students were female, and only 1 was male. In Turkey, the gender distribution was slightly more balanced, with 2 female students and 1 male. In contrast, India had a higher proportion of male students, with 2 males and only 1 female out of the 3 total participants. Azerbaijan followed a similar pattern to Turkey, with 3 female students and 1 male. Kazakhstan showed a slight majority of female students, with 3 women and 2 men out of the 5 participants. Uzbekistan had an equal gender split, with 4 female students and 4 male students, reflecting a more balanced representation. In Nigeria, there was a noticeable predominance of male students, with 4 males and only 3 females among the 7 total participants. Zimbabwe exhibited the highest male-to-female ratio, with 5 male students and only 2 females out of the 7 participants.

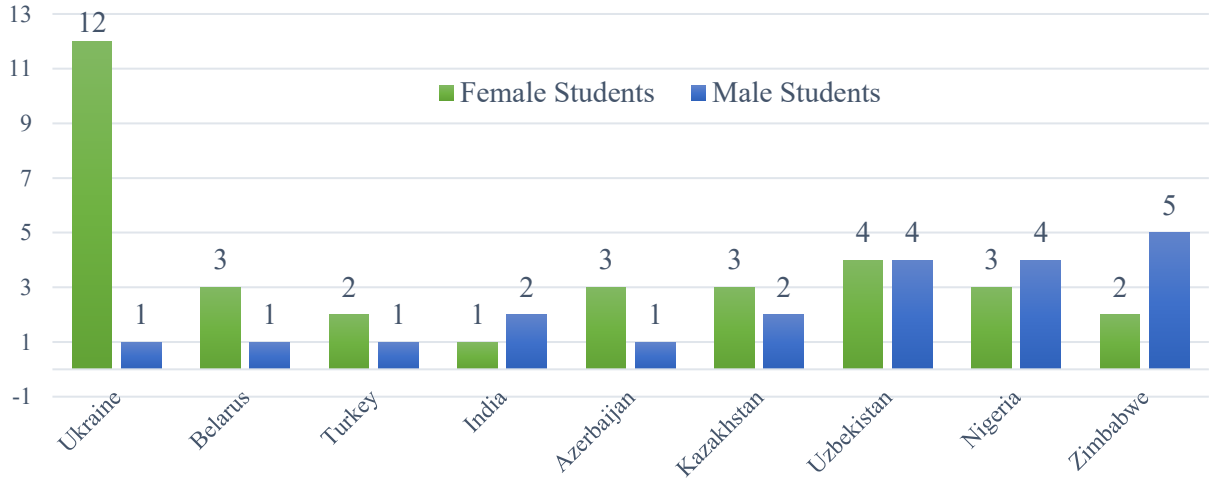

Figure 1. The number of students by country of origin.

Source: Own study.

One of the main reasons respondents chose to study in the Silesian region was the relatively low cost of living and education. Approximately 20% of the students pointed to the attractiveness of the educational offer and the availability of programmes in English, and 15% considered the reputation of the university as a key factor in their choice. Some respondents paid attention to specific study programmes that matched their academic and professional interests. Only a small percentage of students were guided by recommendations from friends.

Opinions were divided when it came to assessing the level of lecturers' language skills and the use of innovative teaching methods. More than 50% of respondents rated the English language level of lecturers as ‘very good’ and 35% as ‘good’. At the same time, 40% of respondents

indicated the high quality of innovative educational methods, while 20% found it difficult to assess them, suggesting a lack of clear experience in this area.

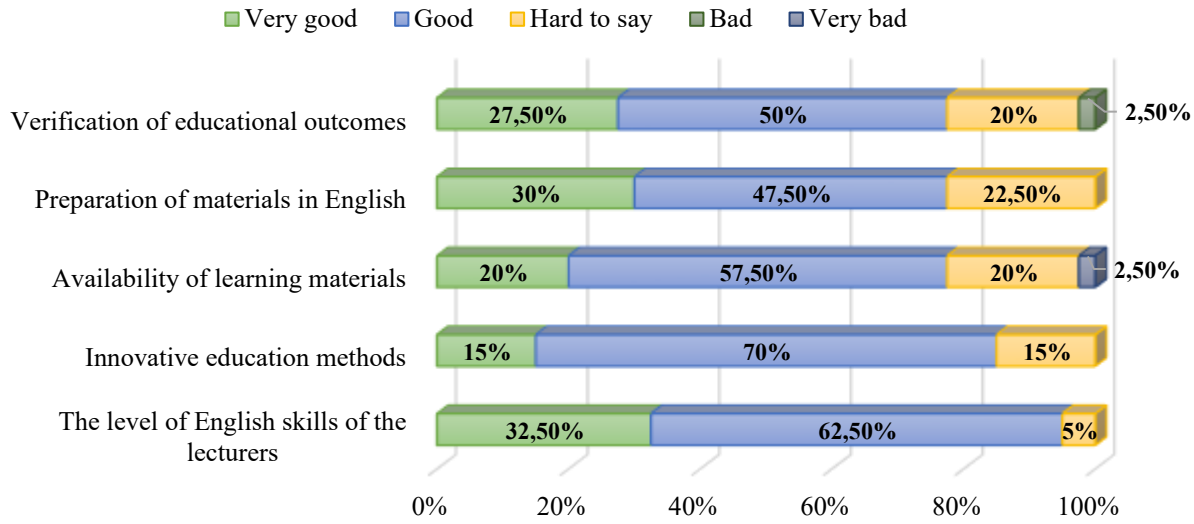

Figure 2. Students' evaluation of the quality of education at the universities.
Source: Own study.

The biggest difficulties faced by students concerned language barriers and problems related to administrative formalities. As many as 45% of respondents indicated problems with dealing with official matters, and 30% highlighted difficulties arising from adaptation to the academic system in Poland. The Polish language was a significant barrier to everyday functioning for 40% of students, suggesting a need for more support in learning the language at a basic level.

As part of the survey, an open-ended question was asked to gather foreign students' opinions on possible ways to improve their experience of both studying at universities in the Silesian Voivodeship and their everyday life in the region. This form of question allowed participants to freely share their comments and suggestions, which provided valuable information for qualitative analysis.

One of the most recurring themes in the responses was the issue of language barriers and the need to increase the availability of information in English. Many students indicated that the lack of adequate information in this language was a significant barrier. As one respondent noted: "I know that it is Poland and it is important to learn the language of the country, but some things should be done in English." Another student highlighted the need for better signage and labels in English: "Having more of English labelling and options on their applications or informative labels." Respondents also highlighted the difficulties associated with administrative processes, in particular obtaining a residence permit. These problems were described as time-consuming and complicated. One survey participant noted: "Easy access to Residency Permit application process would be a great plus to me and other prospective Students." A similar frustration was expressed by other students: "Dealing with official matters faster and getting residence permit faster." Some also suggested the need for support from the university in terms of administrative formalities. The issue of social inclusion and openness of the local community

was another important theme. One respondent wrote: "The locals need to be more open to foreigners," indicating a difficulty in establishing contacts with local people in the region. Other students suggested that more involvement of Polish students in integration could improve their experience: "More interactions with polish students." There were also suggestions to introduce more activities and events conducted in English and to organise language courses. As one participant noted: "Language courses and scholarships." Another respondent suggested a greater involvement of the university in creating development opportunities: "More involvement I suppose." Despite numerous criticisms, some students highlighted their positive experiences, expressing their overall satisfaction with living in the region and studying at the university. One wrote: "So far so good." Another pointed out: "An exciting to study and live here because my experience so far has been smooth."

The students' responses provide valuable information on areas for improvement and also point to positive aspects of their experience. Analysis of these opinions can form the basis for recommendations to improve the quality of life and education of international students in the region.

Analysis of the data shows that most students do not plan to stay in the region after graduation. Only 20% of respondents declared a desire to stay for a few years, while 70% do not intend to continue their working life in Silesia. Among the factors that could influence a change in this decision, students mainly pointed to the availability of attractive job offers (60%) and improved economic stability in the region (40%). The quality of life in the region was an important factor for 30% of the respondents, showing that social and economic aspects play a key role in decisions to stay in the region.

There was a further open-ended question in the survey, aimed at foreign students studying at Silesian universities, which asked for their general comments and suggestions about their experiences while studying and living in the region. The purpose of this question was to create a space for respondents to freely share their opinions on the challenges they face and identify areas for improvement. The responses provided important information to better understand the needs and expectations of this group of students, while identifying key issues worthy of detailed analysis. Many students highlighted their overall satisfaction with living and studying in the region. As one respondent noted: "It’s pretty good. I like it so far and I think I might continue being in Silesia in the near future." Similarly, another person added: "Overall it’s great. " These positive opinions indicate a high level of acceptance and a generally good experience among some international students. However, responses also included criticisms of administrative and bureaucratic barriers, particularly in the context of obtaining a residence permit. One respondent noted: "The government offices should do well to provide the permit to stay until the student’s graduation as the ease of getting this is a nightmare by the day." This issue is also highlighted by another student: "The bigger problems with studying and living are not there. The problem is the residence card and the bureaucracy. I applied for a residence card two and a half years ago and I am still waiting." These responses point to the need for streamlined administrative

processes and better support for international students in this regard. Another major problem highlighted was the difficulty of social integration, especially for non-EU nationals. As one respondent wrote: "Generally, Poland is a closed country. I don't have an idea if it is a bad thing or a good thing for the country, but for foreigners it is hard to live, socialize, and to be recruited (especially if you are from Non-EU)." These insights point to the challenges of social openness and integrating international students into local communities. Several students emphasised the need to develop English-speaking communities in the region. One respondent suggested: "Build more English community for foreigners." Others highlighted the general low level of English proficiency among local people, although at the same time they appreciated their friendliness and willingness to help: "In general the English level of public isn't too high, but people are friendly and open to help when needed." There were also suggestions about the university becoming more active on social media and the need for more employment opportunities for international students. As one survey participant noted: "Be more active in social media." Another respondent added: "More employment opportunities for international students." Despite many comments and suggestions, some students had no additional comments or rated their experience as fully satisfactory. As one respondent highlighted: I don't have any suggestions for improving life and studying at the university right now. "Maybe there are some problems, but I managed them and now I will calmly continue my studies and life in Silesia."

In summary, the answers to this question reflect the diversity of foreign students' experiences at Silesian universities. On the one hand, they indicate their satisfaction with living and studying in the region; on the other hand, they highlight the difficulties associated with integration, bureaucracy and the limited availability of information and English-speaking communities. The insights gained can provide valuable material for university and regional authorities seeking to improve the living conditions and quality of education offered to international students.

4. Discussion

The study confirmed that foreign students at Silesian universities encounter more difficulties in social integration than in academic adaptation. This result is important in the context of the development of internationalisation strategies, as it highlights the need to expand integration measures, which have so far received less emphasis in the literature. The problems of establishing social relationships, especially for non-EU students, point to the need for mentoring programmes, intercultural workshops and joint social initiatives. These findings contribute to the debate on the relationship between academic and social adaptation in the context of internationalisation.

The second hypothesis, that difficulties in communicating in English are the biggest challenge for international students in the region, was also confirmed. This indicates an urgent need to develop an information infrastructure in English, both at universities and in public spaces. Previous research on internationalisation has emphasised the importance of English as a key communication tool, but our analysis has highlighted its under-utilisation in the regional context, which requires the cooperation of university authorities and public administration.

The results also indicate that foreign students rate the educational offer of Silesian universities well. This positive perception is an important asset that can be used to promote the region as a place conducive to acquiring a quality education. Moreover, it confirms the assumptions of earlier studies, which pointed to the quality of education as a key factor in attracting foreign students.

The similarities of the findings with earlier studies, such as the need to simplify administrative procedures or increase the availability of materials in English, confirm the universal challenges of internationalisation. At the same time, new findings on social and language barriers point to the under-utilisation of the potential of foreign students as future graduates who can make a significant contribution in the local labour market. Internationalisation strategies to date have rarely taken into account the role of graduates in economic development, which opens up new perspectives for university and employer activities. Further research should focus on understanding how to better support international students in building competences and social networks that will facilitate their entry into the labour market after graduation. Developing research tools, especially in terms of open-ended questions, can provide valuable qualitative data, helping to develop measures to foster both better integration of students and to realise their potential in the context of local economic needs.

5. Conclusion

The study highlighted both its cognitive value and limitations, which should be considered in future analyses. The confirmation of hypotheses regarding difficulties in social integration and the significance of language barriers provides a better understanding of the needs of international students in the region. At the same time, the results indicating a high evaluation of the educational offer are a positive signal and a foundation for the further development of internationalisation.

The limitations of the study include a small research sample and a limited scope of open-ended questions, which may impact the comprehensiveness of the data obtained. Nonetheless, the analyses provided new insights that can be applied both locally and globally. Highlighting the role of regional authorities in creating English-language public infrastructure and the need

to increase integration efforts are significant findings that can have practical applications in designing supportive strategies.

The significance of this study extends beyond the local context, offering a new perspective on the relationship between academic and social adaptation in the process of internationalisation. The findings can be utilised to develop support programs for international students and serve as a basis for further analyses on regional specifics in the internationalisation of higher education. These actions can contribute to increasing the attractiveness of the Silesian Voivodeship as a welcoming place for the international academic community.

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THE ROLE OF EMPLOYEE TRUST IN BUILDING CORPORATE SOCIAL RESPONSIBILITY IN MODERN ENTERPRISES

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Purpose: The aim of the article is to explore the role of employee trust in building corporate social responsibility in modern enterprises and to understand how trust influences the perception of a company's image.
Design/Methodology/Approach: The research method used in the article is a systematic literature review.
Findings: The findings respond to the research questions formulated based on the objectives of the study, allowing for the drawing of general conclusions.
Research limitations/Implications: A key drawback of this study is the limited availability of relevant literature, along with the fact that much of the research has been conducted primarily in Asia. Future research should consider searching other databases with the same keywords or adding new combinations to the already searched databases to gather more literature and better understand the topic, which is also highlighted later in the methodology section.
Practical Implications: The practical implications emphasize the importance of authentic engagement in socially responsible activities and suggest active involvement in long-term CSR initiatives, transparent communication of actions, and the inclusion of employees in decision-making processes related to social responsibility.
Originality/Value: The article compiles and summarizes the latest research related to corporate social responsibility (CSR) and employee trust. It is based on a systematic literature review covering the period from January 2010 to April 2024. The aim is to demonstrate that employee trust is not only a value in itself but also an invaluable component that enhances all CSR activities. The article is primarily targeted at managers, but it is also relevant for employees and other external stakeholders. It includes practical business guidelines derived from the research findings.
Keywords: Employee trust, social responsibility, CSR, the role of employee trust in CSR activities
Category of the paper: literature review.

1. Introduction

The concept of Corporate Social Responsibility (CSR) has gained popularity over the past several years, both in academic discussions and in business practice. Howard R. Bowen (1953), one of the pioneers of the concept of CSR, defined it as "the obligations of businessmen to pursue policies, make decisions, or follow lines of action which are desirable in terms of the objectives and values of our society" (Carroll, 1999). In contemporary times, society is becoming increasingly aware of how human and industrial activities impact the environment and the quality of social life. Consequently, in the face of growing social and economic expectations, corporate social responsibility has become a crucial element of business strategies worldwide. Stakeholders increasingly expect businesses to fulfill complex promises and build a solid reputation as socially responsible entities. The Covid-19 pandemic underscored the importance of employee trust, with employers largely responsible for ensuring appropriate working conditions and safeguarding employees' health and safety. The significance of trust for an organization's success is undeniable; only the degree to which it affects the success of a company is subject to discussion (Grudzewski et al., 2009). Trust is a result of how managers treat their employees. R. Rosenthal wrote that the less a manager trusts themselves, the less likely they are to inspire trust in others (Birkenbihl, 1998, p. 121). Credibility and acceptance are the foundations of trust, and the more credible a company is, the greater social trust it inspires and the greater its impact (Maxwell, 1999, p. 56).

Studies conducted in 2019 by the Knight Commission on Trust, Media and Democracy (Knight Commission, 2019) demonstrate that the presence of trust leads to numerous positive outcomes, as societies with higher levels of trust respond better to crises. Another study (Edelman, Trust, Barometer, 2020) revealed that no institution—from businesses and governments to non-profits and media—was perceived as both ethical and competent, nor were any regarded as honest. This illustrates the difficulty any institution faces in gaining societal trust today. Thus, businesses should prioritize both their internal and external stakeholders, particularly valuing the trust they have already earned.

At the core of the social responsibility concept is, or should be, employee trust, as employees are a valuable asset and should be the foundation of CSR activities. This article, grounded in a systematic literature review, aims to explore the role of employee trust in building corporate social responsibility in modern enterprises and to understand how trust influences the perception of a company's image. Additionally, the article seeks to highlight the importance of employee trust as a strategic resource that can contribute to the sustainable development and success of a business within the context of social responsibility. Through the analysis of available research and literature, the article aims to demonstrate that employee trust is not only valuable in itself but also an invaluable component that bolsters all CSR activities. The hypotheses formulated for the purpose of this article are as follows:

- employee trust in the organization plays a key role in the implementation of CSR strategies,
- lack of employee trust in the organization can undermine the credibility and effectiveness of CSR activities,
- companies that do not include their employees in CSR activities risk losing their image and the trust of external stakeholders.

2. Literature review - the concept of corporate social responsibility and trust

Howard R. Bowen first introduced the concept of social responsibility in 1953. He argued that an organization is more than just profit and should be committed to taking actions that benefit society as well. It is a way of operating, a foundation that creates morality in the approach to its stakeholders (Kantor, 2021; Karwacka, 2016). Soon after, Chester L. Bernard addressed CSR, positing that corporate responsibility starts with individual values, which are then translated to the organizational level. He divided responsibility into two types: internal and external. The first relates to employees, management, and shareholders, meaning stakeholders who create the company's values and interact with it daily. The second, external responsibility, relates to society, the government, competitors, and non-governmental organizations (Bernard, 1958; Nieradzik, 2017).

Another well-known definition of CSR indicates that "corporate social responsibility encompasses economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time" (Farooq et al., 2014; based on Carroll, 1979). McWilliams and Siegel (2001) define CSR as "actions that promote social good beyond the interests of the firm and legal requirements." Thus, social responsibility is associated with selfless actions that organizations engage in to contribute to society's development and environmental protection. A socially responsible company should focus on three dimensions of responsibility: economic, social, and environmental (Yadav et al., 2018).

Various definitions of CSR exist in the literature, and the concept continues to evolve. The European Commission defined CSR as “the responsibility of enterprises for their impacts on society” and stated that the first step enterprises should take to be socially responsible is to comply with applicable laws and collective agreements between social partners. To fully realize social responsibility, enterprises should undertake and integrate actions concerning society, the environment, ethics, and human rights and consumer concerns. In the European Commission's communication outlining the renewed EU strategy for 2011-2014, ISO 26000 is listed as one of the three key documents recommended for implementing social responsibility (European Commission, 2011). This standard defines an organization's readiness to consider

environmental, social, and economic issues when making decisions and actions, with accountability for their impact being a fundamental characteristic of social responsibility. This means that an enterprise decides to act ethically and transparently in accordance with applicable laws and international standards, while also considering social responsibility in all actions and responding to stakeholder needs and expectations (Odkrywając ISO 26000 - Gov.pl Portal).

Corporate social responsibility (CSR) has become a popular topic in recent years not only among academics but also among practitioners, especially regarding an organization's responsibility to its stakeholders. In 2020, the consulting firm Porter Novelli conducted research that showed that nearly 90% of employees believe that it is no longer acceptable for companies to exist solely to make money. Modern enterprises should also positively impact society and engage in activities that contribute to its development (77%) (Cogswell, Adams, 2023). This illustrates the importance for enterprises to pay attention to their employees and strive to build relationships based on respect and trust.

Trust, similar to the concept of social responsibility, captures the interest of researchers across various disciplines. It is a dynamic phenomenon that evolves over time, increasing with use and decreasing when neglected, indicating that trust can develop over time but can also regress (Atkinson, Butcher, 2003; Lewicka et al., 2016). Trust is a fundamental organizational value necessitating strong ethical foundations (Bugdol, 2015). It can be conceptualized as a mental structure comprising various beliefs (Yan et al., 2022). Although trust can be defined in many ways, a particularly noteworthy definition characterizes it as "the willingness to be vulnerable to others whose behavior we cannot control" (Hansen et al., 2011). Furthermore, trust is considered a dynamic mutual relationship in which an individual exhibits faith in the reliability and integrity of the other party in an exchange (Sakdanuwatwong, 2020) and is willing to be vulnerable, believing that the other party will not fail them. Its key elements include commitment, kindness, responsibility, honesty, and fairness. The presence of these elements in an organization is assumed to likely build trust among employees and stakeholders (Yadav, Singh, 2016).

The literature points to trust as a key factor for organizational success, facilitating business transactions and increasing customer satisfaction and loyalty (Schwabe, 2023). It is an essential factor supporting significant organizational changes and enabling crisis survival, making it crucial to create an atmosphere conducive to building trust in the enterprise (Barney, Hansen, 1994; Schwabe, 2023). Socially responsible actions can certainly help in this regard. Companies that strive to adhere to corporate social responsibility (CSR) practices show or should show a moral obligation to protect employees from hazardous factors. They should also go beyond traditional CSR perceptions, focusing on social initiatives that prioritize employees' well-being, whose satisfaction with company policies reveals its true intentions (Vveinhardt, Andriukaitiene, Vienazindiene, 2018).

Organizational trust concerns how employees perceive the overall credibility and reliability of the organization and serves as a mediating factor between corporate social responsibility and

its reputation, indicating that higher trust levels correlate with higher reputation growth. Many companies use CSR practices to increase trust among employees. The interconnections between CSR, organizational trust, and company reputation can significantly impact sustainable outcomes. As studies show, gaining trust is difficult, so companies should care for and focus on building it, as it is crucial for survival in a dynamically changing market (Yan et al., 2022). In most cases, it is assumed that there are straightforward relationships, such as employee trust affecting customer trust. To build and maintain trust, transparent policies and dialogue are necessary. Organizations that apply the CSR concept build trust among employees and customers. Some employees believe that the organization should act ethically, even without social control. Employees think that organizations are part of society and must remember this when conducting any actions. It is also anticipated that organizations using CSR to build marketing strategies may lose their trust in the future (Bugdol, 2015).

3. Research methodology

For the purpose of this article, the author uses a systematic literature review method. This approach allows for a comprehensive, reliable, and objective understanding of the topic by analyzing existing studies and publications on the chosen subject. The author focused on two databases: SCOPUS and EBSCO. These databases were chosen because they are widely recognized as reliable sources of scientific information and contain numerous articles from various fields, allowing for an in-depth understanding of the topic. The keywords used for the literature search were: "employee trust," "CSR," and "social responsibility," which helped identify the most relevant articles related to employee trust and corporate social responsibility. These keywords were chosen for their direct relevance to the research questions, which are as follows:

- What role does employee trust in the organization play in building CSR?
- Is it possible for a company to be truly socially responsible without employee trust?
- Do companies that do not consider their employees in their CSR activities risk long-term reputation and trust losses from external stakeholders?

When searching the selected databases, the following pairs of keywords were used: "employee trust" and "CSR" as well as "employee trust" and "social responsibility." The articles analyzed were from the years 2010 to 2024. The factor that prompted the author to use this time range is the fact that the international standard ISO 26000, which contains guidelines on the fundamental principles of social responsibility, its recognition, and stakeholder engagement, was published in 2010. The author also believes that this time range allowed for the inclusion of the latest research and trends in the field of employee trust and corporate social responsibility. The literature review was conducted in several stages, including literature

identification, selection, quality assessment, data extraction, and synthesis. The number of articles analyzed after removing duplicates and combining databases is 22, as shown in the table below.

Table 1.
Number of Articles After Applying Restrictions

No.	Details	EBSCO		SCOPUS	
		„employee trust" „csr"	„employee trust" „social responsibility"	„employee trust" „csr"	„employee trust" „social responsibility"
1	Number of articles after applying restrictions (i.e., keywords, time range)	7	9	12	18
2	Number of articles after excluding duplicates in each database	9		18	
3	Articles marked as useless – duplicate works	5			
4	Final database	22			

Source: Own elaboration based on a systematic literature review conducted in May 2024.

The table shows that the topic of employee trust combined with corporate social responsibility (CSR) is not heavily explored by researchers, highlighting a research gap. However, the chart below, which shows the number of publications over the years, reveals an interesting trend. As can be observed, there has been an increase in publications related to employee trust and CSR after 2020. The projected trend line indicates growing interest in the topic of employee trust combined with corporate social responsibility, suggesting an expected rise in researchers' interest and the number of publications on this subject. This confirms that the Covid-19 pandemic has had, or continues to have, an impact on organizations' attitudes towards employees, with employees expecting more attention and care from their employers. Research also shows that employee trust, in building social responsibility and carrying out related activities, is significantly linked to these efforts. In the long run, it positively affects performance, loyalty, engagement, as well as the company's reputation and image in the eyes of the public.

Upon analyzing the articles, it becomes apparent that researchers have examined different sectors across various cultures, which may distort the results. A researcher conducting the same studies in the same industry but in a different region of the world may obtain entirely different results than their colleague, as countries and communities vary in culture, behavior patterns, beliefs, religious practices, organizational cultures, and political systems. Each of these factors influences employee behavior and trust in the organization, as well as CSR-related activities. As previously mentioned, the author had 22 articles to analyze, but full access to some of them was not possible, which may negatively impact the results and is a weak point of the article.

Future research should consider exploring other databases with the same keywords or incurporating new keyword combinations into already searched databases to gather more literature and better understand the topic. The topic of employee trust and its impact on corporate social responsibility is certainly an underexplored area requiring further investigation to obtain more accurate results. Future studies should investigate whether employee trust in the organization at the time of implementing socially responsible concepts and actions affects their success and whether it is easier to implement these actions in companies that already have employee trust compared to those that struggle with it. Additionally, it is worth examining which initiatives—whether directed at external or internal stakeholders—have a greater impact on building employee trust, engagement, and organizational performance, as well as which CSR activities have the most significant impact on increasing employee trust. Furthermore, it is essential to consider whether education, job position, and the distance from the workplace affect the assessment of the effectiveness of socially responsible actions undertaken by the organization.

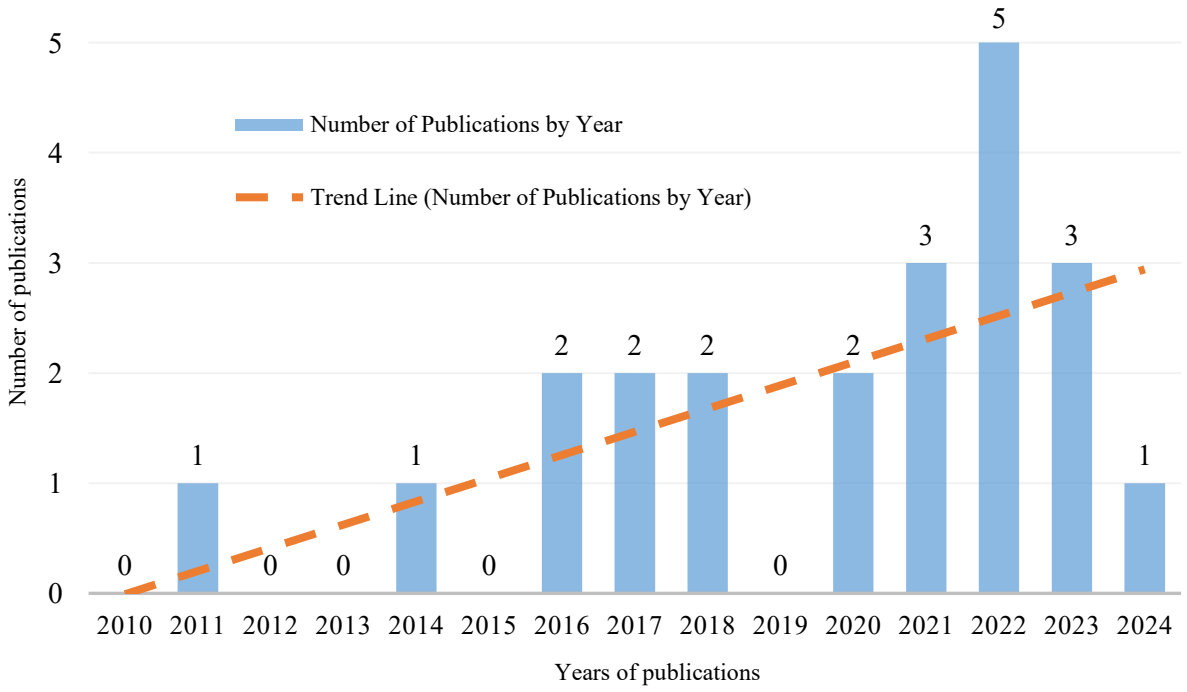

Figure 1. Number of publications in the SCOPUS and EBSCO databases using the keywords "employee trust", "CSR", and "social responsibility" from 2010 to 2024.

Source: Own elaboration based on a systematic literature review conducted in May 2024.

4. Results - employee trust and corporate social responsibility in research

Studies show that CSR activities not only build trust among employees but also enhance the overall corporate reputation of the company. For instance, employees who perceive a strong CSR orientation in their organization are more likely to build trust in the company, thereby

improving its corporate reputation (Yadav et al., 2018). Similarly, Tangngisalu et al. (2020) found that the combination of optimal corporate social responsibility (CSR) and organizational justice positively affects employee trust and the company's reputation. Yan X. et al. (2022) also show that organizations that care for both the safety and needs of their employees can count on greater loyalty and satisfaction. This translates into a higher reputation among the public, as employees praise their workplace outside its walls. Makhdoom and Anjum (2016) also found that companies engaging in socially responsible activities meet the expectations of a wide range of stakeholders, who base their decisions on interactions with them thanks to the positive image. Cogswell and Adams (2023), in their study of employees in southern Louisiana, show that CSR activities aimed at employees can have a greater impact on employee trust and identification than CSR initiatives focused on the community. This may be because CSR activities directed at internal stakeholders not only build their trust but also signal care for them and their well-being, affecting their sense of security. Similar to Hansen et al. (2011), research by Reichert and Sohn (2022) highlights the positive relationship between CSR activities and trust. Their study shows that organizational engagement in socially responsible initiatives not only increases employee trust in the company but also leads to increased employee engagement and a greater willingness to reciprocate towards the organization. This positively influences behaviors such as organizational citizenship and reduces turnover intentions. Studies by Aguilera et al. (2007), Rodrigo and Arenas (2008), and De Roeck and Maon (2018) also confirm that company engagement in CSR practices increases employee trust in the organization, thereby increasing their engagement.

Moreover, studies have shown a strong correlation between increased employee trust in directors and the adoption of corporate social responsibility programs (Hussain et al., 2023). Employees who perceive their employer's socially responsible actions positively and feel that these actions serve both them and the organization are more likely to trust their superiors (Tangngisalu et al., 2020). El Ghoul et al. (2011) also found that when a company engages in charitable activities as part of its CSR strategy, the manager responsible for implementing the control system is perceived as more trustworthy compared to scenarios without corporate donations. This indicates that a company's charitable actions can elicit positive reactions from its internal stakeholders. Additionally, it is worth noting that investors respond positively to companies engaged in CSR activities, consequently lowering the cost of capital for these companies (El Ghoul et al., 2011), even if the impact of donations on charitable causes is relatively modest compared to scenarios without corporate donations. Fehrler and Przepiórka (2013) point to a positive correlation between charitable donations and the perceived credibility of the donor, where donations lead to increased trust in the donor by those observing the act (Reichert, Sohn, 2022). Increased trust in superiors can translate into improved employee perceptions of the company, as well as their satisfaction and performance (Tangngisalu et al., 2020).

Employee trust is significantly linked to the CSR reputation of an organization, and employees' trust in a given organization increases when they perceive that the CSR activities conducted

by the organization align with their values and beliefs (Hebo, Xuexiao, Guangsen, 2024). However, it is worth noting, when examining and drawing conclusions, that education should be considered. A study conducted on automotive industry employees in India found that individuals with higher education had less trust and a lower opinion of their workplace compared to those with lower education. According to researchers, this may indicate that higher-educated individuals in higher positions have greater awareness and demands regarding their employer, or that living in different regions of India, they have not experienced CSR activities (Yadav et al., 2018). According to social exchange theory, CSR initiatives build employee trust in the organization through mutual changes (Hebo, Xuexiao, Guangsen, 2024). Studies show that trust gained through CSR activities impacts employee behaviors and precedes their satisfaction (Kim, Gatling, 2019; Hebo, Xuexiao, Guangsen, 2024). Moreover, cooperation also has a significant and beneficial impact on employee trust (Reiter, Tzafrir, 2021). When a high level of employee trust accompanies the correlation between the company's reputation and performance, the implementation of transparent CSR practices may be most optimal (Tangngisalu et al., 2020). Organizations that prioritize CSR serve as "trustees" for all stakeholders, including employees who closely monitor the organization's ethical actions. Research conducted by Hansen confirmed Rupp's theory, which suggested that the relationship between corporate social responsibility (CSR) performance and financial performance can partially operate through the development of employee trust in the organization. CSR initiatives can directly impact individual employee performance, favoring the organization because employees who perceive their organizations as socially responsible usually develop trust in their organizations, which leads to improved performance (Hansen et al., 2011), as confirmed by later research conducted in 2020 by Tangngisalu J. et al. It is also worth emphasizing the importance of CSR reporting, as it positively influences both the improvement of corporate reputation and employee trust, as well as customer satisfaction. This increases brand value, employee awareness of CSR, and improves communication with stakeholders (Kuo et al., 2016). Research conducted on tourism industry organizations showed that ethical leadership strengthens the relationship between trust and ecological behavior intentions (Ali, Hassan, 2023). Other research conducted on employees of telecommunications companies in Malaysia found that organizations can increase their profitability by adapting to business models where human values, both emotional and spiritual, are significant (Wahid, Mustamil, 2017). Studies show that the more responsible and ethical a company's actions, the more trust they generate among employees (Yadav, Singh, 2016), and that employee trust is an important mediating factor in the relationships between social, environmental, corporate governance duties, personal risk management, and effective organizational management (Duong, Hai Thi Thanh, 2022).

The way employees perceive corporate social responsibility, including philanthropic, ethical, and environmental responsibility, has a direct impact on their trust in the organization, its leadership, and its performance. This is because employees perceive organizations engaging in socially responsible activities more positively, experiencing an increase in self-esteem and

pride in their association with the company, and feeling that their organization also benefits stakeholders. Similar results were obtained by Hansen et al. (2011), Yu and Choi (2014), and Yadav et al. (2018), who also noticed a positive relationship between the perception of CSR and employee trust. Employees usually believe in the credibility of their organization when they can align with a socially responsible leader and company. This shows that employees' positive perception of CSR, based on the organization's focus on profit while considering its impact on the environment and society, contributes to building trust in their leaders and the organization (Sakdanuwatwong, 2020). Given that organizational trust is the belief that employees have that their company's future actions will benefit them, it is essential that this trust is a direct result of CSR initiatives, the effect of which should be increased employee engagement in the organization. Actions taken by the organization that positively affect the community and its well-being encourage employees to reciprocate and maintain a sense of solidarity. This shows that CSR initiates a social exchange between the enterprise and its employees, leading not only to trust but also to organizational engagement. Molm et al. (2000) had a similar view, as according to social exchange theory, when the organization is fair, kind, and cares for its employees, it encourages their reciprocity and trust (Farooq et al., 2014).

Based on the analyzed articles and their results, the research questions can be answered as follows:

- **What role does employee trust in the organization play in building CSR?** Employee trust in the organization can be a driving force that motivates and enables the implementation of CSR strategies and indicates the organization's readiness to adopt such practices. It is an important factor in building social responsibility, and in the long run, without it, companies will face challenges in effectively implementing CSR and reaping its benefits. Studies show that companies engaging in CSR activities increase employees' trust in the organization, which in turn leads to greater employee engagement and loyalty, as well as a willingnes to reciprocate and improve individual employee performance, consequently positively impacting the entire organization. It is also worth emphasizing that employee trust and their positive opinion affect the organization's image in the surrounding community, as well as among suppliers and customers.
- **Is it possible for a company to be truly socially responsible without employee trust?** Trust is often deemed essential for authentic CSR actions, and its absence can undermine their credibility and effectiveness. While a company can engage in CSR activities without employee trust, it must be aware that their effectiveness will be limited. In contemporary times, and especially after the Covid-19 pandemic, the goal of social responsibility should be employee trust, without which a company cannot be considered truly socially responsible, as it lies at the core of this concept and affects the entire organization. Studies show that the more responsible and ethical CSR activities are, the more they inspire employee trust. They also show that the closer CSR

activities are to employees, the greater their trust in the organization; therefore, if a company cannot earn this trust, it cannot be considered truly socially responsible.

- **Do companies that do not consider their employees in their CSR activities risk losing the trust and reputation among external stakeholders in the long run?** Relationships with employees often reflect the overall approach of the company to CSR and can have long-term consequences for its reputation. It is also worth noting that there are studies proving that employee trust translates into customer trust, confirming how important an employee is to their employer, and that without their trust, a company can lose a lot, not only in terms of image and credibility in the eyes of employees but also in the eyes of external stakeholders. The lack of CSR activities directed towards employees may be perceived by external stakeholders as an attempt to deceive and mask the company's true intentions, and the CSR activities conducted by the company without considering its employees may be seen as purely symbolic and marketing efforts aimed at improving the image, which could result in the opposite effect. Employees are key stakeholders, and their perception of the company and engagement in CSR activities significantly impact the overall reputetion of the company. Therefore, companies that do not include their employees in CSR activities risk losing the trust and reputation among external stakeholders, as well as potential financial losses.

5. Discussion and conclusions

The analysis of research on employee trust and corporate social responsibility (CSR) demonstrates that these two concepts are closely related. Research findings indicate that CSR activities not only strengthen employee trust but also enhance the company's overall corporate reputation. Employee trust, in turn, plays a crucial role in the implementation of CSR strategies and impacts the perceived authenticity of socially responsible actions in the eyes of external stakeholders. However, researchers have analyzed various sectors in different cultures, which may result in diverse findings. It is possible that a researcher conducting similar studies in another industry or region of the world may obtain different results due to cultural differences, behavior patterns, religion, organizational culture, and political system, among other factors.

The author analyzed 22 articles, but full access to some of them was not obtained, which may negatively impact the results and constitutes a limitation of this article. Future research should consider searching other databases or incorporating new keyword combinations to obtain more comprehensive literature and better understand the topic. Future studies should focus on whether employee trust in the organization at the time of implementing CSR activities affects their success and whether it is easier to implement these activities in companies that already have employee trust. Additionally, it is worth investigating which CSR initiatives—whether

directed at external or internal stakeholders—have a greater impact on building employee trust, engagement, and organizational performance. Another aspect to consider is education, job position, and the distance from the workplace. Research by Yadav et al. (2018) showed that people with higher education have less trust in their workplace than those with lower education. This may be due to greater awareness and expectations towards the employer or regional differences in CSR experiences.

The conclusions drawn from the analyzed literature are as follows:

- **Role of Trust:** Employee trust is crucial for building corporate social responsibility and is essential for the authenticity of CSR activities. Employee trust acts as a mediator between CSR activities and the organization's reputation.
- **CSR and Reputation:** CSR activities that focus on employees positively impact building their trust, which can translate into an increased company reputation in the eyes of external stakeholders, thereby improving the organization's image.
- **Impact of CSR on Employees:** CSR initiatives can lead to increased employee trust, which can positively affect behaviors and attitudes such as organizational citizenship behaviors and reduced turnover. They can also enhance job satisfaction and make employees proud of their employer, who actively and sincerely engages in socially responsible actions and supports both them and the local community. Socially responsible actions positively impact employee engagement and loyalty.
- **Impact on Financial Performance:** CSR initiatives, by building employee trust and engagement, can positively affect the company's financial performance.
- **Educational Differences:** Trust in the company and its socially responsible actions may vary depending on the employees' education. Employees with higher education may have greater expectations regarding CSR activities.
- **Building Trust in Supervisors:** Ethical leadership that supports CSR initiatives positively influences trust in supervisors (managers, directors, leaders).
- **Management Implications:** Research suggests that companies, and more specifically supervisors/managers, should strive to build trust among employees to fully leverage CSR investments and improve company performance and employee engagement.

In summary, corporate social responsibility activities are crucial for building trust and the company's reputation. Employees who see their employer engaging in ethical and socially responsible practices are more engaged, loyal, and have greater trust in their supervisors. Companies that effectively communicate and implement CSR activities can expect better reputations among customers and investors, which, in the long run, translates into better financial performance. Future research should focus on further analyzing these relationships to better understand the mechanisms of CSR actions and their impact on trust and the company's image.

6. Practical implications

Below are several practical applications of the obtained results in business:

Building Trust:

- **Engagement in CSR:** Companies should actively engage in corporate social responsibility activities to build employee trust. When employees feel that their employer cares about their needs, society, and the environment, they become more loyal and engaged. However, it is important to ensure that the company's actions are not merely symbolic but have a genuine impact on working conditions, employee well-being, or improving the lives of the local community and protecting the environment. Otherwise, the company may lose both the trust it has already gained and its reputation.
- **Transparency and Communication:** Regular, transparent, and effective reporting of CSR activities increases the level of trust and loyalty among both internal stakeholders, such as employees, and external stakeholders, such as customers.

Improving Reputation:

- **Long-term CSR Initiatives:** Effective and genuine CSR activities can significantly improve the company's image among both internal and external stakeholders. Employees who take pride in their workplace's involvement in socially responsible actions praise it outside the company's walls, contributing to its positive perception by society.
- **Ethical Leadership:** Supervisors should set an example of ethical behavior and actively support CSR initiatives, thereby increasing trust in the company and its leadership.

Impact on Financial Performance:

- **Reducing Operating Costs:** Socially responsible actions can lead to more efficient management of the organization's resources, ultimately reducing operating costs.
- **Increased Loyalty and Productivity:** CSR activities build employee trust, leading to greater loyalty and reduced turnover, thereby lowering costs associated with hiring new employees, such as recruitment and training.

Employee Engagement:

- Collaboration: Companies should involve employees in decision-making processes regarding socially responsible actions so that they feel they have an impact on the direction of these actions and can identify with them. This increases their sense of belonging and responsibility.
- **Education and Development:** Companies should educate their employees about the impact and importance of CSR activities on society and the organization, thereby increasing employee engagement.

Relations with Stakeholders:

- **Communication Strategies:** Companies should develop communication strategies that highlight their commitment to socially responsible actions, thereby increasing stakeholder trust.
- CSR Reporting: Companies should regularly publish reports on their CSR activities, which can positively impact the company's reputation and image and increase attractiveness to both investors and customers.

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THE INTERNATIONALIZATION OF POLISH AND GERMAN ENTERPRISES – COMPARATIVE ANALYSIS

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Purpose: The purpose of the paper is to recognize and characterize the process of internationalization of Polish and German enterprises and to identify the differences in the globalization process of these entities on the basis of a comparative analysis.
Design/methodology/approach: The adopted research process oriented towards achieving the purpose of the work was multi-stage, embracing the analysis of source literature, performing qualitative empirical research using the case study method, conducting in-depth interviews with managers of Polish and German enterprises, using the qualitative content analysis technique in the diagnosis, and developing case studies of Polish and German enterprises.
Findings: The study made it possible, among others, to identify the course of the internationalization process, forms and markets of foreign operations, the rationale of Polish and German enterprises for undertaking internationalization, and to isolate differences in foreign operations between the entities under study.
Research limitations/implications: The research results presented in this paper used a qualitative approach. One of the limitations is that qualitative research is generally based on smaller samples. Future research can use the demonstrated qualitative findings as important source of information for forthcoming quantitative studies, e.g. the ones conducted on large quoted samples, and they can also provide a basis for formulating and developing hypotheses in quantitative studies.
Practical implications: The applied value of the results of the study and the obtained identifications is that they can be used by Polish entities in their ongoing or planned expansion into foreign markets. They can also constitute a recommendation for government and local agencies in terms of supporting enterprises in their foreign endeavours. The results of the study of German entities can be significantly meaningful for managers of Polish companies, allowing them to apply best practices in the process of internationalization of their enterprises.
Originality/value: The comparative analysis of Polish and German companies indicates the existence of differences in the internationalization processes of the surveyed companies, the identification of these differences provides valuable insight and tips for researchers and practitioners. The paper is aimed at both scientists and practitioners.
Keywords: internationalization, Polish enterprises, German enterprises, case studies
Category of the paper: research paper.

1. Introduction

The internationalization of Polish companies is a relatively novel phenomenon, since back in 1990 the export of Polish business entities amounted to merely 14.3 billion USD (GUS, 2024). Over the past several years, there has been a significant increase in the export of Polish corporate bodies, which in 2023 reached the value of 381.9 billion USD (GUS, 2024). The main conditions for the internationalization of Polish businesses were the process of transformation of the Polish economy, especially the political transitions, the introduction of a market economy and the adaptive changes introduced by economic entities to conform to new market conditions as well as Poland's accession to the structures of the European Union (EU). An important element of the process of internationalization of the entities was Poland's accession to the EU. In consequence, Polish companies gained easier access to the EU market, making their first attempts at internationalization at that time. The prerequisite for undertaking research on the internationalization of companies was a literature review and the results of my earlier research (Komor, Kuehn, 2013; Komor, 2017; Komor, 2020), which revealed the need to deepen theoretical and empirical research of the process of internationalization of Polish entities.

Due to the fact that most Polish enterprises have only recently initiated the process of internationalization, it was resolved to include also German enterprises in the study, because Germany is the leading global, and largest European exporter, and German entities have many years of experience in internationalization on global markets. In 2023, German exports exceeded 1,589 billion EUR, and Polish exports amounted to over 353 billion EUR (Eurostat, 2024). Germany is the largest European economy, while Poland is the largest economy among the new EU member states and the share of Polish goods and services exports to Germany was 27.9% in 2023 (GUS, 2024). Therefore, it seems interesting to present the internationalization of Polish enterprises in the context of the internationalization of German entities.

Based on the above, for the purposes of the research, the following proposition (P1) was established: There are differences in the process and method of internationalization between Polish and German companies.

The purpose of the article is to identify and characterize the internationalization process of Polish and German enterprises and to identify the differences in the globalization process of these entities based on a comparative analysis.

The adopted research process oriented towards achieving the purpose of the work was multi-stage, embracing the analysis of source literature in the first place, then conducting qualitative empirical research using the case study method, including conducting in-depth interviews with managers of Polish and German enterprises. Then, by the means of the qualitative content analysis technique according to P. Mayring in the process of identification, reports were developed and the results of enterprise studies were presented.

2. Theoretical background

Internationalization, a concept that is often cited in the literature on the subject, can be defined as engagement of a company in any form in foreign markets. Internationalization of a company means "the process of adapting the firms' operations (i.e. strategy, structure, resources) to international environments" (Calof, Beamish, 1995, p.116). It can be defined as "the process through which a firm moves from operating solely in its domestic marketplace to international markets" (Amdam et al., 2020, p. 1; originally: Javalgi et al., 2003, p. 185). Internationalization can be perceived as a means to increase production and revenues, fully utilize the resources of companies, e.g. financial or human, save costs, increase profitability as well as take advantage of the opportunities created by foreign markets (Braunerhjelm, Halldin, 2019). It is important to note that internationalization is a phenomenon affecting the whole company, in which all departments work together to meet expansion goals and take advantage of opportunities in foreign markets.

The source literature is abundant in theories and models explaining the process of internationalization of enterprises. The most well-known and widespread include: the product life cycle theory (Vernon, 1966), the eclectic paradigm theory (Dunning, 1980, 1988), the Uppsala internationalization model (Johanson, Wiedersheim-Paul, 1975; Johanson, Vahlne, 1977), the behavioral theory of foreign direct investment (Aharoni, 1966), innovative stage models of internationalization (Bilkey, Tesar, 1977; Reid, 1981), models of early and rapidly internationalizing firms (Rennie, 1993; McDougall et al., 1994). Some of these concepts will be discussed below.

The Uppsala internationalization model (Johanson, Wiedersheim-Paul, 1975; Johanson, Vahlne, 1977) formulated on the basis of empirical research conducted through case studies in Swedish enterprises, was proposed in the 1970s. In the following years, it was further developed and expanded to include new elements, such as nine situations of internationalization or an adjustment of the model to a network approach (Vahlne, Nordstrom, 1993; Johanson, Vahlne, 2009). In this model, internationalization is a process within which evolutionary, stage-based and incremental internationalization occur, while the model is dynamic in nature. The model has two basic theoretical elements: patterns of internationalization divided into the so-called Establishment Chain and Psychic Distance Chain and the model of Internationalization consisting of dynamic elements, i.e. Commitment Decisions and Current Activities as well as static elements, i.e. Market Knowledge and Market Commitment (Johanson, Wiedersheim-Paul, 1975, pp. 306-309; Johanson, Vahlne, 1977, pp. 26-31; Johanson, Vahlne, 1990, pp. 11-15, Johanson, Vahlne, 2009, pp. 1412-1423). Establishment Chain is a time pattern related to the choice of forms of foreign markets entry, meaning the distance from the company's home country. It distinguishes the following forms: irregular export activity, export through independent representatives, establishment of a foreign sales agency, foreign production units.

Once the next form of internationalization is achieved, the level of foreign resource engagement and the risks involved as well as knowledge and experience in operating on the external market related to the learning process increase accordingly. Psychic Distance Chain is a time and incremental pattern, within which internationalization is initiated on the markets of trusted countries, i.e. with a similar psychic distance. Obtaining the learning effect, acquiring knowledge and experience in countries with low psychic distance means that entering the markets of countries previously perceived by the company as markets with high psychic distance is associated with reducing the aforementioned distance. The Uppsala model contains dynamic and static elements. Commitment Decisions is a dynamic component referring to decisions regarding the course of internationalization generating economic effects and doubts related to the scope of resource engagement and accepted market risk abroad. Current Activities is also a dynamic part of the model. By the means of ongoing business activities out of the country, the entity gains experience by continuous repetition of activities of a learning process nature, in which the passage of time is of significant importance. Market Knowledge is a static part referring mainly to knowledge, which is the result of learning process in the framework of internationalization. The model distinguishes different types of knowledge: objective Knowledge, experiential Knowledge, general Knowledge, market specific Knowledge.

The static element is also Market Commitment understood as the size and structure of resource connections with the foreign market, with the transition to higher forms of internationalization, the involvement of the organization's resources abroad increases.

Innovative models of internationalization were created at the turn of the 1970s and 1980s, they are dynamic and sequential models related to the enterprise learning strategy within the export framework. They are based on the E.M. Rogers' (1962) diffusion of innovations model, which distinguishes the following stages of the adaptation process: awareness, interest, evaluation, testing and adaptation. The most famous include: W.J. Bilkey & G. Tesar (1977), S.D. Reid (1981), S.T. Cavusgil (1980). In subsequent years, these models were augmented, and new, extended concepts appeared on the basis of empirical research. For example, Lim et al. (1991) presented an interesting four-stage model consisting of the following phases: awareness (searching for primary and secondary information on export opportunities), interest (interest in exporting products to foreign markets, doing business with foreign customers, recognizing opportunities on the foreign market), intention (chance to become the main exporter in the industry and the readiness of the company to start exporting), adaptation (status of a firm with regard to export adoption and export intensity). Thereafter, D. Crick (1995) proposed a three-stage model distinguishing non-exporters, passive exporters and active exporters. In the following years, supplementary concepts of innovative models of internationalization were presented. R. Wickramaseker & E. Oczkowski (2006) presented a model introducing an additional stage called trial, and distinguishing the following phases: awareness (export is not profitable, no interest in export, enterprise oriented towards the domestic market), interest (entity interested in recognizing opportunities and products on the foreign market), trial

(assessment of benefits from export, undertaking export attempts and gathering experience), adaptation (enterprise engaged in export activities, undertaking export on new markets). In turn, having in mind the needs of small and medium-sized enterprises, T.Y. Shih et al. (2023) proposed a model consisting of: pre-exporter stage, early exporter stage, established Exporter stage. All innovation models assume that there is a learning process related to export at different stages, which is an innovation for the enterprise. Foreign expansion can be understood as the adoption of innovative behaviors, within which the selection of the country and recognition of prospective sales opportunities on foreign markets are the main elements of export as a process of implementing innovation. The innovative models of internationalization differ from each other to a small extent, as they mainly concern the motives for undertaking export, the number of individual export phases, e.g. three, four or five, or the determination of the stage at which enterprises begin permanent export. Innovation models of internationalization have certain weaknesses related to the lack of a uniform theory and a single model, problems in delimiting individual stages or not taking into account other forms of expansion into foreign markets, e.g. foreign direct investment.

In the early 1990s, the literature on the subject was further expanded on the concept of early and rapid internationalization, which was an outcome of phenomenon of newly established entities, especially small and medium-sized ones, which began internationalization process soon after their establishment (Rennie, 1993; Oviatt, McDougall, 1994; McDougall et al., 1994). At that time, in the paper by M. Rennie (1993), the term born global enterprises appeared, which referred to entities that were mainly technological or IT start-ups that exploited a competitive advantage based on knowledge, which began internationalization promptly after their inception and achieved significant revenues from sales in foreign markets. The definition proposed by B. Oviatt & P. McDougall (1994, 49) defines the term international new ventures as "a business organization that, from inception, seeks to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries". It should be noted that there is no unanimity in the literature regarding the terminology of the so-called early and rapidly internationalized enterprises called, among others, born global, international new ventures, born-international (Renni, 1993; Oviatt, McDougall, 1994; Kundu, Katz, 2003). However, one can distinguish characteristic features of these entities relating to internal factors, i.e. the experience and background of the founder and the global vision of the founder at the time of the company's establishment; external factors, i.e. globalization of production and markets, technological progress in the field of information and communication technologies as well as factors driving early and accelerated internationalization, i.e. niche markets with innovative products for globally dispersed customers, online sales or activities in industries using technology and knowledge (Escandon-Barbosa et al., 2019). Individual researchers of the phenomenon of early and fast internationalization present different opinions as to the time span between the establishment of the enterprise and the onset of internationalization (e.g. up to two,

three or six years) and the size of exports of enterprises considered as early and rapid internationalization (e.g. foreign revenues from 5% or 25% of the total revenues of the enterprise). (McDougall, Oviatt, 1996; Zahra et al., 2000, Kuivalainen et al., 2007). The following distinctive features of early and rapid internationalization enterprises can be distinguished: they introduce innovative, novel, and unique products to the market; the leadership of these firms is frequently supported by change agents (founders or employees) who are advocates of the export initiative, have an entrepreneurial orientation and are convinced that it is possible to reach international customers all over the world; these entities effectively build networks of global collaborators, e.g. distributors or representatives, global companies are more often established in small domestic markets (Cavusgil, Knight, 2015). It should be noted that there are many concepts trying to explain the phenomenon of companies that internationalize early and rapidly in the literature on the subject, however, there is no single, universally recognized theoretical model concerning such companies.

3. Research method

In the empirical study, which was exploratory in nature, the case study research method was applied, embracing secondary and primary information sources (based on in-depth interviews), whereas the qualitative content analysis method according to P. Mayring (2022a, 2022b) was used in the analysis of the said data.

Case study research can be described as "an in-depth study of phenomena and processes in their actual environment" (Czakon, 2013, p. 111). It is an important scientific method of acquiring knowledge about current economic processes, including the processes of internationalization of enterprises. The implemented qualitative research allowed for learning about phenomena, relations and activities occurring within the internationalization framework. For this purpose, the method of case study research of Polish and German enterprises was employyed, which by the means of its exploratory nature, also provided information regarding, among others, the reasons for undertaking internationalization or the course of the internationalization process of Polish and German enterprises.

The literature on the subject lacks a strictly defined procedure for conducting a case study, however, some authors suggested successive stages of proceedings used in conducting such a study (Yin, 2015; Czakon, 2013; Schoegel, Tomczak, 2009). The discussed study was divided into the following stages: creating a research project and formulating research questions, preparing a study project, developing data collection tools and conducting field research, data analysis and evaluation, case study report.

In the first stage of the study, the assumptions of the case study were adopted, the procedure scheme and the subject, purpose, scope of the study were determined, as well as the research

questions were formulated. At this stage, the criteria of methodological rigor were taken into account. It was inferred that evidence would be collected from Polish and German enterprises. The purpose of the article is to identify and characterize the process of internationalization of Polish and German enterprises and to identify, based on a comparative analysis, the differences in the internationalization of these entities. For the purposes of achieving the aim of the work, the following research questions were formulated:

- How did the internationalization process of the surveyed enterprises proceed?
- How and on which markets do the enterprises conduct foreign operations?
- What was the rationale for undertaking internationalization?
- Are there any differences in internationalization between Polish and German enterprises and what is their nature?

In the next stage, which was the preparation of the project of the study, it was decided to conduct multiple case studies (Eisenhardt, 1989) in Polish and German entities. The foreign experience of Polish companies is negligible; therefore, it was decided to conduct supplementary case studies of German companies with long experience in internationalization of their business activity. The method of collecting information and secondary and primary data as well as the method of analyzing evidence to elicit answers to the formulated research questions were also determined. For the purposes of this study, a deliberate selection of cases of four Polish and German companies was made, taking into account the criteria enabling elicitation of answers to the posed research questions. Then, contacts with entities were established in order to identify people in the company knowledgeable about the internationalization process and to schedule appointments to conduct in-depth interviews. It was also decided to triangulate information collection techniques to ensure the convergence of evidence from different data sources (secondary and primary). Qualitative content analysis was used in the analysis of primary data gathered during the interviews (Komor, Grzyb, 2023).

In the third stage of the research, data collection tools were developed and fieldwork was conducted. In the performed case studies, some secondary data was available prior to the interview, i.e. articles in magazines and press, publications of industry reports, statistical data, as well as information from the websites of the company and its foreign subsidiaries and other external websites. The remaining pieces of information were obtained during the interviews, during which the interviewees were asked to provide internal data, reports, brochures, presentations or other materials. A partially standardized interview scenario, which contained a range of issues related to the process of internationalization of enterprises, was prepared. In order to determine the correctness of the prepared scenario, a pilot interview was conducted, after which some corrections were made. The scenario was prepared in Polish, and then, in order to verify the translation correctly, it was translated from Polish into German and again from German into Polish (Brislin, 1970). The interviews with the managers of the enterprises were conducted by the author of this paper. In the case of German companies, they took place at the headquarters of entities in Germany. All interviews were conducted between 2023 and 2024.

The respondents were representatives of the management staff acquainted with knowledge about the internationalization of the company, in most cases representatives of the first level of management, i.e. president, board member, export director. Accordingly, in individual cases of Polish enterprises, these were representatives of the second level of management. The length of the interviews ranged from about 49 to 93 minutes. In order to ensure precise and correct analysis of the collected primary data, the interviews were recorded on electronic media and notes were taken, and then the full version of the recording was transcribed using the "F4" program, providing the basis for the future qualitative content analysis.

In the penultimate stage, all collected data was analyzed and evaluated. In the discussed study, the analysis was based on evidence obtained from both primary data (conducted expert interviews) and secondary data (collected internal and external information). For this purpose, the qualitative content analysis method according to P. Mayring (2022a; 2022b; Komor, Grzyb, 2023), used for identifications in the field of management and quality sciences, was applied. It is being an increasingly used technique of analysis, evaluation and interpretation in economic sciences, as a method of analyzing material in qualitative research. It consists in evaluation and interpretation through systematic analysis carried out according to a scheme based on fixed rules of procedure, simultaneously creating categories or systems of categories and thus enableing the analysis of the research material in a methodically controlled manner. Due to the exploratory nature of the study, an inductive model of procedure was adopted in the analysis. Three techniques were used in the conducted qualitative content analysis: summarizing (reduction and compression of the source material, explicative (introducing explanations to unclear parts of the original material or taking into account additional contextual information) and structural (isolating and summarizing certain topics, problems and aspects from the material) (Mayring, 2022b). In the course of the analysis, particular importance was attached to the structural content analysis, which was used to conduct comparative case studies of Polish and German companies. In the discussed study, the MAXQDA 2020 program was used to support data analysis.

In the last stage of the study, case study reports of Polish and German enterprises were developed and included in the following subsection of this article. They contain comprehensive information on the enterprises studied, refer to the research questions and the purpose of the work stated at the beginning of the study, and present the results of the conducted research.

4. Case studies of Polish and German companies

Descriptions of individual case studies, created on the basis of the content analysis conducted according to P. Mayring and the analysis of other collected pieces of information and materials are presented below. In all the conducted case study research, primary data, i.e. the results of the analysis of in-depth interviews, and other secondary data were used.

4.1. Case study of Universum-BLC sp. z o. o.

The Universum-BLC sp. z o.o. company was established as a family business in 1999 in Gdynia. Since its foundation, it has been involved in international freight forwarding services and services related to comprehensively represent the client's interests before customs authorities. Over 97% of customers are foreign companies. The rationale behind the internationalization was the experiential knowledge of the founder in the forwarding industry. In 2023, the company employed approximately 75 employees, including 35 people in the headquarters in Gdynia, and the revenue from the business amounted to several dozen million PLN. In the initial period of activity, these were services related to sea and land forwarding and customs clearance. As the company developed, it also began to offer rail and air forwarding services, customs warehousing and temporary storage, and oversized goods forwarding. The company specializes in organizing the logistics chain in every part of the world, but does not offer forwarding services on the domestic market. Therefore, the company can be considered a so-called early and rapidly internationalized company. Universum specializes in forwarding activities to Eastern European countries (Ukraine, Kazakhstan, Belarus, Russia, Georgia, Armenia, Azerbaijan) and the Middle East (Turkey, Iran, Iraq) and China. As the Respondent accounts: "our main role is that a customer comes to us with their own goods and we have to take care of logistics from point A to point B, from the shipper to the final recipient, including sea, road and rail transport, plus all customs documentation, and we do all of that." Most of the commissions combine sea transport with road transport and customs clearance. Just a year after its inception, i.e. in 2000, the company established a subsidiary in Guangzhou in China. Then, in 2007, a representative office in Hamburg and in 2012 in Przemyśl and Lviv in Ukraine. In the following years, branches were established in Kaliningrad in Russia in 2018, and in Tbilisi in Georgia in 2021. All foreign branches, except for China and Georgia, are also customs agencies. Each foreign branch hires several employees. Additionally, the company has domestic branches located in Zielona Góra and Przemyśl. As it is observed contextually by the Respondent: "the customer can choose where it is more convenient for them to store their goods, because sometimes the goods arrive in a container and the customer asks not to unload them in Gdynia but in Przemyśl, because for example, it is more convenient for them there, because then they will travel in a small bus and will collect the goods there in batches". The company has been expanding dramatically since 2019. The outbreak of war in Ukraine in 2022 boosted company’s top-line growth. At that time, the company was contracted for the transport of goods from ports in Western Europe and Gdynia owing to the fact that Ukrainian ports ceased to operate and customers from Ukraine rented company’s warehouses to store their commodities. Currently, freight forwarding on this market constitutes a significant revenue share. The pandemic and the energy crisis had no impact on the business. The company is a logistics partner of non-governmental organizations providing humanitarian aid such as the UN, IHRC, UNHCR, BRICS.

4.2. Case study of AC S.A.

The AC company is a joint-stock company dealing in the segment of power supply systems for automotive industry, car electronics and distribution of car parts. It is the largest Polish, and third largest producer of LPG installations in the world, and a leader on the Polish market. In 2023, the entity generated revenues of 260 million PLN and employed 739 people. When the company was established in 1986 as Wytwórnia Części Samochodowych (Car Parts Manufacture), the business profile of the enterprise was related to the production of oil heaters for diesel engines and car parts. In 1988, thus shortly after its establishment, the company went into partnership with an Italian contractor and initialized its first export activities. In the mid-1990s, the company underwent business transformation, which caused it to withdraw from the production of heaters in favor of other products. The production of small LPG installations for cars was launched, gradually expanding it to include its own electronic products, i.e. controllers for LPG installations, up to the production of its own LPG installation systems, also containing its own mechanical sets, i.e. reducers or injectors.

Thereupon, the entity established cooperation with a German contractor in the area of production and export of cable harnesses and electronic sets for trailer hitches for campers in the form of contract manufacturing, the cooperation, which is still ongoing, constitutes a significant part of the company's revenues and exports. In subsequent years, the entity tried to adapt its products to market requirements and in 1999 created its own brand STAG, offering technologically advanced sequential electronic controller systems for car LPG installations. The company then began to expand not only to the markets of neighboring countries, such as Belarus, Russia, and Ukraine, but also to African countries (e.g. Algeria, Kenya), South and Central America (e.g. Peru, Mexico), and Asia (e.g. Uzbekistan, Turkey, India, Thailand, and China). As the respondent reveals: the adopted strategy of geographic diversification was helpful in a situation when, for example, Thailand was the main export destination, and at some point…, the military junta took over..., and then we lost that market overnight. Poland's accession to the EU facilitated exports to EU countries. In the following years, the company expanded abroad. In 2014 the company established a branch in Peru, which is an important sales market, because therein the company converts brand new cars and equips them with STAG systems. The reasons for expanding operations abroad were multifaceted and included: the openness and vision of the then owners focused on export, proximity to eastern markets and, later, diversification of export in many markets due to securing the production volume in Poland.

The pandemic reduced demand for LPG installations, while sales of cable harnesses to a partner in Germany soared. The energy price rise had a small impact on the company due to the fact that the production process in this segment is not energy-intensive, while the war in Ukraine affected the company significantly, because it was an important sales market.

The STAG brand is sold in over 50 countries worldwide, in which the company has distributors and expands cooperation with garages. Up to the present moment, the STAG LPG systems have been installed in over 5 million cars worldwide. Currently, approximately 70% of AC S.A.'s sales revenue is export, including 50% of automotive LPG systems and 20% of trailer hitch kits for the German partner.

4.3. Case study of Trefl S.A.

Trefl S.A. is a family business established in 1985 in Sopot by Kazimierz Wierzbiński for the purpose of small-scale production of jigsaw puzzles. At present, the company is one of the largest jigsaw puzzle manufacturers in Europe and is present in many markets worldwide. The headquarters are located in Gdynia and all shares belong to the Wierzbicki family. In 2023, the company generated revenue of 294.1 million PLN and employed approximately 850 staff members. The Trefl Group consists of production, trade, media and sports entities. The company deals in designing, manufacturing and distributing games, toys and puzzles. The firm offers a range of about 2,000 products divided into the following groups: jigsaw puzzles, games and cards, toys, books and Trefliki. The company is licensed by many brands, e.g., Disney, Hasbro and Mattel, and uses the assets in the production of individual products.

A few years after its foundation, the company established cooperation with a license partner, The Walt Disney Company. This was a breakthrough period in the company's development, in 1991 the company began selling jigsaw puzzles featuring Donald Duck. As the respondent accounts, "we are the only manufacturer of wooden puzzles that has a Disney license for the whole world and no other company has it, only us, so we try to build a competitive advantage." Obtaining a license that was not geographically bound to the Polish market was also a drive for foreign expansion. Furthermore, the incentive to expand into foreign markets was manifold and can be attributed to the saturation of the domestic market in the jigsaw puzzle segment, expansion of the sales market, building a global brand and the owner's vision of a global business. Currently, Trefl exports toys to over 50 countries on 5 continents, conducting sales in the B2B model in cooperation with foreign partners and distribution agents as well as the largest retail chains. In individual markets, the company cooperates with strategic distributors, but also smaller agents. The company does not have its own stores and its online sales are negligible. Revenues from foreign sales constitute around 60% of the company's total revenues. It has branches in Germany, the USA, the Czech Republic and Slovakia. The most important foreign markets are Germany, Great Britain, the Scandinavian countries and France. As the respondent contextually observes: "Germany is a very important market for us and at the same time very difficult for various reasons... However, it is an important market for us, it is a very absorbent market, we have not only jigsaw puzzles but also board games, so we try as much as possible to enter this market with games with increasing success, we also undertake a lot of PR activities in this area to build Trefl's recognition." Most of the revenue from foreign sales are jigsaw puzzles (about 70%), then board games and toys (about 20%) and a small range of Trefliki licenses.

The pandemic had a positive impact on the entire industry because the introduced restrictions on leaving home resulted in an increase in sales of games and jigsaw puzzles. During this period, the company's revenues and profits increased significantly. In turn, the war in Ukraine had a negative impact on the company's revenues due to the decrease in sales on the Ukrainian market and the company's termination of operations on the Russian market. The related energy crisis led to surge in energy costs, which in turn caused a significant increase in production costs at the plant in Gdynia.

4.4. Case study of Pronar sp. z o. o.

The Pronar sp. z o.o. company was founded in 1989 in Narew, where the company's headquarters are still located. Over 3,000 employees are on the payroll in 9 production plants, and revenues amounted to approximately 1.3 billion PLN in 2023. The company is owned by 3 local entrepreneurs. Initially, the company dealt in the export and import of agrifood products and mineral fertilizers. Just after a year in the business, the company began exporting fruit and vegetables to Belarus. Under the barter agreement, payment for the goods were Belarus tractors, which the company then resold in Poland. In 1993 the firm began producing its own tractors under the Pronar brand. In the following years, the company's business profile changed, and so the entity's focus moved toward agricultural machinery and equipment for municipal, recycling and transport industries. For this purpose, the factory in Narew was streamlined and adapted to the needs of production processes in the new lines of business and new production plants were put in motion. In connection with the above, the company undertook a large-scale international expansion in the second half of the 1990s. The main reasons for the venture were more effective use of production capacity in plants in Poland as well as a limited domestic sales market for manufactured products. Currently, the foreign sales in the segment of agricultural machinery constitute approximately 70%, in the segment of components and parts, including disc wheels, over 70%, and in the segment of municipal and recycling machines about 50%, which means that revenues from foreign sales constitute approximately 65-70% of the total revenue of the company. The firm specializes in the production of agricultural machinery and equipment as well as machinery for municipal, recycling and transport industries. Moreover, the firm is a manufacturer of pneumatic and hydraulic system parts, axles and suspension systems for trailers, and it also produces plastic components. As the respondent said while describing Pronar, "it is currently the largest manufacturer of agricultural machinery, trailers, recycling machines for waste sorting, as well as municipal machines and components in Poland, as well as the world's second largest producer of disc wheels for all slow-moving tractors." Pronar exports its products to markets on five continents, i.e. Europe, Africa, Asia, North and South America. The foreign expansion is based on export forms and a developed network of distributors and agents on many markets. Important export markets include Germany, France, Lithuania, the Czech Republic, Slovakia and Kazakhstan. The respondent accounts: "Pronar

is the second most frequently purchased trailer brand in Germany, it sells very well in Germany." The company has no foreign branches, which makes it difficult to service equipment, because in the event of a breakdown both mechanics and parts have to be transferred from Poland. In recent years, the importance of export in the segment of municipal, recycling and transport machinery has been on the increase.

The Covid-19 pandemic did not influence Pronar's operations significantly. However, the war in Ukraine and the surge in energy prices have a perceptible negative impact on the entity's operations. Sales of products on the Russian market were discontinued and exports to Ukraine were curbed. The manufacturing costs were driven up due to energy-intensive production, which resulted in the need to reduce other costs in the company, e.g. slimming down staff.

4.5. Case study of Ara AG

Ara AG was founded in 1949 in Langenfeld, Germany, and is a leading footwear manufacturer on the European market. Since its establishment it has been owned by the Röseler family. The company manufactures and retails footwear for children, women and men. Until 2023, the Ara Group included the following companies: Ara Shoes AG (women's footwear under the Ara and Jenny brands and men's footwear under the Ara brand), Lloyd Shoes GmbH (men's and women's footwear under the Lloyd brand), Salamander GmbH (retail sales of women's and men's footwear under the Salamander brand and children's footwear under the Lurchi brand). On top of that, since 1997 the company has been a 49.9% shareholder in the Austrian footwear manufacturer Legero, which offers the Legero, Superfit and Think! brands. Between 2011 and 2023 the entity owned Delki, an Austrian footwear retailer responsible for the expansion into the markets of Central and Eastern European countries. In 2022 Ara AG employed over 6,000 people and generated revenues of around half a million euros. The group produced over 6 million pairs of shoes in their production plants in Germany, Portugal and Indonesia.

The process of internationalization of Ara began in the second half of the 1970s on the Austrian market. The undertaking of internationalization was driven by expanding sales markets for its products. Currently, footwear is exported to over 70 countries around the world. The most important markets include Austria, France, the USA, Canada, the Netherlands, Italy, Belgium, Switzerland and the United Kingdom. In Germany, the company has 6 of its own brick-and-mortar stores in the form of outlets and its additional online sales generate 2% of revenues. Additionally, by 2023, it had 180 conventional stores through the Salamander retail chain. The share in revenues from foreign sales is about 62% of total revenues. In countries where the company has no foreign branches, operations are most often conducted through independent agencies (operating on a commission basis) acting and signing contracts on behalf of the company. Then the headquarters in Germany issues invoices directly and delivers footwear to foreign chains stores. Until 2023, Ara had foreign branches and brick-and-mortar retail stores in Belgium, the Netherlands, France, the Czech Republic, Poland, the USA, Canada and Hungary. As observed contextually by the respondent "we started internationalization

relatively early, especially in the form of foreign branches, due to having our own stores abroad." Owing to the failure of achieving the planned sales volume in Central European countries, i.e. in Poland, the Czech Republic and Hungary, and low brand awareness, branches and brick-and-mortar stores were closed on 31.12.2023. Sales are maintained on these markets through independent foreign agents, who are the former chairpersons of Central European subsidiaries.

The Covid-19 pandemic, the increase in energy costs and problems in the footwear segment related to changes in consumer behavior and the rise in the cost of premises rental caused significant economic problems for Ara. In particular, the pandemic restrictions introduced in individual countries (closing stores and shopping malls) led to a loss of financial liquidity. As a result, the Ara group had to declare bankruptcy of its subsidiaries, Klauser and Salamander. The war in Ukraine had little to no impact because both the Ukrainian and Russian markets were not substantially beneficial for the company. Therefore, it was decided to comprehensively reorganize the Ara group. In 2023 the consortium sold the subsidiaries of Salamander Retail, the rights to the Salamander and Lloyd brands, and foreign subsidiaries of Salamander-Austria and Delka, focusing solely on the Ara Shoes brand in the future. The engagement in Central and Eastern Europe, including Poland, was also minimized by closing brick-and-mortar stores and foreign branches in this region of Europe.

4.6. Case study of Spelsberg GmbH & Co. KG

The Günther Spelsberg GmbH & Co. KG company was founded in 1904 in Schalksmühle by E. Spelsberg and W. Kaiser under the name Kaiser & Co. In 1956 the enterprise was renamed to Günther Spelsberg and the Spelsberg family became the sole owner. In the following years the company developed. New shop floors were built, the product range was increased, the company expanded its business to the industrial segment and filed patents in Germany, Europe and other countries of the world. Spelsberg is currently one of the leading European manufacturers in the electrical industry in the areas of electrical installation technology and housings. After the German reunification the company invested in a second production plant in Buttstädt in Thuringia. The company has a product range of over 5 thousand items such as junction boxes, distribution boxes, terminal block housings, meter and industrial housings, as well as bicycle charging stations. In addition, the company offers its customers services and individual solutions from consulting, through prototype development and production to testing and certification and final assembly. The products are manufactured in plants in Germany and then sold using the positive associations of the "Made in Germany" label. The target group is installers and industrial customers. Catalog sales account for about 60% of revenues, while services and individual solutions account for around 40% of sales revenues. In 2023 Spelsberg employed around 600 people in Germany and abroad and generated revenues of over 100 million EUR.

The company's foreign expansion began in the 1970s in the form of exports to neighboring countries, mainly Austria and Switzerland. The rationale behind the internationalization was

the utilization of full production capacity, increasing revenues and breaking into new markets. Currently, the company sells in over 70 countries around the world through subsidiaries and importers, sales agents and distribution partners. Foreign operations constitute approximately 25-30% of the company's revenues. As the respondent accounts "We are a relatively small company, but in Germany, Austria and Switzerland we are among the top three sellers on the market and we want to continue to expand further in the future.". In the 1990s, the process of internationalization in the form of individual foreign companies gained momentum, thus in 1995 a branch was established in the Czech Republic, and then in 1997 another one in Great Britain. More new companies were established in 2003 in the Netherlands and Spain and in 2007 in Denmark. After a period of consolidation of foreign companies, a further process of internationalization took place, consisting of capital engagement in new markets.

New subsidiaries were established in Sweden (2017), Norway (2018), Finland and Belgium (2019), France (2021) and Poland (2024).

The Covid-19 pandemic and the war in Ukraine had little impact on the company's performance. The exports to Russia, which were already small-scale prior to the war, were terminated. On the other hand, the increase in energy prices had a significant impact on the company's operations in 2022, i.e. following the outbreak of the war, which caused these prices to soar. By the present, the prices have fell and stabilized.

4.7. Case study of Murtfeldt Kunststoffe GmbH & Co. KG

The Murtfeldt Kunststoffe GmbH & Co. KG company was founded in 1954 by Fritz Murtfeldt in Dortmund. It is one of the leading European suppliers in the production and processing of high-performance plastics, which are mostly used in mechanical engineering, as well as drive and conveyor technology. The company manufactures products from ultra-high-molecular-weight polyethylene and high-molecular-weight polyethylene and other engineered construction materials. Customers include leading suppliers in, among others. the fields of mechanical engineering, drive technology, pharmaceutical and medical engineering, beverage bottleing, food processing, packaging industry, aviation and automotive industry. The company works closely with customers to develop and produce individual engineering plastic solutions for the production of mechanical engineering and sliding profiles, mounting and lubrication systems, and industrial 3D printing of plastics, as well as carbon and glass fibers. As the respondent stated, "our key competence is designing, advising and solution planning for our customers, then modifying and developing technical plastics, processing them and delivering them together and providing assembly services" Currently, the Murtfeldt Group also includes takeover companies, such as Carbovation (2019), Jomatik (2020) and Crosslink (2021). In 2022, the Muftfeldt Group employed circa 750 people (including about 80 people abroad) and achieved sales revenues of approximately 100 million euros.

Murtfeldt began its internationalization in the late 1960s in connection with cooperation on the domestic market with a German roller chain manufacturer that secured the services of sales

representatives abroad. Along with the sale of chains, the necessary components, such as tensioners, were also sold, which allowed Murtfeldt to actively operate on many foreign markets around the world. As the respondent states, "due to the leading role of the German engineering industry in the world, approximately 80% of revenues are generated by sales in Germany and 20% by foreign operations." It should be noted that the indirect share of the company's internationalization is much higher because assembled industrial machines (which contain Murtfeldt semi-finished products) are then sold abroad. The first capital engagement took place in 1989, when the Dutch cooperator Mata was taken over. In 1993 a branch was established in the Czech Republic, which now deals with production and offers individual solutions for industrial customers in the Czech Republic and Slovakia. The reason for entering the Czech market was the strong position of the Czech engineering industry in Central Europe and the expansion of German companies in this industry to the Czech Republic, which resulted in an increase in demand for Murtfeldt products. In the same year, another branch was also opened in Italy. The company is present in all remaining European markets and many global markets and sells its products to foreign importers who buy the products on their own account. In some markets, such as Poland, France or Scandinavian countries, the company cooperates with foreign partners who sell products on a commission basis. The most important foreign markets are Italy, Great Britain, Switzerland and Scandinavian countries.

The production process is very energy-intensive (constitutes approximately 50% of production costs), therefore the increase in energy prices, especially natural gas, related to the war in Ukraine resulted in a significant increase in production costs. These problems concern the entire industry, because most competitors also produce in Germany or Western Europe. After the outbreak of the war, exports to Russia were terminated and operations in Ukraine were restricted, however these markets were never substantial for the company. The Covid-19 pandemic had no effect the company's operations.

4.8. Case study of Rudolf von Scheven GmbH

The Von Scheven GmbH company is a family business founded in 1937 by Rudolf von Scheven in Sprockhövel (Germany). Since the beginning of its commercial activity, the enterprise has specialized in the production of high-quality ball valves for industry, including 2-way, 3-way and multi-way valves, and also high pressure and high temperature valves. Until the mid-1980s, the production and sale of valves was mainly targeted at the needs of hard coal mining and to a small extent at industry. As a consequence of gradual decommissioning of hard coal mining in Germany, the company restructured, focusing on two segments: mining (hard coal and other minerals, deep and open pit) and industry. Currently, it supplies its products to many industrial sectors, such as energy, hydraulics, mining, chemical, petrochemical, shipbuilding and environmental protection. As the respondent states, "we produce various valves for fluids (aggressive and non-aggressive), solids and gases from steel, metal, duplex stainless steel, stainless steel and ductile iron, used wherever something needs to be closed or opened."

The company began its internationalization in the 1970s in the form of indirect export as part of cooperation with German manufacturers of equipment and machinery (mainly for the mining industry) sold on foreign markets, where von Scheven valves were mounted. The export of valve replacement parts was conducted in a similar manner, i.e. through manufacturers of the equipment who had foreign representatives. As part of the restructuring of the company, the strategy on foreign markets underwent some changes. The previous strategy of valve sales in Germany for the first assembly remained unchanged. However, the process of establishing relationships with designers of industrial equipment and machines was strengthened in order to increase the use of von Scheven valves in the manufacture of the equipment. The internationalization strategy regarding replacement parts previously sold in the form of indirect export was also changed. The company started to offer its products through direct export by establishing foreign market cooperation with partners who are independent brokers (usually sales representatives). They purchase products directly from the company's headquarters in Sprockhövel and often have exclusive sales on a given foreign market. Cooperation with foreign partners is based on building relationships and mutual trust. In the respondent's words, "when I receive a purchase inquiry for a valve from a mining company in the USA, I forward it to our partner in America - I don't want to pass them over, because building trust takes a long time and it can be ruined in seconds." In 2022 the company had 60 employees on the payroll and export revenues from the mining segment accounted for over 85% of the company's total revenues in this segment, and export in the industrial segment constituted about 20% of the company's total revenues accordingly. The rationale behind the internationalization was cooperation with domestic manufacturers of machinery and equipment and the decommissionning of hard coal mining. As a consequence, the company was forced to find new sales markets for its products. Currently, the commodities are exported to many countries in Europe, Asia, Australia, South and North America. The most important foreign markets in terms of sales volume are the USA, Australia and China. South American countries are served by a large cooperator in the USA, who has representative offices in the said countries.

The pandemic had no impact on the company's performance. On the other hand, the war in Ukraine led to a drop in sales in Ukraine and the termination of exports to Russia, which was an important market for the firm. The company's production process is energy-intensive, therefore the increase in energy costs translates into an increase in production costs.

5. Discussion and implications

The account of case studies of Polish and German enterprises presented in the preceding chapter addressed the research questions formulated in the paper. A comparative analysis

of case studies of Polish and German enterprises regarding their internationalization was also conducted, the results of which contain an answer to the last research question.

The results of the qualitative study confirm proposition P1 presented in the introduction. The conducted comparative analysis leads to the conclusion that there are certain differences in the process and methods of internationalization between the surveyed Polish and German companies. The identified differences are presented below. The findings from the comparative analysis accentuate the diverse strategies adopted by companies concerning the initiation and expansion process in foreign markets.

Polish companies are entities that decided to internationalize only after the democratic transition at the turn of the 1980s/1990s. It is interesting that some of the analyzed businesses decided to become involved in foreign operations soon after inception (or after concluding adaptive processes). It can be assumed that these were international undertakings based on the model of born globals. The Polish enterprises internationalize mainly on the EU market; however, some operate on numerous markets worldwide. The primary strategy of internationalization is indirect export, yet some entities take advantage of direct export and sometimes have dealerships or they rarely engage their capital in a foreign branch. The revenues from foreign sales constitute a considerable portion of the total revenue of the enterprises, and they are related to the limited demand for the commodities on the domestic market. The rationale for undertaking internationalization is the knowledge, vision and experience of the owners, accessibility of eastern markets, geographical diversification of operations, saturation and low demand on the domestic market, the need to expand sales markets, and maximizing production capacity.

German companies are entities with a long tradition that have been operating abroad for many years. Until the 1960s and 1970s, they were engaged in the German market only, due to the significant potential of the domestic market. Currently, they are internationalizing in numerous markets around the world, using export forms (direct and indirect) as well as direct investments, conducting internationalization through foreign branches and some firms also have production and assembly plants scattered in many countries in Europe and beyond. It can be stated that international activity is based on the theory of the Uppsala School and innovative models of internationalization. It is interesting that many companies operate in the B2B segment, especially when production for the machine industry is involved. The significant potential of the domestic market means that the portion of revenues from foreign sales in the total revenues of enterprises is often lower comparing to Polish companies. The reasons that drive internationalization in German companies include expanding sales markets, uplifting production capacity, increasing revenues, capturing a share of new markets, demand for products on foreign markets, cooperation with German manufacturers of equipment and machinery who sell on foreign markets in which the products are assembled.

Polish entities often operate in the low-price segment, while German ones operate in the high-price segment, often selling not only the product itself but also a comprehensive concept (e.g. on the B2B market) consisting in the development and production of individual

solutions related to consulting, project preparation, custom production, delivery of products, assembly or after-sales services.

This exploratory qualitative study has provided a comprehensive and detailed picture of the internationalization process. Thus, the findings constitute a significant contribution to the comprehension of internationalization processes, as well as the motivations and behaviors of Polish and German enterprises in the context of foreign expansion. The conducted analysis also brings new insights regarding the reasons, methods, and processes of re-internationalization—that is, withdrawal from foreign markets—including, in particular, the abandonment of direct foreign investment. The research also provides valuable information for scholars, as it is one of the first studies to undertake a comparative analysis of internationalization processes among European enterprises from both "old" and "new" EU member states, as well as countries with high and low labor costs, or states that are leading global exporters and those with lower export volumes but significant potential in this area.

6. Theoretical contribution and management implications

The study's results have expanded and deepened knowledge and provided new insights into the rationale behind the internationalization process or entering new markets, as well as the strategies and motivations behind companies' actions to capture foreign markets. Additionally, the findings contribute to internationalization theory in several ways, particularly regarding the Uppsala school of internationalization (Johanson, Wiedersheim-Paul, 1975; Johanson, Vahlne, 1977), innovative stage models of internationalization (Bilkey, Tesar, 1977; Reid, 1981), and early and rapidly internationalizing firms (Rennie, 1993; McDougall et al., 1994). First, by conducting qualitative interviews, it was possible to ensure a holistic approach and define a detailed picture of companies' behaviors and the reasons for their internationalization. Second, the study allowed for the identification of companies' internationalization behaviors in response to changeable market conditions (e.g., EU accession, the Covid-19 pandemic, and the energy crisis in Europe caused by the war in Ukraine). Third, the qualitative comparative study revealed differences in internationalization behaviors and their reasons among Polish and German firms.

From a practical standpoint, the study's findings can be exploited by Polish companies in their foreign market expansion efforts. The results are particularly valuable for enterprises planning to start or expand internationalization in the European market. They provide important information for business managers, helping them prepare and adapt internationalization strategies to varying market conditions. Moreover, the findings can serve as recommendations for government and regional agencies in supporting small, medium, and large enterprises in their

international activities. The results of the German firms' study can also provide valuable insights for Polish business managers, allowing them to adopt best practices in foreign market operations. Polish companies could consider, following the example of German firms in the B2B sector, shifting from selling products or semi-finished goods to offering a more comprehensive concept—namely, a full-service approach that includes design, consulting, custom manufacturing, assembly, and after-sales services. This strategy could enable companies to operate in a higher-price segment, achieve higher margins and revenues, and enhance brand recognition of their products among foreign customers.

7. Limitations and future research

The discussed research results have certain limitations. The analysis demonstrated in this paper used a qualitative approach to establish an in-depth understanding of the attitudes and behaviors of enterprises regarding internationalization. The fact that qualitative research is generally based on smaller samples is likely one of the limitations. These limitations also create opportunities for future research in this field. This research has identified important aspects of internationalization that can be explored in more detail in prospective research and provide a basis for developing and refining research hypotheses in quantitative studies. Further research can use the qualitative findings presented herein as essential information for future quantitative studies, e.g. conducted on large, quoted samples. An interesting recommendation for further research would be to deepen the analysis of the forms and reasons for foreign expansion, internationalization regions, foreign marketing activities, and the strategies used by small, medium, and large Polish and German enterprises in foreign markets, followed by a comparative analysis of these entities.

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SKILLS IN POLISH HEALTHCARE IN THE CONTEXT OF INTEGRATED SKILLS STRATEGY 2030

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Purpose: The aim of skills development and use in healthcare is to support workers and management staff in the use of skills in the workplace to increase effectiveness and job satisfaction and to better provide medical services. The aim of the article is to present the directions of development future skills in the healthcare in Poland in accordance with the assumptions of the Integrated Skills Strategy 2030.
Design/methodology/approach: The Integrated Skills Strategy 2030 includes policy assumptions for skills development. The document supports the creation of an effective management and monitoring system in the area of lifelong learning policy (formal education, non-formal education and informal learning), so that it responds to existing and emerging challenges and needs to the highest possible extent. It seems to be particularly significant in the healthcare sector.
Findings: According to polish health policy the main objective of healthcare units is to ensure patients effective healthcare by providing medical services, considering patients' values and expectations. That's why development of future skills in the healthcare in Poland in accordance with the assumptions of the Integrated Skills Strategy 2030 is so important.
Originality/value (mandatory): Identification skills in polish healthcare in the context of Integrated Skills Strategy 2030.
Keywords: skills, healthcare, Integrated Skills Strategy 2030
Category of the paper: conceptual paper.

1. Introduction

Nowadays, among all the resources, no longer financial capital nor technology, but people are becoming more and more important resources. To promote physical and mental health and well-being, and to extend life expectancy for all, we must achieve universal health coverage and access to quality healthcare (United Nation, 2016).

The supply of relevant skills plays a special role in social and economic development today. Contemporary changes resulting from globalization, technological development, an aging society, the growth of migration, urbanization or the green economy determine the set of skills conditioning success in the social sphere and the labor market. Above all, these include transversal skills: digital skills, a readiness for learning, critical thinking, problem solving, teamwork and the ability to adapt to new conditions. The growing importance of these competences is due, among others, to global trends that are changing the organization of work and the role of employees, generating the rapid obsolescence of skills and growth in the demand for new ones, as well as increasingly accentuating those skills that are more difficult to automate. In the context of these challenges, investing in the ability to match skills with anticipated and current social and market needs requires a systematic and comprehensive approach to skills policies.

A well-organized and prepared healthcare system has the capacity to maintain equitable access to essential service delivery throughout an emergency, limiting direct mortality and avoiding increased indirect mortality. As this situation creates the challenge, the importance of skills in heatlhcare become very huge.

According to Polish health policy the main objective of healthcare units is to ensure patients effective healthcare by providing medical services, considering patients' values and expectations (Krawczyk-Sołtys, 2018b).

The provisions of Integrated Skills Strategy 2030 (ISS 2030) constitute both the basis for determining plans for the management of national and European funds for the development of skills, as well as a common frame of reference enabling the most advantageous planning of projects and programs by administrators of individual parts of the state budget, local government units and other public and private entities.

The commitment to develop an integrated skills development strategy was included in the Partnership Agreement - approved by the European Commission on October 23, 2017 on the basis of Implementing Decision C (2017) 6994 (notified on October 24, 2017).

The Integrated Skills Strategy 2030 includes policy assumptions for skills development. The document supports the creation of an effective management and monitoring system in the area of lifelong learning policy (formal education, non-formal education and informal learning), so that it responds to existing and emerging challenges and needs to the highest possible extent. Effective coordination of activities is based on the involvement of stakeholders at both the national and regional levels and using existing solutions, experiences and good practices at both the national and regional levels. The Integrated Skills Strategy 2030 was created to:

- designing a coherent policy for shaping and developing skills,
- coordinating the activities of various entities for skills,
- increasing educational and professional activity in all social groups, especially those exposed to exclusion, strengthening awareness of the importance of skills for achieving individual, economic and social benefits,

- ensuring equal access to information on the demand and supply of skills, career counseling and training offers related to the formation and development of skills.

The Integrated Skills Strategy 2030, facing the requirements of public policy, includes in particular:

- conclusions from the diagnosis of the skills area - included in the general part,
- strategic goals – included in the general part,
- directions of intervention – presented in a framework in the general part, then developed in the detailed part,
- principles of public policy implementation - presented in a framework manner in the general part, then developed in the detailed part.

The aim of the article is to present the directions of development future skills in the health-care in Poland in accordance with the assumptions of the Integrated Skills Strategy 2030.

2. Future skills overview

Skills are essential for personal, social and economic development. In the Integrated Skills Strategy 2030 (ISS 2030), the term "skills" refers to the ability to correctly and effectively perform a specific type of activity, task or function. Correct performance is understood as the application of appropriate theoretical and practical knowledge in action as well as compliance with social norms, in particular those relating to a given type of activity. The adopted definition of skills follows the recommendations of the European Parliament and the Council on the European Qualifications Framework (EQF) and the definition adopted by the Organization for Economic Co-operation and Development (OECD). Both in the Polish and international definitions of this concept, knowledge and attitudes are an integral component of the development and use of skills (Integrated Skills Strategy 2030 (general part), 2019).

Therefore, it is impossible to talk about skills without embedding them in the idea of learning through lifelong learning (LLL). Today, this idea means inclusive learning human life in its various dimensions, contexts and social spaces (lifewide learning). It means shifting the focus and responsibility for acquiring knowledge and developing skills from educational institutions to activities undertaken by learners. Moreover, it recognizes and appreciates the importance of education non-formal, as well as every day, colloquial experience as an opportunity for learning and development. Lifelong learning therefore covers all types of learning and personal development – in a formal and diverse educational environment environment and non-formal situations. It also includes learning and development which arise from personal needs, capabilities, interests and the learning that occurs during everyday activity. Therefore, they fit into the idea of lifelong learning formal, non-formal education and informal learning (Domański, Staszewicz, Walczak, 2023).

A wide perspective of key skills from the point of view of personal life, social and economic is the transition point to the skills needed in the market work. Research conducted by McKinsey Global Institute in 2019 allowed us to distinguish four broad categories of skills – cognitive, interpersonal, self-leadership and digital, in which 13 separate skill groups belonging to each have been identified category. They include 56 combinations of skills and attitudes called DELTA (distinct elements of talent) (Dondi, Klier, Panier, Schubert, 2021).

Within cognitive skills, four groups of skills have been distinguished: critical thinking, communication, flexibility of thinking, ability to plan and implement different ways of working. And so: the ability to think critically allows to solving complex problems through their factor analysis, as well as drawing conclusions logical conclusions based on facts and substantive argumentation. It also applies recognizing cognitive patterns based on prejudices and the ability to identification, evaluation and selection of information and facts necessary for logical conclusions.

Communication skills are the ability to appropriately select words, tone, gestures to the recipient group. It is also the ability to formulate and ask questions communicating in a synthetic way. It is also an attitude towards the interlocutor that allows for its full acceptance.

The next group of skills - flexibility - allows for creative and imaginative thinking, as well as the application of knowledge in various contexts.

The components of these attitudes are the ability to take the perspective of other people, to be open to change, including learning both within formal education, non-formal and informal learning. Ability to plan and implement various tasks ways of working refers to preparing a schedule of activities needed for achieving a specific goal. It is also the ability to prioritize tasks and choices optimal way of implementing them, iterative work, continuous testing of assumptions and prototypes, rapid creation of effective solutions and continuous improvement and adaptation to changing circumstances.

The set of interpersonal skills includes the following groups of skills: mobilization systems, relationship development and effective teamwork. Among others, there are: the ability to model the behavior of others, identifying their needs, interests and creating solutions for mutual benefits. This category also includes the skills to inspire others to make things happen created vision, idea and management of group processes while maintaining organizational procedures. The key skills that enable the development of relationships include: the ability to notice and empathize with other people's emotional states, to arouse trust through an open and honest attitude and concern for the needs of others, as well directness, naturalness and modesty in relationships. In turn, effective teamwork is based on the ability to respect and appreciate the diversity of personalities, pedigrees and experiences and the different motivation systems associated with them. Also important are the skills of diagnosing and resolving conflicts, striving for achieving common goals and effective coordination of activities. In effective work teamwork

requires the ability to delegate activities and decisions while establishing goals and expectations, as well as the ability to coach towards goals maximizing the personal and professsional potential of team members.

The next group - self-leadership skills - is related to self-awareness, self-management, entrepreneurship and achieving goals. Self-awareness and self-management are the ability to recognize stimuli and situations, that trigger emotional reactions that may influence decisions. This is also ability to manage your own emotions, including controlling them, especially in crisis situations. Additionally, these are the skills of recognizing one's own resources and belief in one's causative power, compliance with generally accepted social principles and moral standards. They also include the ability to maintain high motivation and commitment to long-term personal goals.

Entrepreneurial skills set include the ability to maintain energy and positive attitude on the way to achieving the goal, skill taking risks and self-improvement. It is also the ability to be unconventional and non-stereotypical thinking. Among skills that allow to achieve goals include a sense of responsibility decisions made, actions and goals achieved, the ability to select means intended goals and perseverance in their implementation; the ability to turn difficulties into challenges and be effective actions in situations of high uncertainty and the ability to self-evaluate and continuously development.

Digital skills set include digital proficiency and understanding digital systems. This is a broad category that includes: skills in using digital devices and services, using software and its creation, ability to understand digital systems; applicability of solutions digital in the real world (using them to increase life efficiency everyday life), the ability to apply cybersecurity principles and update knowledge in the field of information and communication technologies and artificial intelligence (AI), skill collecting, validating and storing data and applying the ethics of the digital world (Dondi, Klier, Panier, and Schubert, 2021). Research conducted by McKinsey Global Institute clearly indicate that technology skills are in demand information and artificial intelligence will increase mainly in the cognitive dimension, social and emotional.

Cognitive skills seem to be becoming more and more important. In the light of the report "The Future of Jobs Report 2023" (World Economic Forum, 2023) in 2023, analytical thinking is considered a key skill. Second place - another cognitive skill was ranked among the top ten skills creative thinking, ahead of the next three self-efficacy skills, i.e.: resistance, flexibility and dexterity; motivation and self-awareness; curiosity and lifelong learning. Sixth place was taken by a skill that boils down to knowledge of technology, and the next - seventh place - reliability and attention to detail. Three last places belong to work-related skills – empathy and active listening; leadership and social influence and quality control skills.

There is no doubt that these skills are crucial in the healthcare. The skills discussed above must be developed among all health care workers to ensure the highest quality of health services provided.

3. Specifics of future skills in healthcare

The adopted definition of skills follows the recommendations of the European Parliament and the Council on the European Qualifications Framework (EQF) and the definition adopted by the Organization for Economic Co-operation and Development (OECD). Both in the polish and international definitions of this concept, knowledge and attitudes are an integral component of the development and use of skills.

In the Integrated Skills Strategy 2030 (Integrated Skills Strategy 2030 (detailed part), 2020) the rank of professional skills – the ability of using the knowledge of a particular sector/field and acquired skills to perform defined and specific activities in a given profession – is pointed.

Poland's healthcare system is affected by large imbalances in the provision of services, with infrastructure concentrated in the hospital sector; insufficient provision of outpatient care, diagnostics and long-term care; and weak coordination between inpatient and other care. The number of hospital beds is high, at 6.2 beds per 1 000 population in 2019 compared to an EU average of 5.3, but these are unevenly distributed across the country. Current reform plans anticipate transformation of acute hospital beds into other types of beds, such as long-term care beds, rather than reducing their number (OECD, European Observatory on Health Systems and Policies, 2021).

According to Eurostat data, Poland has the lowest number of practicing doctors per 1 000 population (2.4) in the EU, and the number of nurses (5.1 per 1 000 population) is also among the lowest. While the official national estimates appear to be higher – ranging from 3.4 to 4.4 doctors per 1 000 inhabitants (Kowalska-Bobko et al., 2021) – shortages of health workers have been reported in several regions, leading to difficulties in accessing health services. Shortages are particularly severe in small counties around large cities and in rural areas. Moreover, Polish hospitalization rates for conditions that could have been effectively managed in outpatient settings are among the highest in the EU (OECD Health Statistics, 2021).

Great effort has been made in recent years to implement an electronic health data platform and related e-health tools. From 2019, medical records have to be kept electronically by health care institutions and doctors. From January 2020, with a few exceptions, only e-prescriptions have been allowed. Implementation of e-referrals started in January 2021 in facilities that have the necessary information technology capacity, and from July 2021 all health care providers are expected to exchange medical health records electronically. The pandemic response has shown that successful implementation of these tools is closely connected to the level of digital skills of both health care providers and service users. Poland's efforts in the area of digital health will be supported through the European Health Data Space initiative, which aims to promote better exchange and access to different types of health data, including electronic health records, genomics data and data from patient registries, and to support health care delivery, health research and policy making (European Commission, 2021).

As a result of many years of Author's research, models of personal competencies in healthcare in Poland (professional and managerial) have been created (Krawczyk-Sołtys, 2018a, Krawczyk-Sołtys, 2018b, Krawczyk-Sołtys, 2019, Krawczyk-Sołtys, 2021, Krawczyk-Sołtys, 2022, Krawczyk-Sołtys, Płatkowska-Prokopczyk, 2022, Krawczyk-Sołtys, Płatkowska-Prokopczyk, 2023, Krawczyk-Sołtys, Płatkowska-Prokopczyk, 2024). Based on them, the skills that should be developed in healthcare need to be indicated.

Model of managerial competencies contains six domains with 32 competencies. These domains capture the dynamics and complexity of health care unit's manager's role and reflect the dynamic realities in health leadership today. Established on this model can be distinguished six sets of skills:

- leadership skills: leadership abilities and behaviors, leading change, encouraging employees to creativity, innovation and development, management skills and mentoring,
- communication and relationship skills: relationship management, communication skills, and facilitation and negotiation,
- professional and social skills: professionalism, professional development and lifelong learning, contributions to the development of management in health care, awareness of goals, values, strengths and weaknesses, ethical behavior and social awareness, ability to recognize common interests on organizational scale, empathy, ability to cooperate with people and have an effective influence on them, serving its interests and dignified representing the organization outside, ability to choose people for key positions in the organization,
- cultural skills: creation of an organizational culture based on mutual trust, transparency and focusing on improving the quality of provided medical services, the ability to provide care to patients with diverse values, beliefs, and behaviors, meeting patients' social, cultural, and linguistic needs, delivering the highest quality of care to every patient, regardless of race, ethnicity, cultural background, removing barriers, such as different perspectives on health, medical care, and expectations about diagnosis and treatment, supplanting the current one-size-fits-all approach with a system more responsive to the needs of an increasingly diverse population,
- sectorial skills (concerning the health care system and its environment): knowledge of the functioning of the health care system and entities of this system, ability to optimize employment in the organization, personalizing health care, public health competences,
- business skills: knowledge of basic business practices and the ability to manage projects, strict adherence to procedures, regulations and legal norms as well as the ability to create internal regulations on their basis, financial management, human resource management, strategic management, information and knowledge management, risk management, improving the quality of medical services, and systems thinking.

Next model includes professional competencies in healthcare units. Established on this model can be distinguished five sets of skills:

- professional skills: functioning as a professional, participating in continuing education and professional development, possessing an understanding of the medicolegal aspects of the profession, recognizing and complying with relevant Polish legislation, functionning effectively in a team environment, making decisions effectively and managing scenes with actual or potential forensic implications,
- communication skills: practicing effective oral and written communication skills, practicing effective non-verbal communication skills and practicing effective interpersonal relations,
- health and safety skills: maintaining good physical and mental health, practicing safe lifting and moving techniques and creating and maintaining a safe work environment,
- assessment, diagnostics and therapeutics skills. In case of these domains particular skills are not being specified, because depending on the department, urgency of situation, etc. they are different,
- health promotion and public safety skills: integrating professional practice into community, contributing to public safety through collaboration with other emergency response agencies and participating in the management of a chemical, biological, radiological, nuclear and explosive incident.

4. Integrated skills strategy 2030 as the policy for skills development in line with the concept of lifelong learning

Integrated Skills Strategy 2030 consists of two documents: "Integrated Skills Strategy 2030 (general part)" and "Integrated Skills Strategy 2030 (detailed part)".

Integrated Skills Strategy 2030 (general part) was developed based on research and analyzes including:

- diagnosis of the current system of shaping and developing skills of children, youth and adults in Poland,
- diagnosis of the current state of skills of children, adolescents and adults in Poland based on the results of existing research (in particular PISA, PIAAC and the results of external examinations),
- diagnosis of the demand for skills on the labor market and in social life, based on existing research and materials,
- analysis of domestic and foreign strategies for shaping and developing skills,

- analysis of the methods, tools and procedures used in Poland and in selected OECD countries to diagnose the demand for skills from the point of view of the needs of the labor market,
- examining the needs of all ministries and main stakeholder groups.

In the document "Integrated Skills Strategy 2030 (general part)", based on the diagnosis of the functioning of the mechanisms for the development and use of skills in Poland, six priorities in the field of skills development are set:

1. Raising the level of key skills in children, adolescents and adults.
2. Developing and promoting a learning culture focused on active and continuous development of skills.
3. Increasing employers' participation in the development and better use of skills.
4. Building an effective system for diagnosing and informing about the current state and demand for skills.
5. Developing effective and lasting mechanisms of inter-ministerial and inter-sector cooperation and coordination in the field of skills development.
6. Equalizing opportunities in access to development and opportunities to use skills.

The implementation of activities in these priority areas will contribute to the development of skills relevant to the needs of learners, society and the economy, and better coordinate the activities of the parties involved in these efforts. Having the right skills will help to secure jobs that bring satisfaction and make the most of their potential. This then contributes to ensure well-being, a dignified life and cohesive, sustainable and inclusive development in line with the Strategy for Responsible Development and other government policies and agreements of the European Union. The structure and scope of this document results from the interdependence of policy areas relating to skills and the diverse forms and contexts in which they are acquired. It covers the elements indicated in the Partnership Agreement and refers to the framework set by the Organization for Economic Co-operation and Development (OECD) to develop effective skills policies. A key element of the Integrated Skills Strategy is the diagnosis of progress, and above all, the challenges and priorities relating to the development of relevant skills in Poland, the activation of the skills supply in the labor market, the effective use of skills in economic and social life, as well as strengthening the system for the formation and development of skills. This document specifies the actions to be taken to achieve the set goals, and also presents the model of implementing and monitoring the Integrated Skills Strategy together with the institutions participating in these processes.

Contemporary social changes, among them globalization, technological developments, an aging society, increased migration, urbanization or a green economy, not only shape the socio-economic landscape of the modern world, but also indicate the skills conditioning success in society and the labor market.

Everyone needs key competencies developed in the perspective of lifelong learning, which constitute a dynamic combination of knowledge, skills and attitudes that a learner must develop

throughout life, starting from an early age. Key competencies are needed for personal fulfilment and development, employability, social inclusion 16 or a satisfying life. They include such competencies as selecting and generating information in one's native language and foreign languages, numeracy, skills relating to the natural sciences, digital skills, as well as personal, social and civic competences, and finally entrepreneurial skills, cultural awareness and expression (European Commission, 2018).

As part of the European Commission recommendation on key competences updated on 22 May 2018, we can distinguish both basic and transversal skills (European Commission, 2018). Basic skills include: generating and correctly understanding written information, developing and using mathematics skills, using a foreign language, and competences in science, technology and engineering. On the other hand, general, transversal skills include IT, citizenship and entrepreneurial skills. Transversal skills are applicable in many professions. They increase employee productivity, allow job seekers to apply for positions with more employers, thus improving their chances of becoming employed. They also form the basis for developing other skills. Thanks to their universality, they facilitate the ability of persons to function under uncertain conditions, in times when dynamic technological advances are resulting in rapid changes to qualifications' standards and professional competencies.

In the context of future skills, it is important to pay special attention to those included in the key transversal competencies, including critical thinking and comprehensive problem-solving skills, team work, the ability to adapt to new conditions, leadership skills and those relating to attitudes of openness and tolerance in an age of multiculturalism.

Among basic skills European Commission recommends (Integrated Skills Strategy 2030 (general part), 2019):

1. Understanding and generating information - the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written form using visual, sound/audio and digital materials in all fields and contexts; the ability to communicate and connect effectively with others in an appropriate and creative way.
2. Multilingual competence - the ability to use different languages appropriately and effectively for communication; the abilities to understand, express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form in an appropriate range of societal and cultural contexts according to one's wants and needs.
3. Mathematical competence - the ability to develop and apply mathematical thinking in order to solve a range of problems in everyday situations; the ability and willingness to use mathematical modes of thought, logical and spatial thinking and presentation (formulas, models, constructs, graphs, charts).
4. Competence in science, technology and engineering - the ability and willingness to explain the natural world by making use of the body of knowledge and methodology employed; to identify questions and to draw evidence-based conclusions; make use of that knowledge

and methodology in response to perceived human wants or needs; [understand] the changes caused by human activity and responsibility for them.

The transversal skills set includes (Integrated Skills Strategy 2030 (general part), 2019):

1. Digital skills - the confident, critical and responsible use of digital technologies and engagement with them for learning, at work, and for participation in society; the skills of information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property rights, problem solving and critical thinking,
2. Personal, social and learning to learn - the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career; the ability to cope with uncertainty and complexity; to maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context.
3. Citizenship - the ability to act as responsible citizens and to fully participate in civic and social life, based on an understanding of social, economic, legal and political concepts and structures, as well as global developments and sustainability.
4. Entrepreneurship - the capacity to act upon opportunities and ideas, and to transform them into value for others, creativity, critical thinking and problem solving, taking initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social or financial value.
5. Cultural awareness and expression - knowledge of local, regional, national, European and global cultures and expressions, and an understanding of how these expressions can influence each other as well as the ideas of the individual; understanding the different ways of communicating ideas between creator, participant and audience within written, printed and digital texts, theatre, film, dance, games, art and design, music, rituals, and architecture, as well as hybrid forms; understanding of one's own creative identity and cultural heritage within a world of cultural diversity and how arts and other cultural forms can be a way to both view and shape the world; the ability to express and interpret figurative and abstract ideas, experiences and emotions with empathy, and the ability to do so in a range of arts and other cultural forms; the ability to identify and realize opportunities for personal, social or commercial value through the arts and other cultural forms and the ability to engage in creative processes, both as an individual and collectively.
6. Critical thinking and comprehensive problem solving - readiness to consider in a thoughtful way the problems and objects that fall within the scope of experience; knowledge of and the ability to apply logical methods of reasoning and inquiry.
7. Team work - the skills of effective work in groups; working to achieve a common goal; the ability to reach a compromise by being flexible and open to helping other team members and assuming part of the responsibility for the results of the team's work and learning process.

8. Ability to adapt to new conditions - the ability to quickly adapt to new roles and responsibilities; the ability to adapt to a new team; the ability to work effectively under changing conditions and priorities.
9. Leadership - planning activities leading to the implementation of set goals; making use of interpersonal skills to solve problems; the effective implementation of activities to reach a goal; making use of the skills of others to achieve a common goal; acting responsibly in the interest of the group in which one is a member; organizing and leading the work of a team.
10. Multiculturalism - an open attitude, productive and authentic cooperation with others; appealing to the group's collective wisdom; overcoming cultural differences and looking at problems from different perspectives in order to increase innovation and the quality of work.
11. Creativity and innovation - the ability to generate, express or apply new and valuable ideas, techniques and perspectives, also in the form of cooperation; proficiency in coming up with non-routine solutions and answers, as well as exploring and experimenting with innovative and unconventional approaches to achieve valuable results.

Fulfilling the objectives of the Integrated Skills Strategy should contribute to Poland's achievement of goal 4.4 of the "2030 Agenda for Sustainable Development" of the United Nations (UN) (United Nation, 2016, Krawczyk-Sołtys, Wojtal, 2024), which concerns increasing the number of young people and adults with appropriate skills, including technical and vocational skills, essential for the development of employment, jobs and entrepreneurship by 2030 (Integrated Skills Strategy 2030 (general part), 2019).

Therefore, the provisions of ISS 2030 (detailed part) should be treated as a substantive guide for the optimal allocation of national and European funds for the development of skills at the national and regional level.

Each area of impact contains topics and directions of activities, as well as a catalog of entities that will be involved in the implementation of the strategy. The Integrated Skills Strategy 2030 is a strategic policy framework for the development of skills necessary to strengthen social capital, social inclusion, economic growth and achieving a high quality of life.

There are eight areas of impact under ISS 2030 (detailed part):

1. Basic, transversal and vocational skills of children, adolescents and adults.
2. Developing skills in formal education – management staff.
3. Developing skills in formal education – teaching staff.
4. Developing skills outside formal education.
5. Developing and using skills in the workplace.
6. Career counseling.
7. Cooperation of employers with formal and non-formal education.
8. Planning for lifelong learning and validating skills.

The effective management of human resources in an organization is inextricably linked to planning employee development, their further training, and monitoring this development.

The challenge is to take advantage of the potential of employees by optimally matching their skills to the tasks in the workplace. Diagnosing and eliminating skill mismatches is an important part of human resource management in companies. Action in this area will have a positive economic, social and individual impact.

Employee involvement is one of the most important factors contributing to the better use of their skills and higher productivity in the workplace. Increasing employee participation in the decision-making process on the organization of work and management can contribute to the better use of skills in the workplace.

The aim of skills development and use in the workplace is to support workers and management staff in the use of skills in the workplace to increase effectiveness and job satisfaction and to better utilize the potential of human resources in the economy.

5. Conclusions and further research

The new economy is based on new skills. In view of the declining number of jobs consisting of simple activities, employers are increasingly paying attention to the entire spectrum of their employees' skills. Above all, they expect complex skills, especially those relating to: communication, problem solving, team work and emotional intelligence. The quality of human capital is increasingly the basis for intelligent and sustainable development, based on social cohesion.

The pandemic has led healthcare leaders to act with agility, build resilience and adopt smarter ways of working to help future-proof care. It has also pushed them to rethink how care is delivered. In many cases, healthcare leaders have continued to use care practices that were adopted more widely during the pandemic, including virtual care. Skills and competencies seem to be crucial for recognizing the needs of the organization itself and its environment, as well as following new challenges and opportunities to deal with them.

Currently, assessing healthcare units as other organizations are based not only on financial criteria, but rather on their relationship with the surrounding community, customers and employees, as well as the company's impact on the environment and society. In a responsible organization, apart from striving to maximize profits, key roles are played by good civic practices, a company mission contributing to positive social change, and a culture based on cooperation. Connected to this are three key challenges facing organizations: collaborative leadership, greater flexibility in designing the career paths of employees, and technological changes and their impact on how work is performed (Integrated Skills Strategy 2030 (general part), 2019).

In addition to high-quality human capital, social capital also has key significance, that is, the trust that facilitates interpersonal cooperation and supports the coordination of activities,

norms of reciprocity, as well as networks of civic engagement. It serves, among others, social integration and solidarity, complements and supports state institutions, as well as controls the government and commercial sectors. One of the effects of social capital or one of its functions is also to increase the level of economic development. As is evident from the experience of other countries, after exceeding a certain threshold of wealth, which Poland is approaching, social capital gains enormous significance. This is related, among others, to the growing importance of teamwork, which is becoming a decisive factor in attaining a competitive advantage. Restrictions in the development of social capital may thus become a barrier to further economic growth and result in a deterioration of the quality of life of the inhabitants of the country.

Among the challenges relating to developing skills it can be pointed (Integrated Skills Strategy 2030 (general part), 2019): long-term domination of the learning paradigm (based on competition, control, assessment and the relatively passive role of the learner), still too little emphasis on developing the skills of independent, creative and critical thinking and learning at all levels of the education system, mismatch of the skills of people supporting others in learning (teachers, educators, etc.) to the needs of learners and the requirements of a modern society and economy, the low potential of the majority of polish higher education institutions to attract and retain particularly talented students, unequal access to opportunities for the development of relevant skills at all stages of life, low participation of adults in learning, especially among older workers and people with low-level qualifications, limited possibilities of developing forms of learning at work, poor promotion of the validation procedures for skills acquired outside the education system, untapped potential of non-formal education, including activities conducted by civic organizations.

It should be emphasized the significance of systemic challenges such as (Integrated Skills Strategy 2030 (general part), 2019): limited effectiveness of coordination, communication and understanding among ministries and social partners in the area of skills policies, dispersed activities and resources in public administration on skills issues, hierarchical and silo mentality of the skills development system and institutions involved in its functioning, lack of a systematic approach to monitoring and better utilizing skills.

The success of policies to develop and use people's skills will require effective coordination between government, students, teachers, employees, employers, trade unions and other [stakeholders]. It seems to be particularly important in the healthcare sector. OECD pointed significant rank of expanding the use of skills and introducing high-performance work practices (HPWP) practices in the sector public by promoting culture innovation and knowledge (OECD, 2019, OECD, European Observatory on Health Systems and Policies, 2021).

As well sustainability is increasingly playing a key part in recruiting talent in areas where there is significant competition (Philips, 2022).

In Poland, the intersection of skills is a new topic, subject to preliminary scientific analyzes and practical research (Kowalska-Bobko, et. All, 2020, Sowada et. all, 2022). However, it can be concluded that the process of intersection of rights in the Polish healthcare system will

develop: primarily towards takeover qualifications of doctors and nurses by other medical professionals, but also towards the systemic use of various forms of skill mix, such as enlarging, strengthening or replacing roles.

Therefore, it seems necessary to conduct empirical and literature research in this area, which will enrich scientific knowledge, rationalize the research methodology, as well as allow to formulate recommendations for practice.

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CONDITIONS OF EMPLOYEES RELATIONS IN A REMOTE WORKING MODE IN ENTERPRISES IN POLAND

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Purpose: The research objective of the article is to explore the determinants of the relationship of exchange of knowledge, experience and support, among employees within and outside teams, as well as with superiors, taking into account the area of feelings and emotions accompanying remote and hybrid work.
Methodology: The research question posed were: Do positive emotions and feelings in interactions correlate with the willingness to share knowledge resources and experience and readiness to help colleagues (and their frequency)? A nationwide survey was conducted using the method CATI. The hypotheses were tested with Spearman's rank correlation coefficient.
Findings: The hypothesis was confirmed that employees who more frequently experience positive emotions and feelings that accompany interactions more willingly share the experience with co-workers. In the case of knowledge sharing, the hypothesis was only partially confirmed. The assumption that the employees who more frequently experience positive emotions and feelings more willingly provide assistance to co-workers was found to be untrue. What was confirmed was that the employees who more frequently experience positive emotions and feelings that accompany interactions more frequently share knowledge and experience, and more frequently to provide assistance to co-workers.
Research limitations: Measurement of the scale of feelings and emotions based on declarations is fraught with subjectivity. It would be valuable to deepen the research using the interview technique. Further research would be required to explain the positive correlations for variables that represent negative feelings and emotions. The results of the survey are subject to the sociocultural conditions. The research results obtained should not be extrapolated to the companies operating in other countries.
Value: Introduction of variable feelings and emotions helps to understand their relationship to the sharing of the knowledge and experience resources among employees. Diagnosing how the psychosocial sphere is reflected in exchange attitudes can provide hints as to which elements of the relationship area are worth undergoing targeted changes, what methods and tools for improving psychosocial working conditions will foster positive relationships among employees within and outside of their teams, as well as with superiors.
Keywords: emotions in employee interactions, remote and hybrid work, sharing knowledge and experience
Category of the paper: research paper.

1. Introduction

Due to the social nature of human beings, our efficiency in daily functioning is greatly influenced by the quality of the social networks we create as individuals and collectives. Networks in this view are synonymous with relationships with others. The strength of the relationship's impact on individuals depends on the strength of the ties of its participants (Granovetter, 1973). Labor relations reflect the dynamics of interaction among co-workers and employees and their employers. They include aspects such as communication (Jämsen et al., 2022), cooperation, exchange of knowledge and experience, trust, but also conflict resolution. Good employee relations influence employee engagement, satisfaction and effectiveness (Fay, Kline, 2011, Alegre et al., 2016) and the desire to stay with the organization for the long term (Regts, Molleman, 2013). Conversely, rudeness from co-workers causes emotional exhaustion and reduces job satisfaction (Hur et al., 2015). The quality of the relationship among subordinates and superiors is positively correlated to the quantity and quality of information provided by superiors. Such a relationship is also true with regard to the quality of information exchanged among co-workers when their relationships are amicable (Sias, 2005). Employee relations are an organization's capital (most often referred to as social capital), which in its dynamics transforms into other forms of capital, such as knowledge capital (Kukowska, Skolik, 2013). It is mainly this fact that makes the topic of relationships constantly relevant and attractive to management sciences and economics. Diagnosing the state and quality of relationships is a fundamental element of the human resources management system.

When the global pandemic rapidly accelerated changes in the organization of work, companies and other organizations could not foresee all the consequences that the modification of the mode of work to remote would bring. For many employees, the remote form of execution of obligations was a new, often forced, experience (Kniffin et al., 2021, Kowal et al., 2020). Currently, from the perspective of the well-established experiences of both employees and managers, it is possible to recognize and diagnose on a much broader scale how remote working conditions affect individual employees, relationships in teams, relationships with other employees and managers.

The research objective of the article is to explore the determinants of labor relations taking into account the area of feelings and emotions accompanying the processes of interacting with the co-workers with remote and hybrid work experience. The emotions felt in the process of communication with others shape relationships, consequently building various qualities of the social networks which are carriers of knowledge capital. The research question posed were: Do positive emotions and feelings in interactions correlate with the willingness to share knowledge resources and experience and readiness to help colleagues and their frequency?

2. Literature review

Intensification of the transformation of working conditions during the global pandemic resulted in intensification of the research work on the determinants of remote work. The content of many studies has been the impact of digitization of work on employees' social and mental processes, their physical condition and efficiency. Costin et al. (2023) conducted a meta-analysis of studies on remote work during the global pandemic, thus summarizing a number of remote work-related phenomena on people's subtle sense of well-being:

- an increase in technological exhaustion,
- deterioration of well-being, contributing to occupational burnout,
- anxiety and fatigue lowering employees' effectiveness and productivity,
- exhaustion resulting in mental health problems and thus lower productivity,
- the impact of chronic stress on work quality and personal relationships,
- reduced ties with the organization and co-workers, leading to a sense of isolation,
- the impact of loneliness in the workplace on health, job satisfaction and productivity,
- difficulties in reconciling private life with work,
- increased tension leading to emotional exhaustion due to poor support from the organization.

The difficulties reported by employees doing online work also included: the need for contact and integration with people; the inability to deal with urgent matters quickly; self-discipline, organization of work time and motivation, but also the inability to perform duties remotely, delays in information exchange processes and difficulties with sharing knowledge (Albrychiewicz-Słocińska, 2021). By depleting opportunities to meet the social needs which are naturally fulfilled in the traditional work process, employees run the risk of feeling lonely, can impede satisfying interactions with co-workers, limit smooth communication and reduce productivity (Waizenegger et al., 2020). Feeling lonely in the workplace indicates the need to form satisfying relationships (Wright, Silard, 2020). Subjective feelings of loneliness have been shown to have a negative impact on employee engagement and job performance (Anand and Mishra, 2021; Ozcelik et al., 2020). Remote work often limits employees' engagement in social relationships, due to the need to split work duties performed at home and family life responsibilities. Employees exhaust their energy, thereby impoverishing social relations and limiting engagement in social exchanges (Walz et al., 2024). The results of research on blurring the boundaries of family life and work responsibilities in the process of remote work revealed that the negative consequences of the work-life imbalance are experienced more by those without children. Greater isolation and lack of emotional support particularly affect those living alone (Kangas et al., 2023). Among others, the weakening of the social ties of employees doing remote work has been demonstrated (Chen, Eyoun, 2021; Shipman et al., 2021; Shockley et al., 2021).

The difficulty of obtaining benefits from a working relationship even when only a portion of employees work remotely, was pointed out more than 20 years ago (Cooper, Kurland, 2002). By measuring the level of team integration by the frequency of employee interactions, it has been shown that the higher the level of team integration, the higher the productivity (Pinker, 2015). Unlike spontaneous interactions triggered in a jointly occupied workspace, remote task completion imposes certain limitations on people's access to free contact. In coordination of tasks and effective implementation of the work process, an important role is played by the exchange of information, knowledge, experience and mutual assistance among participants in the organization. When communication is based primarily on technology, interaction is more fraught with difficulties in coordinating tasks and with the risk of conflict (Mortensen, Hinds, 2001). Sharing knowledge, reflecting on and interpreting its content for implementation in tasks, are determinants of team learning (Argote et al., 2001). Cooper and Kurland (2002) discovered, among others, that people working remotely lose the opportunity for organizational learning. Also, the study by Jämsen et al. (2022) indicated limitations in using the knowledge and support of others. Team learning is necessary to maintain the quality of results and develop the organization. A link among team learning and emotions has been demonstrated (Mulder, 2022). As co-workers interact, they engage in a variety of activities while succumbing to the influence of their emotional states, which over time can promote or hinder team learning (Decuyper et al., 2010). Watzek et al. (2022) studied the dynamics and complexity of emotions and team learning activities among teams of teachers and showed that the more they experienced positive emotions, the more often they shared knowledge. In contrast, for example, when annoyance, disappointment or possessiveness was shown, it made it difficult to share information. Remote working can negatively affect well-being and cause negative emotions (Charalampous et al., 2018). The distance characteristic of remote work can exacerbate introversion tendencies, which results in decreased positive emotions (Margolis, Lyubomirsky, 2020).

The practice of employee participation in decision-making increases job satisfaction and social-emotional well-being, reducing job burnout. Ongoing virtual social interactions, emotional team support, and time management, can improve health, creativity, job satisfaction, engagement, and productivity (Costin et al., 2023). Supporting employees to experience e-work, can improve employee resources and effectiveness in dealing with work stress (Taser et al., 2022). Caring for the well-being of employees prompts the use of methods that would be based on the involvement, interaction and co-responsibility of employees for the implementation of assigned tasks (Albrychiewicz-Słocińska, 2021). Organizations should enable the perpetuation of emotional ties among co-workers, creating conditions for interactions beyond the performance of job duties (Kniffin et al., 2021). Even occasional face-to-face meetings with co-workers affect job satisfaction (Nurmi, Hinds, 2020).

3. Methodology

The results of the research work presented in this article are part of the project: "Social Capital and Knowledge Sharing in the Modern Organization". The nationwide survey was conducted in December 2022. The survey included companies with more than 50 employees, selected by simple random sampling (confidence interval: 95; error rate α 4%) from the REGON database of Polish enterprises. An attempt was made to conduct 1,532 surveys using the computer-assisted CATI technique. In the end, 575 correctly completed questionnaires were received.

Table 1.
Hypotheses and Variable Designations

H1: The employees who more frequently experience positive emotions and feelings that accompany interactions more willingly share their knowledge with co-workers.
H2: The employees who more frequently experience positive emotions and feelings that accompany interactions more willingly share the experience with co-workers.
H3: The employees who more frequently experience positive emotions and feelings that accompany interactions more willingly assist their co-workers.
Category of variables: willingness to share one's knowledge and experience, willingness to help
V1 – Willingness to share knowledge with teammates
V2 – Willingness to share experience with teammates
V3 – Willingness to help new teammates
V4 – Willingness to share knowledge with employees outside the team
V5 – Willingness to share work experience with employees outside the team
V6 – Willingness to help new, less experienced employees from outside the team
H4: The employees who more frequently experience positive emotions and feelings that accompany interactions more frequently share their knowledge with co-workers.
H5: The employees who more frequently experience positive emotions and feelings that accompany interactions more frequently share their experience with co-workers.
H6: The employees who more frequently experience positive emotions and feelings that accompany interactions more frequently assist their co-workers.
Category of variables: frequency of sharing one's knowledge and experience, and of helping newcomers
V7 – Frequency of sharing knowledge with teammates
V8 – Frequency of sharing experience with teammates
V9 – Frequency of providing assistance to new members of the team
V10 – Frequency of sharing knowledge with employees outside the team
V11 – Frequency of sharing experience with employees outside the team
V12 – Frequency of providing assistance to new employees outside the team

Source: Own study.

The research objective presented in this article was to identify how social relationships are formed among employees with remote work experience in their current workplace.

The selection criterion set reduced the number of surveys analyzed to 148. Table 1 shows the hypotheses assumed and some of the variables analyzed, the presentation of which in the following section required symbolic representation. The emotion and feeling variables

are summarized in Table 2, which presents the results of the measured relationships. Spearman's rank correlation coefficient was used for verifying the hypotheses. The use of this measure for analysis was supported by the ordinal indices of the variables, the non-linear relationship among them, the robustness to outliers, and the lack of a requirement for a normal distribution (Szajt, 2014, pp. 82-83). The general direction of the relationship among the variables was examined (symbolically represented by arrows: positive ↑ and negative ↓).

Table 2.
Correlation of categories of variables

3) Emotions and feelings that accompany interactions *	**1)** Willingness to share one's knowledge and experience and to help												**2)** Frequency of sharing one's knowledge and experience and helping											
	1		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**10**		**11**		**12**	
	r	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**	**r**	**s**
Contentment	-	↑	-	-	-	-	-	-	-	↑	-	-	↑	↑	-	-	-	-	-	↑	-	↑	↑	↑
Satisfaction	-	↑	-	-	-	-	-	-	-	-	-	-	↑	↑	-	-	-	-	↑	↑	↑	↑	↑	↑
Kindness	-	↑	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	-	-	↑	-	↑	-
Sense of community	-	↑	-	↑	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	↑	-	↑	-	↑	-
Sense of support	-	-	-	↑	-	-	-	-	↑	-	-	-	↑	-	-	-	-	-	↑	-	↑	-	↑	-
Interest	↑	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	-	-	↑	-	↑	-	↑	-
Enthusiasm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Relaxation	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	↑	-	-	-	-	↑	-	↑	-	↑
Trust	-	-	-	-	-	-	-	-	↑	-	-	-	-	↑	-	-	-	-	-	↑	-	↑	-	↑
Sadness/despondency	-	-	-	-	-	-	-	-	↓	-	-	-	↓	-	-	-	-	-	↓	-	↓	-	↓	-
Isolation/loneliness	-	-	-	-	-	-	-	-	-	-	-	-	↓	↓	-	-	-	-	↓	↓	↓	↓	-	↓
Anxiety	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	-	-	-	-	↓	-	-	-	↓
Disappointment	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	-	↓	-	-	↓	-	-	↓	-
Frustration	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	-
Discouragement	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anger	-	-	-	-	↑	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shyness	-	-	-	-	↑	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jealousy/envy	-	-	-	-	-	-	-	-	-	-	-	-	↓	-	-	-	-	-	↓	↓	-	-	↓	-
Sense of being	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	↑	-	-	-	↓	-	↓	-	↓

Note: * 3) frequency of the emotions and feelings that usually accompany contacts in the case of remote work (r) vs. on-site work (s) for N=148, $p<0.05$.

Source: Own study.

4. Study results

The study differentiates between knowledge and experience resources that can be exchanged among employees.

In the context of management and the work environment, knowledge can be a resource for both the employee and the organization. By design, it is acquired by the entity mainly from external sources. In organizations, knowledge is subject to management, which involves its collection, storage, sharing and practical use (Huysman, de Wit, 2013). Experience is a personal, individualized resource, grounded in a certain amount of hardship that the individual has had to endure. Experience leads to development of skills, meaning they are acquired through subjective and objective human experiences (Massimini, Delle Fave, 2000).

Table 2 shows the correlations among the emotions and feelings that typically accompany respondents' interactions with both the closer and more distant co-workers within their company. Two social contexts of the communication process are presented here: 1) remote and hybrid work and 2) on-site work.

4.1. Emotions and feelings that accompany contacts with employees vs. willingness to share knowledge and experience (verifying H1-H3)

A statistically significant positive correlation was confirmed between interest during remote work interactions and willingness to share knowledge with close co-workers (V1). In the case of stationary work, an increase in V1 correlates with the increase in the frequency of the following feelings and emotions: contentment, satisfaction, kindness and sense of community. The positive correlation for the willingness to share one's experience with teammates (V2) is found only for a sense of community and support during stationary work. The increase in willingness to help new teammates (V3) correlates with the increase in frustration, discouragement, anger and shyness. However, this relationship only appears in remote work. In contrast, when the willingness to help involves people outside the team (V6), neither remote nor stationary work showed any correlation with the variables of emotions and feelings. The greater the willingness to share knowledge with employees outside the team (V4) when working remotely, the more often people feel angry. The willingness to share work experience with employees outside the team (V5) correlates positively with a sense of community, confidence and support in remote work. In contrast, it negatively correlates with sadness (despondency). Thus, the less often this negative emotion occurs, the willingness to share the experience with more distant company employees increases. When contentment is experienced more often during stationary work, the willingness to share work experience with employees outside the team also increases (V5).

From the pool of variables related to feelings and emotions examined, positive correlations were shown with five positive feelings and emotions and one negative emotion in the context of the willingness to share knowledge. The interdependence of the variables was mostly related to stationary work with close co-workers. H1 has been verified in part.

The willingness to share experiences was positively correlated with four positive emotions and one negative emotion, where the correlation was negative. The relationships among

the variables mostly related to the situation of doing remote work in contact with employees from outside the team. H2 has been verified positively.

No relationship was shown among any positive emotion and the willingness to help less experienced employees. In contrast, there was a negative correlation with four negative emotions when work was done remotely and involved new members in the employee's team. H3 has not been confirmed.

4.2. Emotions and feelings that accompany contacts with employees vs. frequency of sharing knowledge and experience (verifying H4-H6)

Statistical analysis of the frequency of sharing one's knowledge and experience with employees on and off the team and the frequency of experiencing positive and negative feelings and emotions, confirmed a number of statistically significant correlations among the variables. For the frequency of sharing knowledge with teammates (V7) in remote work, positive relationships were found among: contentment, satisfaction, kindness, feeling of being supported and interest, and negative relationships among: sadness (despondency), isolation (loneliness) and jealousy (envy). The variable of: the frequency of sharing experience with teammates (V8), demonstrated significant relationships with only two variables of feelings and emotions. A positive correlation was confirmed for the feeling of relaxation and remote work. In stationary work, there was also a positive correlation, but with the negative feeling of being overwhelmed. So, as the frequency of feeling overwhelmed increases, so does V8. The implication here is that sharing the experience more often with close employees in face-to-face interactions is motivated by a negative feeling of being overwhelmed, which is associated with being overloaded from an excess of responsibilities or with difficulty in fulfilling them. The variable of frequency of helping new teammates (Zm9) shows a statistically significant correlation with only one variable, and only when working remotely. The relationship shown is negative and relates to the feeling of disappointment. So, there is a correlation between an increase in the frequency of helping new teammates and a decrease in the frequency of feeling disappointed. The frequency of sharing knowledge and experience with employees outside the team showed significantly more statistically significant correlations than with closest co-workers.

For sharing knowledge (V10) in remote work, a positive relationship was confirmed with the following variables: satisfaction, sense of community and support, interest. In contrast, a negative relationship was shown among sadness (despondency), isolation (loneliness) and jealousy. V10 in stationary mode shows a statistically significant positive correlation with the variables of contentment, satisfaction, relaxation and trust. A negative relationship in the stationary mode was confirmed for the variables of isolation (loneliness), anxiety, disappointment, jealousy (envy) and feeling of being overwhelmed. A statistically significant positive correlation was confirmed with the variable of frequency of sharing experience with employees outside the team (V11) and the variables of satisfaction, kindness, sense

of community and support and interest, and the negative correlations of sadness (despondency) and isolation (loneliness). The above results of the statistical analysis were for remote work. In contrast, in on-site work, V11 correlated with the variables of contentment, satisfaction, relaxation, confidence, isolation (loneliness), frustration and the feeling of being overwhelmed. For the positive feelings and emotions, the relationship shown was positive, and for the negative feelings and emotions, it was negative. The frequency of helping new employees outside the team (V12) proved to be a variable for which many correlations exist with feelings and emotions evoked in interactions with employees. For the remote work mode, a positive correlation was shown for: contentment, satisfaction, kindness, sense of community and support, and interest. In turn, a negative correlation was also confirmed – the higher the V12 concordance, the lower the frequency of feeling sadness (despondency), disappointment and jealousy (envy). For stationary work, a statistically significant correlation was confirmed among V12 and the following variables: contentment, satisfaction relaxation, confidence, isolation (loneliness), anxiety and the feeling of being overwhelmed. The relationship of V12 with positive emotions and feelings was positive, while it was negative with the negative ones.

A positive correlation was found between eight positive emotions and feelings accompanying interactions and the frequency of sharing knowledge. Negative correlations occurred for six negative feelings and emotions. Stationary work in contacts with both co-workers on and off the team demonstrated the same positive feelings and emotions related to the frequency of exchange of knowledge. In the case of remote work, the examination of relationships demonstrated the same negative feelings and emotions in contacts with the team and outside the team. H4 has been verified positively.

The variable of frequency of sharing experience with co-workers outside the team in relation to the variables of feelings and emotions, confirmed H5. Positive correlations were found with eight positive feelings and emotions, and negative correlations with four negative ones. What is more, it was the work with people outside the team, regardless of its mode, that showed numerous interdependencies among the variables. The variable of frequency of sharing experience with teammates showed a positive relationship with only two feelings.

For the variable of frequency of helping new teammates, only one relationship was shown, which was negative and concerned the feeling of disappointment. Less disappointment is accompanied by an increase in the frequency of helping newcomers. In contrast, as many as fourteen correlations have been shown with the variable of frequency of helping new co-workers outside the team. For the variables of emotions and positive feelings, the correlations were positive, and for negative emotions, the correlations were negative. H6 has been verified positively.

5. Discussion and research limitations

The exchange of knowledge and experience resources and the provision of help among closest co-workers and further employees while working in remote, hybrid or stationary mode, was found to be correlated with 12 variables of feelings and emotions (7 positive and 5 negative ones). As for the frequency of exchange of these resources, an interrelation was shown for 15 variables of feelings and emotions (8 positive and 7 negative ones). Therefore, it can be concluded that the sentiment and emotion variables adopted for the study were properly selected. No interdependence with any of the variables was shown only for enthusiasm. However, further research would be required to explain the positive correlations for variables that represent negative feelings and emotions. An increase in the frequency of feeling frustration, discouragement, anger and shyness when working remotely or in hybrid mode showed a correlation with an increase in the willingness to help new teammates. A possible explanation is motivation based on negative emotions. Employees can make an effort to provide assistance to newcomers for the purposes of their faster adaptation, thus improving the work of the entire team and ultimately increasing the efficiency of the group. However, to avoid overly speculative conclusions it would be necessary to conduct more extensive research.

Mutual support, exchange of knowledge and camaraderie are rated much higher in relationships with team members than with employees outside the team. Thus, it seems that the form of communication in remote work does not affect the transfer of these relationships to relationships with further employees in the organization. Ties to employees on the team and to the company's non-direct managers show much greater similarity in the relationship of variable emotions and feelings and sense of closeness than with the direct manager. Closeness with close co-workers and further managers is accompanied by the same emotions and feelings: satisfaction, kindness, a sense of community and support, and interest, but also a greater sense of closeness, greater disappointment. Closeness has also been shown to increase with increasing trust, but this relationship is only found in stationary work.

A number of correlations have been shown among the emotions and feelings and the sense of closeness in the working relationships of remote and hybrid employees and the willingness and frequency of sharing knowledge and experience resources, and the willingness to help colleagues:

- in the case of interactions with close co-workers, a positive correlation was confirmed between the feeling of interest and the willingness and frequency of knowledge sharing (also in a study by Watzek et al. (2022)), the more positive emotions were experienced, the more often knowledge was shared); the frequency of knowledge sharing increases when contentment, satisfaction, kindness and a sense of support increase, and sadness, loneliness and jealousy decrease; the willingness to share knowledge with employees outside the team positively correlates with anger; but an increase in satisfaction, a sense

of community and support and interest, and a decrease in sadness, isolation and jealousy, showed a correlation with an increase in the frequency of sharing that resource;

- the frequency of experience sharing among closest co-workers showed only one correlation – to the feeling of relaxation; in the case of employees outside the team, as trust increases, willingness to share experience also does, while an increase in both willingness and frequency of experience sharing is accompanied by an increase in feelings of community and support, and a decrease in sadness; satisfaction, kindness and interest also correlate positively, and isolation negatively, with the frequency of experience sharing itself;
- for new team members, an increase in willingness to help is accompanied by an increase in frustration, discouragement, anger and shyness; but the frequency of helping showed a negative correlation with disappointment; the frequency of helping new employees outside the team was shown to be positively related to contentment, satisfaction, kindness, sense of community and support, and interest; the higher the frequency, the lower the sadness, disappointment and envy.

A limitation of the present study is the measurement of the scale of feelings and emotions based only on declarations, since they are loaded with subjectivity. Respondents may succumb to the freshness effect and therefore refer to recent experiences in dealing with colleagues. They can thus ignore the evaluation in the category of "usual feelings and emotions". It is also difficult to have a complete understanding of the concept of closeness, which included some of the variables studied. These problems could be reduced by expanding the research through interviews. In addition, the selection of research material limited the data to 26% of the cases analyzed. In order to extend the results of statistical analysis to a wider scale, it would therefore be necessary to continue research for more data.

The research focused on employees of Polish medium and large enterprises. Thus, the research results obtained regarding the exchange of knowledge and experience resources, help to newcomers and a sense of closeness in business relations, will be subject to socio-cultural conditions specific to a given country. Referring to Hofstede's typology of cultural dimensions (Hofstede et al, 2010), the variables studied can produce significant differences in results for other countries. It appears that the Power Distance Index (PDI) and Individualism versus Collectivism (IDV) may have the greatest impact on these differences. PDI expresses attitudes toward inequality among people in a culture, the level of acceptance of the hierarchical order. PDI thus reflects the position of subordinates towards superiors, which can affect the closeness of ties to the management. IDV reflects attitudes towards cooperation and collaboration, as it expresses the level of collective and individualistic attitudes and behaviors in an organization. Therefore, IDV can explain the cultural attitude to the willingness and frequency of sharing knowledge, experience, helping others, and feeling of closeness to employees. Therefore, the conclusions of the study may inspire this research to be repeated in other countries. At the same time, the results obtained should not be treated universally.

6. Practical value of the study

Optimizing remote work practices depends on the ways of managing and experiencing the spread of technology (Anderson, Kelliher, 2020). Effectively managing employee relations in a remote environment requires recognizing the accompanying conditions. Diagnosing how the psychosocial sphere is reflected in the attitudes of exchange of knowledge and experience resources can provide hints to managers as to which elements of the relationship area are worth undergoing targeted changes. Diagnosing the state of employee relations is a fundamental element of the human resources management system, when the goal of the organization is to create smoothly functioning teams of employees, based on loyalty and a culture of trust, both among colleagues and to the organization itself.

The addressees of the research results are management theorists and practitioners who deal with the issues of social capital, relational capital, cultural capital, trust, knowledge capital flows and the transformation of these capitals. Managers who recognize the correlation among the emotions and feelings that accompany employees when sharing knowledge, experiences and providing support, can more accurately choose methods and tools to improve working conditions that foster positive relationships among employees within and outside of their teams, as well as with superiors.

The foundation of relationship building is communication. Thus, a basic requirement for organizations whose employees work remotely, is investment in tools and platforms, and in training in using them, to facilitate and support communication. Promoting transparency in procedures and processes, camaraderie, mutual support and knowledge sharing, honesty in supervisor-subordinate relations, provide a clear benchmark for supervisors' expectations of subordinates' behavior. At the same time, the effectiveness of promoting certain behaviors and building attitudes requires supervisors to be open to learning about employees' opinions on and experiences with remote work. A systemic approach, such as through surveying, improves identification of relationship problems. Detailed identification of psychosocial conditions accompanying remote and hybrid work enables the creation of dedicated, individual programs to support employee well-being, mental and physical health, and professional and personal development.

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PREPARING FOR ADULTHOOD: A COMPARATIVE ANALYSIS OF STUDENTS' ATTITUDES TOWARD LABOR MARKET CHALLENGES ACROSS SCHOOL TYPES

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Purpose: The paper examines the differences in attitudes of students from three types ofschools - urban public, urban private and rural public - towards developing skills necessary for the modern labour market. The study aims to explore how socio-economic and institutional factors influence students' readiness to engage with topics such as entrepreneurship, financial literacy and career management.
Methodology: The research uses correspondence analysis to examine survey data collected from 187 students representing the three school types. The methodology identifies patterns of similarities and differences in students' responses to various educational and vocational topics, focusing on nuanced relationships and internal group dynamics.
Findings: The analysis revealed significant differences in students' attitudes. Urban public school students were most enthusiastic about developing practical skills such as saving and investing. Urban private school students showed polarised attitudes, with responses ranging from strong interest to indifference, reflecting a variety of personal and contextual factors. Rural public-school students, on the other hand, showed predominantly neutral or sceptical attitudes. The findings highlight the importance of institutional support and socio-economic context in shaping students' engagement with labour market-oriented education.
Research limitations/implications: The limitations of the study include a relatively small and geographically restricted sample, which limits the generalisability of the findings. Future research could expand the scope to include a larger and more diverse population.
Practical implications: The research highlights the need for educational reforms, including integrating entrepreneurship and financial literacy into school curricula, expanding access to career guidance, and increasing resource allocation to public schools. These measures could better prepare students for the demands of the modern labour market.
Social implications: Addressing the inequalities identified could contribute to reducing socio-economic inequalities by equipping students with the necessary tools for upward mobility. Better alignment of education systems with labour market needs could also promote more inclusive economic development.
Originality/value: The paper provides a novel application of correspondence analysis to explore students' attitudes in the context of educational preparation for the labour market. It contributes to the literature on educational equity and labour market readiness and provides actionable insights for policy makers, educators and researchers.

Keywords: educational policy, student attitudes, labor market readiness, educational equity, competency development
Category of the paper: research paper.

1. Introduction

In Poland, as in many other countries, the public education system can be described as a non skills-focused education system. This model of education is mainly concerned with the transmission of theoretical knowledge and rarely considers the importance of fostering practical vocational skills such as teamwork, critical thinking or adaptability. (Busso et al., 2017; OECD, 2018). The lack of integration of practical education means that students leave school with a limited set of skills useful in the labour market, resulting in a mismatch between their qualifications and the requirements of the modern economy (Leuven, Oosterbeek, 2011; Salas-Velasco, 2021).

The non-skills-focused system prevalent in public schools in Poland is based on a traditional approach, in which teachers are the main source of knowledge and students function as passive recipients of information. In this system, the transmission of theoretical content, verified by examinations and tests, plays a key role (Laurisz, Sanak-Kosmowska, 2022). Unfortunately, this approach neglects the development of practical skills that are essential for functioning in a dynamically changing professional environment (Busso et al., 2017). For this reason, graduates often face difficulties in making a smooth transition from education to work because they lack skills valued by employers, such as innovation, adaptability and interpersonal skills.

In a system that does not focus on qualifications, students, especially those from less resourced public schools, are less prepared to face the challenges of the labour market. Research shows that graduates from such schools often lack adaptive and entrepreneurial skills, which limits their opportunities in the labour market (Afzal et al., 2023). The lack of access to career guidance, entrepreneurship workshops and other key skills development initiatives means that students in Polish schools have fewer opportunities to explore alternative career paths and are more likely to choose safe, stable occupations (Ćwiek et al., 2021).

Despite these limitations, urban public schools are increasingly integrating a skills-focused approach into their curricula, providing students with opportunities to develop entrepreneurial and practical skills. As a result, students are better prepared to meet the challenges of today's labour market, and their readiness to make independent career choices and implement innovative projects is enhanced. Public schools, which often have fewer resources and less flexibility in the choice of educational pathways, are not in a position to introduce such solutions without systemic changes (Laurisz, Sanak-Kosmowska, 2024).

The diversity of educational environments – both in terms of school types and their location – has a significant impact on the development of students' attitudes towards future professional

challenges (Echazarra, Radinger, 2019; Henderson et al., 2020). The education system in Poland includes a wide range of institutions, from urban public schools, which offer a more individualised approach and access to resources, to rural public schools, which often have limited career opportunities for students. In the context of different types of schools, a key concern is the mismatch between the support available to students for vocational preparation and the increasing demands of today's labour market.

From this perspective, understanding the diversity of school settings and the impact of systems that do not focus on qualifications on the development of students' career attitudes is crucial in the context of designing education reforms (Echazarra, Radinger, 2019; Laurisz et al., 2022; OECD, 2018). Developing education systems that integrate a skills-focused approach can help close the gap in work readiness between students from different school backgrounds, promote equity, and support students to make a successful transition from education to work.

This study makes a novel contribution to understanding students' preparation for the challenges of the labour market by examining the relationship between school type (urban public, urban private and rural public) and students' attitudes towards skills development. Unlike previous studies, which often focus on broad system analyses, this paper uses correspondence analysis to reveal nuanced relationships and internal group dynamics in student populations. The originality of this study lies in its comparative approach across different socio-economic and institutional contexts to show differences in access to educational support. The results reveal previously unrecognized disparities in students' readiness for the labor market, particularly highlighting the role of rural schools in limiting access to key skill development opportunities. This diagnostic perspective provides actionable recommendations for educational reform and contributes significantly to the literature on educational equity and vocational skills development.

2. Literature review

Research on educational systems and their impact on students' attitudes towards the labour market reveals important differences resulting from the interaction of a variety of environmental, socio-economic and structural factors (Cope, 2005; Deci, Ryan, 2013). Three main theories are useful in explaining these phenomena: Bronfenbrenner's ecosystem theory, Bourdieu's cultural capital theory and Bandura's social learning theory (Bandura, 1993; Bourdieu, 1984; Paquette, Ryan, 2011).

2.1. Theoretical underpinnings of the analysis of differences in students' attitudes

Urie Bronfenbrenner's ecosystem theory focuses on the interplay of different levels of the individual's environment, from the immediate microsystem, the school, to the macrosystem,

which includes broader cultural norms. In an educational context, the school microsystem is where key skills related to future careers, such as autonomy and motivation, are shaped (Ettekal, Mahoney, 2017; Tong, An, 2024). From Bronfenbrenner's perspective, the differences between private and public schools, and urban and rural schools, can have a significant impact on students' career development. In urban public schools, where the school climate often supports proactivity and career aspirations, students are more likely to develop individual career aspirations. In contrast, in public schools, particularly in rural areas, students may have limited access to resources, which limits their career development.

Pierre Bourdieu's theory of cultural capital emphasises the importance of social and cultural resources in educational attainment and career aspirations (Ball, 2002; Bourdieu, 1984). According to this theory, cultural capital includes the values and skills transmitted by families and schools that can promote higher social and occupational status. Urban public schools are more likely to offer programmes that support the development of students' cultural capital through entrepreneurship classes that enhance their career aspirations. In contrast, in rural public schools, where access to cultural resources is more limited, students are more likely to prefer stable, traditional career paths, which may lead to a reduction in their career mobility.

Albert Bandura's social learning theory emphasises the role of observation and modelling in the acquisition of vocational skills. In the school environment, students learn by imitating and modelling behaviour, which means that access to inspiring teachers and mentors who promote innovative career approaches can be crucial (Afzal et al., 2023; Bandura, 1993; J.E. Robinson, 2000). Research shows that students in public schools are more likely to develop entrepreneurial attitudes because they are more likely to have role models who promote career independence and entrepreneurship. In public schools, particularly rural schools, the lack of such role models may limit students' aspirations and willingness to take career risks.

2.2. Factors influencing students' attitudes

School climate is one of the most important factors influencing students' readiness for future career challenges. Research shows that a supportive and inclusive school environment increases students' engagement, which is important for their success in the labour market (Afzal et al., 2023; Thapa et al., 2013; Wulan, Sanjaya, 2022). Here, school climate acts as a microsystem that fosters the development of professional attitudes such as adaptability and self-confidence (Cohen et al., 2009). Schools with positive climates, especially public schools, often support students in acquiring skills needed in the labour market, while schools with less supportive climates may limit the development of these skills.

Socio-economic factors strongly influence students' career attitudes and work readiness (Busso et al., 2017; P. Robinson, 2017). Urban private schools, often attended by students from higher socio-economic backgrounds, provide resources such as career guidance and entrepreneurship workshops, which shape students' proactive career attitudes.

In contrast, students from lower socio-economic backgrounds attending rural public schools often have limited access to such resources, which limits their career aspirations and preference for stable, traditional occupations.

Another factor is the level of match between education and labour market requirements (Leuven, Oosterbeek, 2011; OECD, 2018). The non-skills-focused system that dominates the Polish public education system focuses mainly on providing theoretical knowledge and neglects the development of practical vocational skills (Laurisz, Sanak-Kosmowska, 2022). As a result of this educational model, graduates often lack key skills required in the modern labour market, such as critical thinking or teamwork. The lack of integration of practical skills in curricula makes it difficult for students to make a smooth transition into the professional environment and limits their opportunities in the labour market.

Access to non-formal education and extracurricular engagement play a key role in students' career preparation, providing them with opportunities to learn practical skills beyond the standard curriculum (Dewey, 1997; Rogacheva, 2016). Students in urban public schools are more likely to participate in skills development programmes as part of school provision, due to the availability of resources. In the context of public schools, particularly rural schools, access to such initiatives is often limited, reducing the opportunities for students to develop the necessary professional and adaptive skills.

The education system in Poland, as in many other countries, includes different types of schools that differ in their resources and approach to students' vocational preparation (Kubikova et al., 2024; Rogacheva, 2016). Urban public schools are characterised by access to rich resources that support the development of soft and professional skills. The programmes of these schools increasingly integrate practical skills, so that graduates are better prepared for the challenges of the labour market. Urban public schools offer slightly less support, but have greater access to resources than rural schools due to their urban location. Rural public schools, on the other hand, often have limited resources and a less extensive programme of extracurricular activities, leading to less labour market readiness among their students (Crespo-Cebada et al., 2014; Echazarra, Radinger, 2019).

Building on the analysis of different educational settings and their impact on students' attitudes towards readiness for the challenges of adult life and career development, our study and subsequent analysis focuses on how the type of school students attend - urban private, urban public or rural public - differentiates students' perceived need for additional skills and their willingness to engage in additional learning activities. Therefore, we decided that the main purpose of the article was to analyse the differences in the attitudes of students from the three school types towards labour market challenges and their willingness to develop skills such as entrepreneurship, financial education and career management. This purpose is driven by the following hypotheses: (1) students from urban public and private schools exhibit greater interest in developing market-relevant skills compared to those from rural public schools; (2) differences in students' attitudes are shaped by socio-economic context and access to educational

resources; and (3) within each school type, there are internal variations in attitudes influenced by individual socio-economic factors. By addressing these hypotheses, the study highlights critical inequalities in educational preparation for the labor market, providing practical recommendations for policymakers and educators.

Accordingly, we posed the following research questions:

1. How do the attitudes of students from the three types of schools - urban public, urban private and rural public - differ towards the development of skills needed in today's labour market?
2. How does school type affect students' interest in specific areas such as entrepreneurship, financial education or career management?
3. What factors, such as socio-economic context or access to educational resources, might explain differences in students' attitudes?
4. Are there internal differences in students' attitudes within different school types?

These questions aim to deepen our understanding of the role of educational context and school type in shaping students' readiness for life challenges and their overall career preparation.

3. Methodology

The study focused on the attitudes and skills of students in the final years of primary school, taking into account their attitudes towards future employment and career choices. It was conducted in late 2022 and early 2023 in three selected primary schools participating in a non-formal education development project implemented by the Cracow University of Economics (Poland). The study included schools differentiated by location (urban, rural) and ownership (public, private). The research group consisted of an urban public school, an urban public school and a rural public school. The survey was conducted using an anonymous online questionnaire aimed at final year students. The survey was conducted with the consent of the school and the parents or guardians. The total research sample was 187 individuals.

Correspondence analysis and consistency analysis using Cronbach's alpha coefficient were used to clearly present the results of the study. The choice of correspondence analysis as the main method of data analysis was dictated by the nature of the study, which aimed to capture the complex relationships between school type and students' attitudes towards labour market challenges (Blalock, 1979; Luszniewicz, Słaby, 2008). Correspondence analysis, especially in the canonical standardization version, allows for the visualization of multidimensional relationships in an intuitive way while maintaining the detail of the data. Thanks to this method, it was possible to identify key differences and similarities between the study groups (Górniak, 2000). The use of correspondence analysis also provided a more accurate understanding of the variation in responses within schools, allowing nuances such as polarisation of attitudes

(e.g. the proximity of 'definitely yes' and 'definitely no' responses in some categories) to be captured. It was also particularly useful for analysing the quality of the categorical data that dominated the survey, such as students' ratings of attitudes on a five-point scale.

Correspondence analysis is a multivariate statistical technique used to examine relationships between categorical variables. It is a tool often used to discover patterns in data where two categorical variables are related. Correspondence analysis was used to examine the relationship between school type and students' responses regarding their attitudes towards preparing for adult life and the labour market. The aim of correspondence analysis is to simplify large categorical data sets by mapping them into a space with fewer dimensions, allowing for an easier understanding of the relationships between categories.

The analysis uses canonical standardisation, which allows the data to be transformed to maximise their distribution on the axes of the graph, while preserving the proportion of points in relation to their interdependence. Canonical standardisation allows the most salient patterns in the data to be extracted and is key to obtaining clear graphs showing the relationships between school type and student attitudes. In a canonical graph, each school and question response (category) is represented by a point. Closeness of points in space indicates greater similarity between categories. Responses that are close together suggest that students in a particular school have similar attitudes towards a particular question.

The following measures can be used to test the quality of a canonical correspondence analysis model: 1 Inertia: This is a measure of the variance explained in the data. It shows how much of the variance in the responses was explained by each dimension in the analysis. A high value of inertia indicates a good fit of the model to the data. 2 Eigenvalues: These are measures of the amount of variance explained by each dimension in the correspondence space. Eigenvalues show how much information has been 'compressed' across dimensions. Higher values indicate that more variability in the data is explained by a particular dimension. 3 Proportion of variance explained: This is the sum of the eigenvalues divided by the sum of all values to assess how much of the total variance is explained by a given dimension of the model. The higher the proportion, the better the relationship between the response categories is represented. The values of these ratios make it possible to assess the quality of the correspondence analysis and, in the case presented here, confirm that the results obtained are reliable and well represent the variation in students' attitudes according to school type.

Cronbach's alpha coefficient was used to assess the consistency of the research and analysis design. Cronbach's alpha provides an assessment of the internal consistency of a research instrument - in this case a questionnaire - and allows us to determine how reliably it measures key constructs related to students' attitudes (Blalock, 1979; Luszniewicz, Słaby, 2008). Cronbach's alpha values were calculated for each section of the questionnaire to ensure that questions addressing issues such as the need for additional life skills education, interest in financial topics or attitudes towards entrepreneurship were internally consistent and reliable. Values above 0.8 are considered very good in the context of social research, meaning that the sets of questions

are consistent and measure the attitudes under investigation well. In practice, Cronbach's alpha in the range of 0.7-0.8 is considered acceptable and above 0.8 is considered very good.

4. Results

The Cronbach's alpha values obtained, which are within the acceptable range (0.70-0.95), testify to the high reliability of the questionnaire, which allows reliable conclusions to be drawn from the analysis of the results (Table 1). Thanks to this analysis, it was possible to confirm that the research tool used consistently reflected the theoretical and analytical assumptions of the study, thus allowing a comprehensive assessment of attitudes towards preparation for adulthood and the labour market.

Table 1.
Reliability statistics

Reliability statistics	Cronbach's alpha	Cronbach's alpha (based on standardised items)	Number of items
Set 1	0.815	0.811	5
Set 2	0.823	0.818	4

Source: own elaboration.

In the first step, Cronbach's Alpha took a value of 0.815 (set 1, for 5 items). A value above 0.8 indicates a high internal consistency of the questions in the set. The set of questions measures a consistent construct well, indicating that students responded consistently. The version based on standardised items (0.811) confirms that the scale works equally well with standardised responses. In the second step, Cronbach's alpha was 0.823 (set 2, for 4 items): This result is slightly higher than for set 1, which means that the scale is also very reliable in this case and that the questions in the set do not need to be modified. The version based on standardised items (0.818) confirms the robustness of the scale in both cases.

In the case of correspondence analysis, measures such as eigenvalues, inertia and proportion of variance explained for each dimension allow us to assess the quality of the analysis carried out and the importance of each dimension in explaining the variation in the data (Górniak, 2000). The results presented in the table (Table 2) show that Dimension 1 explains the dominant part of the variance in each of the categories analysed, especially in the case of coping activities in adulthood (94.00%) and attitudes towards responsibility for one's fate (84.74%). This suggests that the differences in these areas are strongly embedded in the underlying relationships between school types and response categories. Dimension 2, on the other hand, although explaining a smaller proportion of the variance (from 6.00% to 34.44%), provides additional information about subtle differences in categories such as saving and investing

(34.44%) and seeking activities independently (25.88%). In these cases, in particular, the inclusion of both dimensions provides a fuller understanding of the complexity of the data. The total inertia (the sum of the contributions of both dimensions) ranges from 13.688 to 30.490, indicating the high quality of the model and the high effectiveness of the correspondence analysis in capturing the variation in the data. The high values of inertia and explained variance suggest that the results of the analysis are robust and adequate for interpretation.

Table 2.
Measures describing the dimensions of the correspondence analysis

Issue	Dimension 1 (eigenvalue / inertia / % of variance)	Dimension 2 (eigenvalue / inertia / % of variance)	Total inertia / % explained variance
People should be in charge of their own destiny	0.12916 / 12.916 / 84.74%	0.02237 / 2.237 / 15.26%	15.153 / 100%
I independently seek opportunities to participate in various extra-curricular activities	0.19110 / 19.110 / 74.12%	0.06673 / 6.673 / 25.88%	25.783 / 100%
I would attend classes on how to run a business	0.10279 / 10.279 / 84.81%	0.05682 / 5.682 / 15.19%	15.961 / 100%
I would attend classes on how to save and invest	0.19403 / 19.403 / 65.56%	0.10192 / 10.192 / 34.44%	29.595 / 100%
I would attend classes showing us future jobs and different professions	0.23924 / 23.924 / 77.47%	0.06566 / 6.566 / 22.53%	30.490 / 100%
Students need extra activities to prepare them for adult life	0.12885 / 12.885 / 94.00%	0.00803 / 0.803 / 6.00%	13.688 / 100%

Source: own elaboration.

The results of the correspondence analysis for the 6 problem areas presented in the figures below (Figures 1-3) allowed us to characterise the attitudes of students for each type of school and to define differences in attitudes towards the challenges of today's labour market in a non-skills-focused system.

The correspondence analysis allows for a clear interpretation of each of the problem areas. However, from the perspective of this article, it is not only the interpretation of individual attitudes that is important, but above all the characterisation of school types as well as the identifycation of differences in attitudes. Therefore, a table is proposed below that synthesises the results of the analysis carried out for each school (Table 3). The objective of this interpretation is to demonstrate the attributes of students' attitudes in relation to their educational context.

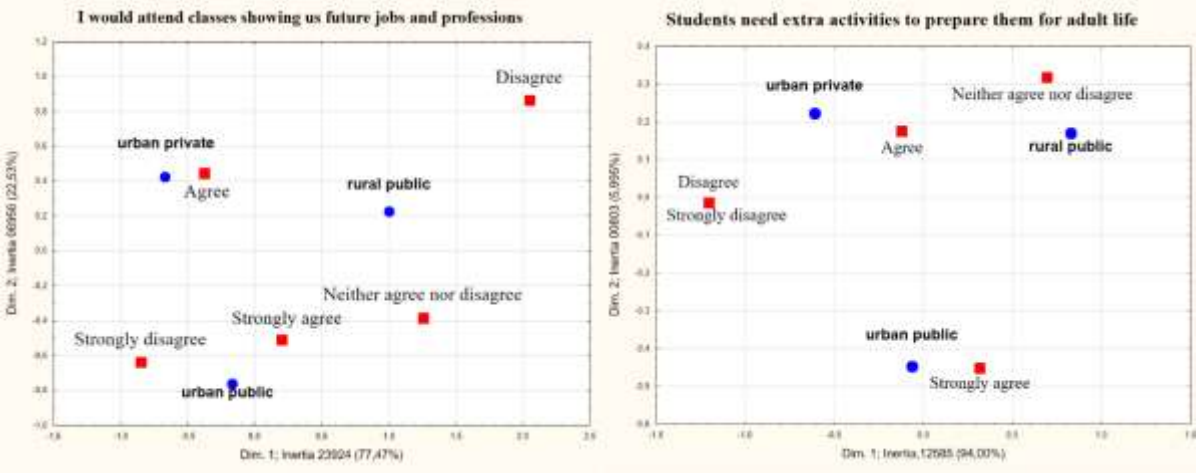

Figure 1. Correspondence analysis for two variables: 'Students need extra activities to prepare them for adult life' and 'I would attend classes showing us future jobs and different professions'.

Source: own elaboration.

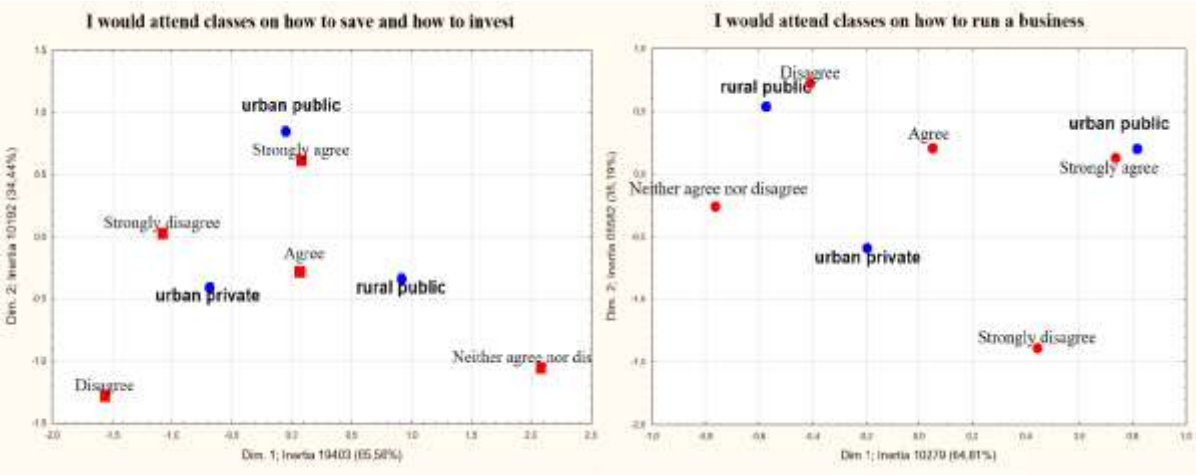

Figure 2. Correspondence analysis for two variables: 'I would attend classes on how to run a business' and 'I would attend classes on how to save and invest'.

Source: own elaboration.

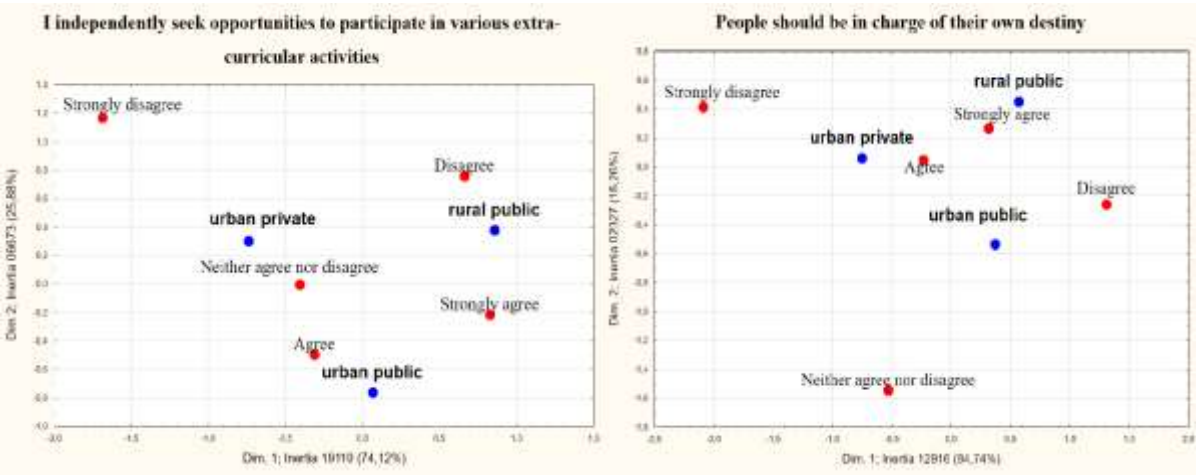

Figure 3. Correspondence analysis for two variables: 'People should be in charge of their own destiny' and 'I independently seek opportunities to participate in various extra-curricular activities'.

Source: own elaboration

Table 3.
Attributes of students' attitudes by different types of school

Issue	Public urban	Private urban	Public rural	Degree of differentiation between schools
I would attend classes on how to save and invest	Strongly yes (2)	Polarity: Definitely not (-2), with gravity to Yes (1)	Yes (1), with gravity to neutral (0)	Very high - large differences between schools
I would attend classes showing us future jobs and different professions	Polarity: Strongly yes (2) and strongly no (-2)	Yes (1)	Neutrality (0), with gravity to 'no' (-1)	Very high - strong differences and polarisation
I independently seek opportunities to participate in various extra-curricular activities	Yes (1) and Definitely yes (2)	Neither yes nor no (0)	No (-1)	High - differences between activism and scepticism
People should be in charge of their own destiny	No (-1), with gravity to neutral (0)	Yes (1), with gravity to neutral (0)	Definitely yes (2)	High - different approaches to accountability
Students need extra activities to prepare them for adult life	Definitely yes (2)	Yes (1), with gravity to no (-1)	Neutrality (0)	Moderate - differences mainly due to neutrality
I would attend classes on how to run a business	Definitely yes (2)	Neutrality (0), with gravity to 'yes' (1)	No (-1), with gravity to neutrality (0)	Moderate - mainly due to urban public school enthusiasm

Source: own elaboration.

4.1. Urban public school

The analysis demonstrates that students in urban public schools exhibit the greatest enthusiasm for activities pertaining to the acquisition of practical skills. In categories such as saving and investing, running a business, or coping with adulthood, the majority of respondents indicated a definitive affirmative response (2). This is exemplified by their unequivocal interest in financial education, which differs from the more sceptical attitudes observed among students from other schools. Furthermore, in the category of self-seeking extra-curricular activities, students demonstrated both moderate engagement (indicated by a rating of 'yes' on the scale) and clear proactivity (indicated by a rating of 'definitely yes' on the scale).

Nevertheless, in certain categories, such as responsibility for one's own destiny, there is a moderate degree of scepticism, indicated by the response 'no' (-1). This may be attributed to the heightened reliance on educational and social institutions in an urban setting. It is notable that this school exhibits a high degree of polarisation in attitudes, as evidenced by the category of activities pertaining to different professions. In this instance, students simultaneously express strong interest (2) and rejection (2). This discrepancy may be attributed to the presence of disparate career aspirations within this cohort.

4.2. Urban private school

The attitudes of the students at the urban public school are distinguished by a greater degree of diversity and moderation. The category of saving and investing evinces a polarisation of attitudes, with a preponderance of responses indicating a definitive negative (–2), although a subset of students evinces a proclivity towards a positive response (1). This may reflect differing priorities based on the individual family situations of the students, with some perceiving no necessity for such activities and others viewing their value. In categories such as coping with adulthood or running a business, responses indicating a moderate stance are more prevalent, suggesting a lack of clear-cut attitudes. Students at this school are less likely to display strong enthusiasm, yet also less strongly opposed, which may be attributed to their greater material comfort or access to alternative forms of educational support.

The attitudes of students in urban public schools are distinguished by a greater degree of diversity and moderation. In the domain of saving and investing, there is a notable polarization in attitudes, with a preponderance of "definitely no" responses (-2), yet a notable group of students exhibiting a proclivity towards "yes" (1). This may reflect differing priorities based on students' individual family situations, with some students perceiving no necessity for such activities and others acknowledging their value.

In categories such as coping with adulthood or running a business, responses indicating a moderate stance are the most prevalent, suggesting a lack of clear-cut attitudes. Students at this school are less likely to display pronounced enthusiasm, yet also less strongly opposed, which may be attributed to their superior material comfort or access to alternative forms of educational support.

One of the most distinctive aspects is the lower self-efficacy of the students in seeking additional activities, as indicated by the response 'neither yes nor no' (0). This finding contrasts with the greater level of activity observed among students at the urban public school, suggesting a different approach to motivating students in a private educational setting.

4.3. Rural public school

The attitudes of rural public-school students are distinguished by a greater degree of neutrality and moderation in the majority of categories. With regard to saving and investing, students indicated a moderately positive attitude, with a clear inclination towards neutrality. This may be attributed to a paucity of practical financial education or a constrained perception of its significance within the local milieu.

With regard to categories such as coping with adulthood and running a business, rural public-school students exhibited a predominantly neutral response, indicating a lack of perceived necessity for such classes. However, their attitude towards assuming responsibility for their own destiny was notably positive, with an unambiguously affirmative response ('definitely yes',

2). This result may reflect a stronger belief in individual responsibility in a rural environment, where students are more likely to perceive the need for independence and self-reliance.

Table 4.
Differences in students' attitudes between school types

Issue	Public urban vs. Private urban	Public urban vs Public rural	Private urban vs Public rural
I would attend classes on how to save and invest	4 (significant difference: 2 vs. -2)	3 (significant difference: 2 vs. 1)	3 (significant difference: -2 vs. 1)
I would attend classes showing us future jobs and different professions	4 (polarity 2/-2 vs. 1)	4 (polarity 2/-2 vs. 0/-1)	2 (moderate difference: 1 vs. 0/-1)
I independently seek opportunities to participate in various extra-curricular activities	3 (1/2 vs. 0)	3 (1/2 vs. -1)	1 (slight difference: 0 vs. -1)
People should be in charge of their own destiny	3 (-1 vs. 1)	4 (-1 vs. 2)	2 (moderate difference: 1 vs. 2)
Students need extra activities to prepare them for adult life	3 (2 vs. 1)	3 (2 vs. 0)	2 (moderate difference: 1 vs. 0)
I would attend classes on how to run a business	3 (2 vs. 0)	3 (2 vs. -1)	2 (moderate difference: 0 vs. -1)

Source: own elaboration.

A comparison of the attitudes of students from the three types of school reveals significant differences, which are due both to the educational characteristics of these institutions and to their socio-cultural context (Table 4). The urban public school is characterised by students' clear enthusiasm for practical skills, which is reflected in their clearly positive attitudes to categories such as financial literacy, entrepreneurship or preparing for adulthood. For students in this type of school, lessons on saving and investing are crucial, as evidenced by their overwhelming 'definitely yes' response. In the same category, however, students from urban public schools are more diverse, with their attitudes oscillating between strongly opposed and moderately interested. This contrast may be due to students' different life experiences and individual abilities, which influence their perceptions of the importance of financial education.

Similar discrepancies are observed in attitudes towards activities that show different occupations. Students in urban public schools are characterised by polarisation, with some expressing enthusiasm for such activities and others strongly rejecting them. In contrast, students in urban public schools show a more moderate interest, which may indicate a more homogeneous attitude due to access to other forms of vocational support, such as individual counselling or extra classes organised outside school. In rural public schools, on the other hand, there is more neutrality, which may be due to students' limited awareness of the diversity of careers or the lack of availability of such activities in the local environment. It is noteworthy that the urban public school also shows a clear commitment in the categories related to self-selection

of additional activities. Students from this school show both moderate activity and clear proactivity, suggesting high motivation and a need for self-development. In contrast, students from urban and rural public schools show more sceptical or neutral attitudes in this category, which may be due to different ways of motivating students and different access to educational resources.

In the context of responsibility for one's own destiny, students from an urban public school have moderately negative attitudes, which contrasts with the strong belief of students from a rural public school in the need for individual responsibility. This difference may be related to different social expectations in these settings - in a rural setting the idea of self-reliance and independence may be more highly valued, whereas in an urban setting students are more likely to rely on institutional support.

The differences in attitudes become less pronounced for activities related to coping with adult life. Again, the urban public school shows the highest level of interest, while the urban public school and the rural public-school show more moderate or neutral attitudes. This suggests that the need for such classes may be more pronounced in urban areas, where the challenges of adulthood may be more complex and varied.

A similar pattern can be observed for courses on running a business. The urban public school stands out for its enthusiasm for entrepreneurship, which contrasts with the neutrality of the urban public-school students and the scepticism of the rural public school. These differences may be related to the different career aspirations of students depending on their environment - in urban schools, students may be more likely to see entrepreneurship as an attractive career path, while in rural environments more traditional approaches to work prevail.

Analysis of the results presented in the tables also allows for a more detailed and nuanced understanding of the variation in attitudes of students from different types of school. Particular attention should be paid to cases where responses to different categories are close together, which may indicate internal variation within the groups surveyed. For example, in the case of the category 'I would take lessons on saving and investing', students from urban state schools showed a polarisation between 'definitely no' and 'yes', reflecting the diversity of beliefs within this group. This may reflect differences in students' family experiences - students from more affluent families may not see the need for financial education, while others may see its potential value. This type of variation suggests the need for further research into the individual factors influencing students' attitudes, rather than treating the results as a clear trend for the group as a whole.

A similar situation exists for the category 'I would take part in activities that showcase different careers', where a polarisation between 'definitely yes' and 'definitely no' responses was observed in urban public schools. This suggests significant differences in students' preferences, which may be related to their individual career aspirations or access to information about different career paths. Such a result does not suggest a homogeneous approach within this group, but rather clear divisions that may be due to socio-economic differences and levels of family

and school support. In contrast, rural public-school students, who were more likely to choose neutrality, showed more homogeneous but also less pronounced attitudes, which may be due to a lack of access to a variety of career role models in their environment.

The category 'I would take a course on running a business' is also an interesting case. Students from rural public schools showed a clear tendency towards 'no' and 'neutral' answers, indicating a lack of clear attitudes towards entrepreneurship. In the context of urban public-school students, neutrality with a tendency towards 'yes' may indicate their moderate interest, but not strong enough to dominate the attitudes of the whole group. The difference in results between these groups could be interpreted as a result of differences in access to educational resources, such as entrepreneurship workshops or meetings with entrepreneurs, which are more common in urban areas.

The results of the analysis indicate that there are significant differences between schools, but also reveal significant internal variation in some categories. Interpreting the closeness of responses to different categories suggests that the results are not always clear cut and may reflect more complex relationships, which we intend to explore in further research on this topic. In future research, we plan to supplement our analysis with more detailed qualitative data that will allow us to clarify students' individual motivations and approaches to the challenges of the contemporary labour market.

5. Discussion

Differences in students' attitudes may be due both to differences in access to appropriate educational tools and to the socio-economic context in which they are located (Busso et al., 2017; Echazarra, Radinger, 2019; Li, Hou, 2022). Education in public schools, especially in rural areas, does not always provide the relevant skills needed in today's labour market, which is reflected in students' lower self-seeking activities and more sceptical attitudes towards entrepreneurship. Students in urban private schools have more opportunities and are better prepared for the challenges of today's labour market, which may be due to a more individualised approach to education and more classes developing soft and entrepreneurial skills (Gibb, Haskins, 2014; Laurisz, Sanak-Kosmowska, 2022; Oosterbeek et al., 2010). The findings of the study on differences in students' attitudes towards the challenges of today's labour market are confirmed and complemented by previous research. The following points elaborate on the previously discussed interpretations, enriching them with research perspectives that allow for a fuller understanding of the observed differences.

5.1. The role of educational environment

The educational environment plays a key role in shaping students' attitudes towards career development and the acquisition of soft skills (Afzal et al., 2023; Thapa et al., 2013). Urban public schools, according to the study, are characterised by greater flexibility in adapting their curricula to the needs of students and the labour market. According to our study, students in these schools show an interest in entrepreneurship and financial education, which may be due to a more individualistic approach. Research shows that curricula that introduce elements of entrepreneurship are effective in shaping skills such as innovation and the ability to manage risk (DiBenedetto, 2019; Gibb, Haskins, 2014; Oosterbeek et al., 2010).

Urban public schools, on the other hand, while offering a more structured programme, often fail to address the specific needs associated with dynamic changes in the labour market. Analyses show that public educational institutions struggle to adapt to new demands, which may affect students' limited willingness to explore alternative career paths (Echazarra, Radinger, 2019; OECD, 2018). The polarisation of attitudes among this group of students, particularly in relation to activities that showcase different occupations, reflects this problem.

For public schools in rural areas, the impact of resource constraints is even more pronounced. The findings of students' neutrality or scepticism towards additional vocational activities are consistent with researchers' findings that lack of access to mentors, modern technology and extracurricular activities leads to lower career aspirations among rural students (Laurisz, Sanak-Kosmowska, 2022; Mbagaya, 2021; Zynuddin et al., 2023).

5.2. Socio-economic context

The importance of socio-economic context in shaping students' attitudes is supported by literature. Differences in the social status of students' families influence their attitudes towards education and their professional future (Bourdieu, 1984; Busso et al., 2017; Li, Hou, 2022). Students from families with higher socioeconomic status, who often attend public schools, have more resources and support, making it easier for them to develop social and entrepreneurial skills. The results of our study indicate that students from these schools show a clear interest in self-development in their careers, which is reflected in their proactivity and high support for individual responsibility for their own destiny.

In contrast, in rural areas, where socio-economic status is often lower, students have neutral or sceptical attitudes towards extracurricular activities and alternative career paths. Researchers suggest that limited access to vocational role models and community support may result in lower student motivation to develop marketable skills (Mbagaya, 2021; Robinson, 2017). This issue is particularly evident in rural students' scepticism towards activities such as running a business or saving and investing.

5.3. The education system and labour market needs

Adapting curricula to meet the needs of today's labour market remains a challenge for education systems around the world. Our study found that public schools, particularly in rural areas, are less effective in preparing students for the challenges of work. These findings are supported by studies showing that public schools in less urbanised regions are less likely to adopt innovative curricula, which limits the development of soft and entrepreneurial skills (Griffin et al., 2011; Li, Hou, 2022; Mbagaya, 2021).

In contrast, urban public schools, with their greater autonomy and flexibility, are able to respond more quickly to labour market needs (Crespo-Cebada et al., 2014; Henderson et al., 2020). Researchers highlight that curricula in private educational institutions are more likely to include elements such as project management, interpersonal skills development or entrepreneurship, thus better preparing students for a dynamic work environment.

At the same time, it is important to note that even in public schools there are barriers related to access to technology and specialised resources, especially in less developed regions (Henderson et al., 2020; Li, Hou, 2022). The results of the study indicate polarised attitudes among public school students towards activities such as saving and investing, which may suggest that even there, access to modern educational tools is not always equal.

5.4. Students' proactivity and willingness to take action

Students' proactivity in seeking additional educational opportunities is a key indicator of their readiness to work in a dynamically changing professional environment. Our study shows that students in urban public schools are more likely to take autonomous initiatives, which is in line with research findings that educational environments that support autonomy and self-efficacy foster students' intrinsic motivation (Deci, Ryan, 2013).

In contrast, in public schools, particularly rural schools, students' lower levels of proactivity may be due to a lack of extrinsic motivation and role models. Researchers suggest that a lack of support in the school and community environment leads to lower educational and career aspirations, which is reflected in students' sceptical attitudes towards extracurricular activities (Busso et al., 2017; Crespo-Cebada et al., 2014; Zynuddin et al., 2023).

5.5. Awareness of labour market challenges

Awareness of current labour market challenges is strongly related to access to educational resources and the quality of curricula. The high level of support among public school students for the statement that "people should be in charge of their own destiny" indicates that they are more aware of the role of soft skills and entrepreneurship. This finding is supported by studies that emphasise the importance of a sense of agency in developing proactive attitudes (Bandura, 1993; Echazarra, Radinger, 2019; Li, Hou, 2022; P. Robinson, 2017).

In contrast, the neutrality or scepticism of students in public schools, especially in rural areas, may be due to a lack of access to tools that support the development of skills necessary for the labour market. Researchers point out that limited access to technology and modern teaching methods can perpetuate traditional attitudes towards work, influencing perceptions of contemporary career challenges as unattainable (Brynjolfsson, Mcafee, 2014; Ćwiek et al., 2021; Laurisz et al., 2022).

6. Conclusions

The analyses conducted have shown that by studying different types of schools it is possible to identify differences in students' attitudes towards their professional future. Among other things, studies have shown that students from urban public schools are more proactive and interested in developing soft and entrepreneurial skills (Crespo-Cebada et al., 2014; Koehorst et al., 2021; Laurisz, Sanak-Kosmowska, 2022). Their attitudes can be attributed to access to richer educational resources, mentors and training programmes. These schools are characterised by flexibility in adapting their curricula to the demands of the labour market, which fosters attitudes in line with modern professional expectations. In urban public schools, a diversity of student attitudes was observed, particularly in categories related to entrepreneurship and financial education. While some students express enthusiasm for these areas, a significant group remains sceptical, which may indicate the lack of a coherent strategy to support the development of professional skills in these schools. In contrast, rural public schools are characterised by the lowest levels of student interest in additional activities to develop skills needed in the labour market. Neutral or sceptical attitudes prevail, reflecting limited access to educational resources such as workshops, specialists or technology. The high support for traditional values, such as responsibility for one's own destiny, indicates the different nature of the socio-cultural environment, which may shape a more conservative approach to education.

The results of this study are in line with the research literature that shows the influence of educational environment, socio-economic status and curriculum structure on students' attitudes (DiBenedetto, 2019; Koehorst et al., 2021; Rehman et al., 2023; P. Robinson, 2017; Santos, 2023). Looking at the educational environment, we can see that public schools, with their greater flexibility and access to resources, better prepare students for the challenges of the labour market. Public schools, especially in rural areas, have difficulties in adapting their curricula to the vocational needs of students, which affects their lower career aspirations. When analysing the socio-economic context, it is important to note that students with a higher social status, who are more likely to attend public schools, are more aware and motivated to develop their vocational skills. In contrast, students from rural areas with limited access to modern

resources may perceive the contemporary labour market as less accessible. On the other hand, the curricular perspective shows us that the lack of adequate curricular adaptation in public schools, especially in rural areas, reduces students' interest in topics related to entrepreneurship, financial education and personal development (Busso et al., 2017; Robinson, 2017; Santos, 2023).

Based on the research findings and their analysis, the following recommendations are proposed to policy makers in order to reduce the gap between schools and better prepare students for the challenges of the labour market:

1. Curricular reform in schools.

In order to better prepare students for the challenges of the labour market, it is necessary to introduce changes in the core curriculum that take into account the development of soft skills, financial education and entrepreneurship. Specific actions:

- mandatory entrepreneurship and financial management modules in the classroom that include practical exercises such as budget management simulations, business projects or the organisation of mini-enterprises.
- the introduction of design thinking and problem-solving classes to develop creativity and teamwork skills.
- flexibility in public school curricula to allow school leaders to add classes that respond to local labour market needs.

2. Strengthening school resources.
   - schools need support in terms of infrastructure and educational resources to close the gap in development opportunities for students, especially for rural schools compared to urban schools. Proposed actions:
   - technology development grants to enable the purchase of computers, multimedia equipment and internet access in every rural school;
   - creation of an 'Education for the Future' programme to provide access to online learning materials such as entrepreneurship and financial literacy platforms such as dedicated educational apps;
   - partnering with local entrepreneurs and vocational training organisations to provide workshops, internships and mentoring for students.
3. Introduce career guidance counsellors in schools.
   - the systematic support of career counsellors in every school is essential to help students choose their career path and develop their vocational skills. Proposed steps:
   - establish the position of a career counsellor in each school, responsible for individual counselling of students and organising workshops and meetings with representatives of different professions;
   - tailor careers guidance programmes to the specific needs of students, taking into account local career opportunities and students' individual aptitudes;

- organise career days in schools where students can meet local entrepreneurs, professionals and employers.

4. Encourage cooperation between schools and local businesses.
   - partnerships between schools and local businesses can improve students' practical skills and labour market awareness. Concrete actions:
   - introduce 'practical education' programmes where students have the opportunity to take part in short-term work placements in local businesses;
   - organise regular workshops and training sessions led by local entrepreneurs, focusing on skills such as management, marketing or logistics;
   - establishing regional networks between schools and entrepreneurs to share experiences and jointly develop educational programmes that meet local needs.
5. Equal access to technology.
   - ensuring that students from different backgrounds have equal opportunities to access modern technology and digital resources is key to preparing them for the future. Proposed steps:
   - implement a 'Technology for Every School' programme to provide every public school with modern computer labs and access to digital and virtual learning tools;
   - introduce compulsory digital literacy classes, including coding, data management and the use of technology in team and project work;
   - establish regional digital education centres to provide courses and workshops accessible to both students and teachers.
6. Develop teacher support programmes.
   - an important element of the changes in the education system is the upgrading of teachers' skills, especially in entrepreneurship and soft skills. Proposed actions:
   - organise regular training for teachers in modern teaching methods, including project-based learning and blended learning;
   - establish mentoring programmes for teachers to help them adapt their teaching to the needs of students and the labour market.

The results of the analyses carried out show that differences in students' attitudes towards the labour market clearly reflect the influence of the educational environment, socio-economic status and the quality of the curricula. In contrast, the key factors that differentiate students are the quality of the education provided and access to resources and educational support to develop key skills. For this reason, policy-makers should seek to equalise educational opportunities between different types of school by introducing reforms to improve the quality and accessibility of vocational education, particularly in rural areas. Such measures will not only make students more competitive in the labour market, but will also contribute to reducing social and economic inequalities in society.

Limitations

The survey was conducted with a limited sample of 187 students from three types of schools, which may affect the possibility of generalising the results, particularly in the context of local differences in the educational conditions of public schools. It is possible that the results of the survey, which constitutes the primary research tool, may also reflect students' subjective preferences or alignment with societal expectations, rather than actual beliefs. A further limitation is the timing of the survey, which was conducted at a specific point in the school year. This may have affected the intensity of students' interest in different issues, such as upcoming examinations.

The full impact of the local context, such as the level of school funding, parental support or teacher involvement, which can significantly differentiate students' attitudes, was not taken into account. In rural schools, for example, a lack of resources may have contributed to neutral or sceptical responses towards entrepreneurship or financial education. Future research would benefit from taking these factors into account in order to gain a fuller understanding of the results and their significance.

Ethical statement

Students from schools involved in the research and education project took part in the study. Each participant had the consent of the school and parents to participate in the project and the evaluation study. Participation was voluntary. Informed written consent was obtained from the parents or guardians of each participant in the study. Anyone could withdraw their consent without giving a reason. The study was anonymous and signed consent forms were only available to the support services at each university. Each participant also had parental consent for the processing of their personal data, in accordance with Article 6 of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). All research procedures were in accordance with the Code of Good Practice in Higher Education Institutions developed by the Polish Rectors' Foundation and adopted by the Plenary Meeting of the Conference of Rectors of Academic Schools in Poland (CRASP) on 26 April 2007, as well as the Ethical Standards of the Krakow University of Economics adopted by the Senate Resolution (No. 38/2011). All participants, as well as schools and parents, were provided with comprehensive information about the study, including details of its scope, subject matter, and the right to refuse to answer questions.

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THE USE OF ARTIFICIAL INTELLIGENCE IN PROJECT MANAGEMENT

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Purpose: The main purpose of the article was to indicate the possibilities of using artificial intelligence as a tool in project management processes in the studied medium-sized Polish companies.
Design/methodology/approach: This pilot study utilized an online survey questionnaire, which was developed following a thorough review of existing literature. The research focused on two key questions: Q1: What impact does AI have on Project Management? Q2: How are AI tools evaluated by its users in Project Management?
Findings: The implications arising from this research extend both theoretically and practically. Theoretically, it enriches the existing literature on AI in project management, underscoring the potential of AI to enhance project performance and decision-making. Practically, the findings offer valuable insights for project managers and organizations striving to integrate AI tools effectively, thereby improving efficiency, minimizing risks, and optimizing resource allocation. The research reveals that the integration of AI in project management significantly improves efficiency, decision-making, and risk management throughout the project lifecycle.
Research limitations/implications: This study examining the application of AI in project management encounters limitations like: the fast-paced development of AI technologies poses a significant challenge in maintaining the relevance of research findings, AI research may lean heavily on case studies, surveys, or secondary data, which might not adequately reflect broader industry trends, and the effective implementation of AI in project management relies significantly on the skills, attitudes, and acceptance of project teams and managers.
Practical implications: The application of AI-driven solutions enhances the execution of project management activities, leading to improved work efficiency and quicker results. It is anticipated that modern technology will be embraced with increasing boldness and innovation.
Social implications: The growing use of AI in project management has significant social implications, particularly concerning the future of work, human-AI collaboration, and the ethical use of technology in organizational settings.
Originality/value: This article explores the growing integration of AI-based solutions in project management. As businesses increasingly adopt AI, it is transforming operations by automating processes. This shift not only enhances efficiency but also improves the effectiveness of task execution, particularly for repetitive activities.
Keywords: Artificial Intelligence (AI), Project Management (PM), development, digitalization
Category of the paper: research paper.

1. Introduction

The rapid advancement of Artificial Intelligence (AI) has revolutionized numerous industries, including Project Management (PM). As organizations face increasing complexity in managing tasks, teams, and resources, the integration of AI tools offers new opportunities to streamline processes, enhance decision-making, and optimize project outcomes. The evolution of technology has significantly enhanced the functionality of artificial intelligence (AI). Advancements such as faster data analysis, increased storage capacity, and improved algorithms have all contributed to a new level of machine learning (ML). From intelligent scheduling algorithms to natural language processing for stakeholder communication, AI is reshaping the way teams collaborate and execute projects. By analyzing vast amounts of data in real time, AI can identify patterns, optimize resource allocation, and provide predictive analytics to ensure project timelines and budgets are met. Moreover, AI tools like chatbots, virtual assistants, and machine learning models are enabling proactive issue resolution, ensuring smoother project lifecycles. These developments enable more accurate predictions, allowing businesses to reduce costs and optimize their operations (Agrawal, Gans, Goldfarb, 2017). AI-driven solutions can automate routine tasks, analyze large volumes of data, predict project risks, and provide valuable insights, enabling project managers to focus on strategic goals rather than administrative details.

By adopting a structured approach, organizations can achieve specific goals within defined timeframes, budgets, and resource constraints. Effective PM plays a crucial role in introducing innovative products, coordinating events, or implementing company-wide initiatives. Companies that embrace project management are more likely to remain organized, meet deadlines, and deliver high-quality results. In PM, AI not only improves efficiency but also brings a significant shift in how projects are planned, executed, and monitored. From intelligent scheduling systems to predictive analytics, AI empowers PM to make data-driven decisions and adapt to dynamic environments. This paper explored the key applications of AI in PM, highlighting the benefits, challenges, and future potential of these innovative technologies in transforming traditional PM practices. The main aim of the article was to indicate the possibilities of using artificial intelligence as a tool in PM processes in the studied medium-sized Polish companies. In view of the above, the following research questions were posed: Q1: What impact does AI have on Project Management? Q2: How are AI tools evaluated by its users in Project Management? The study is of a pilot nature, using an online survey questionnaire preceded by literature research.

2. Project management basics

Understanding PM is crucial, as the concept of a project lacks a universal definition, which leads to divergent interpretations by researchers. For example, Heagney describes a project as a unique endeavor, characterized by specific deadlines, a financial plan, a defined scope of work, and necessary tasks to be completed. He also identifies key constraints within a project, which include performance, cost, time, and scope (PCTS) (Heagney, 2022). Lester (2006, p. 5) in his definition points out the aspects that determine the success of the project, in his opinion the effective planning, monitoring, and management of every aspect of a project, along with fostering motivation among all participants, is essential for achieving the project's objectives within the established parameters of time, cost, and performance. According to Kerzner (2017, p. 47): "Project management is a methodology for achieving goals by planning, organizing, coordinating, directing, and controlling resources over time to complete specific goals". Tereso et al. (2019, pp. 6-22) point to the general features of the project, which include: 1) well-defined quantitative and qualitative objectives, 2) a series of activities that are sufficiently complex to require management (highlighting their uniqueness), and 3) a clearly established start and end date, emphasizing the temporary nature of projects. Referring to the above PM is a systematic approach that involves planning, executing, and overseeing projects to achieve defined goals within established timelines and budgets. It requires the coordination of resources, tasks, and stakeholders to ensure successful outcomes. The core of PM focuses on balancing three key elements: scope, time, and cost — often referred to as the Project Management Triangle (PMT). Changes in one element of the triangle impact the others, so project managers must carefully manage these constraints to ensure project success (Larson, Gray, 2020, p. 9). Understanding the basics of PM is essential for ensuring that projects meet their objectives and deliver value.

Every project has its own cycle, and typically PM consists of five phases, known as the Project Life Cycle (PMI, 2021; Simion, Popa, Albu, 2018, 93–100; Alotaibi, Mafimisebi, 2025, pp. 93-99; Tereso et al., 2025, pp. 6-22): (1) Initiation – Defining the project's purpose, goals, and feasibility: (2) Planning – Creating a detailed project plan that outlines tasks, timelines, resources, and budgets; (3) Execution – Implementing the project plan by assigning tasks and managing the team; (4) Monitoring and Controlling – Tracking progress, identifying issues, and making necessary adjustments to stay on track: (5) Closure – Completing the project, reviewing outcomes, and documenting lessons learned. The Project Life Cycle (PLC) provides a framework for managing projects efficiently and ensures that all essential phases are covered to achieve project success. The PLC consists of clearly defined stages that help project managers and teams organize work, monitor progress, manage risks, and deliver successful outcomes (Enshassi, Kochendoerfer Ghoul, 2016, pp. 50-68; Labuschagne, Brent, 2005, pp. 159-168).

Effective PM requires well-defined roles to ensure tasks are completed efficiently. The most common roles include (Meredith, Mantel, 2018, pp. 77-89):

- Project Manager – Oversees the project from start to finish, managing resources, risks, and stakeholder communication.
- Project Team – Individuals responsible for executing tasks and delivering project outputs.
- Stakeholders – People or organizations affected by the project, including clients, sponsors, and end-users.

The PM is the primary person responsible for planning, executing, and closing a project. Their role includes managing the project's scope, budget, timeline, and communication with stakeholders. Key Responsibilities of a Project Manager are (Meredith, Mantel, 2018, pp. 77-89):

- defining project goals and deliverables,
- creating project plans and schedules,
- allocating resources and managing budgets,
- identifying and mitigating risks,
- communicating with stakeholders,
- ensuring project completion on time and within budget.

From the above, communication stands out as a vital element in project management. It is essential for project managers to keep all stakeholders updated on the project's progress, any changes, and any challenges that arise. By fostering effective communication, misunderstandings are minimized, and alignment among team members is strengthened (Kerzner, 2017, pp. 208-212).

To enhance the work of Project Managers, a range of new tools has been developed. While these tools are not classified as AI, they have arisen from rapid technological advancements and have sparked a growing interest in AI assistance. Among the most popular options are (Top 10 Project Management Tools, https://www.simplilearn.com/tutorials/..., 2024):

- Trello: This tool allows users to create boards filled with customizable task cards. Each card can be edited and assigned to specific team members, with deadlines, comments, and file attachments, facilitating the organization of unique project stages.
- Asana: Asana enables users to structure project stages through sidebars, portfolios, teams, and tasks. Information can be displayed in various formats, including timetables, lists, panels, and calendars. Users can initiate projects from scratch or utilize pre-existing templates, and the platform offers custom field-based segmentation and filtering options.
- Basecamp: Designed to aid in task identification and deadline setting, Basecamp helps users create to-do lists while providing automated progress reports, collaborative

timelines, and real-time group chats. This tool assists in overseeing the overall development of projects and keeping team members connected.

Together, these tools significantly streamline project management processes, paving the way for greater efficiency and collaboration.

The evolution of PM can be traced through four distinct industrial revolutions. In the first phase, the expertise and intuition of experienced project managers played a crucial role, as there was little reliance on research-based methods and procedures. The second industrial revolution introduced tools for project scheduling, most notably the Gantt chart. With the advent of the third revolution, time management tools emerged, including Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT). This period also saw the rise of new management approaches, such as Earned Value Management, among others. Finally, the fourth phase is characterized by advancements in global technology and the onset of the digital age (Heagney, 2022, 20-26). The era of digitalization has brought very interesting and useful solutions in PM.

3. AI into project management

The use of AI tools in PM is transforming traditional workflows by improving efficiency, reducing risks, and enhancing decision-making. These tools allow project managers to automate routine tasks, optimize resources, and focus on delivering successful project outcomes. As AI technology continues to evolve, its role in project management will become even more significant, helping companies achieve greater project success rates.

Project managers employ a variety of tools and techniques to effectively oversee all project processes. This includes functions such as comprehensive project planning, resource cost management, risk mitigation strategies, and change management. The primary purpose of these tools is to develop suitable action plans that address potential risks and uncertainties that may arise in the ever-evolving project landscape (Nakayama, Chen, 2016, 1-6). Project management tools serve a multitude of purposes. They are essential for designing and controlling project plans, managing deliverables, allocating resources, overseeing budgets, assigning staff roles and responsibilities, facilitating communication, and ensuring quality management. Additionally, these tools provide managers with valuable data that enables them to make informed decisions (Serrado, Turner, 2015, pp. 30-39).

AI tools offer significant practical benefits across various aspects of PM. One of their most valuable functions is the ability to predict outcomes based on the analysis of provided data. For example, managers can leverage data from past projects and apply these insights to current initiatives. This capability helps identify potential mistakes and issues that may arise in

the future, allowing teams to formulate proactive action plans. Ultimately, decision-making remains in the hands of human employees. However, research shows that autonomous AI for management is currently under development, paving the way for even greater efficiency and insight in the future (Clemente, Dominigues, 2023, pp. 1769- 1776).

One of the best examples of AI integration in PM is ChatGPT, particularly its latest version, ChatGPT-4. Weng's research highlights its key functions, including human-like responsiveness, language translation, and text summarization. Specific tools such as Talk-to-ChatGPT (enhances two-way communication for better decision-making), Web-ChatGPT (provides real-time, accurate responses), and ChatGPT Sidebar (offers templates for queries, summaries, and localization) are emphasized. ChatGPT supports all key areas of PM, including: Integration, Scope, Time, Cost, Quality, Communication, Risk, Procurement, and Stakeholder Management. It assists in creating action plans, updating reports, estimating task durations, budgeting, risk analysis, strategy development, and improving stakeholder communication. Due to these functions, this tool's significance is highlighted in this master's thesis and will be further discussed in subsequent chapters (Abbas et al., 2023; Weng, 2023, pp. 30-38; Nwosu, 2023). In general, AI enhances the accuracy of project processes by reducing the likelihood of human errors and freeing up managers to focus on non-automatable initiatives. While time is a finite resource that cannot be stretched, AI facilitates its reallocation from one task to another, making this transition smoother and more efficient.

Table 1 outlines traditional PM tools and techniques, detailing their descriptions and functions, alongside AI tools that can address similar challenges. With AI, these tasks become less time-consuming and resource-intensive, particularly with regard to human resources. Many of the activities listed in the table were once performed manually by employees using standard PM tools, such as Gantt charts. Today, thanks to the availability of AI assistance tools, these tasks can be completed more quickly, accurately, and with minimal resource loss.

Human error is a persistent challenge that can hinder project progress, result in additional costs, and consume valuable time when rectifying mistakes. In this context, AI serves as a valuable ally, enhancing precision and reducing the likelihood of errors, all while saving time. By analyzing data, AI can offer suggestions and recommendations that help minimize these issues. Such insights can optimize project processes and significantly enhance productivity. For example, AI might identify constraints in the project schedule and propose effective strategies to navigate them (Niederman, 2021, p. 1578).

AI can offer valuable insights into employee performance, revealing areas where knowledge and skills may be lacking. This clarity allows organizations to identify employees who may require additional support or training. To achieve this, AI relies on data regarding each worker's output and whether it meets established expectations. Furthermore, AI's predictive capabilities can enhance resource allocation based on the performance analysis mentioned earlier, ultimately saving time and resources while providing necessary support for employees (Mohite et al., 2024, p. 421).

In PM, any modifications or changes that arise during execution can lead to delays and increased costs. However, AI introduces greater flexibility in such situations, fostering a more agile approach to PM. With the help of AI algorithms, the likelihood of disruptions and bottlenecks is minimized, enabling timely responses to adjustments by quickly processing new data and offering improved strategies. For example, financial resources are critical to any project, serving as a key indicator of efficiency and productivity measured in terms of profits. It is essential for a project manager to thoroughly examine the budget to ensure it can meet all project demands. They must have a clear understanding of the project's financial sources, prioritize tasks appropriately, and manage the allocation of funds effectively—distinguishing between those that require more investment and those that need less. Tracking and controlling any potential additional costs to ensure timely project completion can be time-consuming and challenging (El Khatib, Falasi, 2021, pp. 251-260).

Table 1.
Overview of traditional project management tools and techniques, with AI integration

Project Management tools and techniques	Description	AI tools	Description	Role in Project Management
Pre-Project Study	Pre-Project Study (also known as a Feasibility Study or Pre-Project Analysis) is a critical preliminary assessment conducted before officially starting a project. The purpose of this study is to evaluate the viability, feasibility, and potential impact of a proposed project, helping organizations determine whether the project is worth pursuing. It ensures that decision-makers have enough information to proceed with confidence or reconsider the project if it seems too risky or unprofitable.	ChatGPT-4	It can handle essential paperwork, enhance communication, and generate up-to-date performance reports. By taking on these time-consuming responsibilities, it allows managers to focus on other critical aspects of the project. Additionally, it offers comprehensive risk analysis and, thanks to its linguistic capabilities, can serve as an interpreter during meetings with stakeholders and shareholders who may not be familiar with complex technical terminology.	Project Initiation and Planning
Logical Framework	It helps to clarify the project's objectives, identify data requirements, highlight key components, and assess the basis for the project's performance level.			
WBS	It begins the process of dividing a project into distinct sections and tasks.	Textio	This effective writing tool can assist in developing job and position descriptions during the initial stages of project implementation. Additionally, it is capable of generating clear and articulate instructtions and reports.	
TCP	Managing the three interrelated project constraints—scope, time, and cost—is crucial, as they significantly impact the quality of the project's outcomes.			

Cont. Table 1.

Gantt charts	A clear and straightforward visual depiction of the time allocation and task distribution throughout the project.	RPA	Routine tasks that are performed daily can often be automated, significantly reducing the need for manual labor. Common examples of such tasks include organizing and tracking timetable data, as well as identifying potential risks based on the provided input.	Scheduling and Time Management
PERT	It explores the various options available for each task and assesses their feasibility within the specified time constraints.			
CCM	It assists in identifying potential drawbacks of the project and adapting to any changes and risks associated with them.	Clockwise	Streamlined the project's scheduling process by developing and updating team plans.	
Kick-off meeting	Internal: Present the project objectives and details to the responsible team. External: Connect with the client to discuss the project details and review drafts.	Conversica	It serves as a virtual assistant primarily for sales departments, facilitating seamless communication among team members through carefully organized schedules and support.	Responsibility and Communication
RACI	Its primary function is to assign and display different types of responsibilities to ensure that the appropriate personnel can effectively carry out the relevant tasks.			
FPCP	It outlines the communication channels as well as the variety, intensity, and format of the data exchanged between the project's internal and external stakeholders.	Zoom.ai	Records and stores data from meetings, on basis of which may create a summary with the main points of that meeting; also, helps with crafting proper emails.	
Progress reports	They collect and present the data, which reveals the project's level of progress.	Data RPM	It aids in reducing companies' operating expenses by analyzing project data and predicting potential investment issues and inefficient resource utilization.	Monitoring and Reporting
EV	It evaluates a project's performance in terms of profitability, allowing for more accurate forecasts of its future trajectories based on factors such as scope, pricing, and organizational data.			
Decision tree	A framework outlining the potential hazards and opportunities of the project, along with strategies for addressing them as they arise.	Decision tree algorithms	Effectively illustrates each step of the decision-making process along with potential outcomes, while offering personalized recommenddations based on the provided data, characteristics, and preferences.	Decision-Making
PCF	Facilitates monitoring of the project's financial resources and funds acquired, serving as a basis for evaluating the project's performance.	IA	Streamlining financial management processes through automation, including spending control and budget creation, among others.	Financial Manageme

Note: WBS - Work Breakdown Structure, TCP - Triple Constraint of Project, PERT - Program Evaluation and Review Technique, RPA - Robotic Process Automation, CCM - Critical Chain Method, RACI - Responsibility Assignment Matrix, FPCP - Formalized Project Communication Plan, EV - Earned Value, PCF - Project Cash Flow, IA - Integration & Automation.

Source: own research according to (Zadeh, Khoulenjani, Safaei, 2024, pp. 1-10; Manchana, 2022, pp. pp. 192-208; Dam et al., 2019, pp. 41-44; Brlečić Valčić, Dimitrić, Dalsaso, 2016, pp. 131-145; Smith, Brown, 2020, pp. 120-134; Khoulenjani, Zadeh, Ghafourian, 2024, pp. 71-85; Zadeh, Khoulenjani, Safaei, 2024, pp. 1-10).

AI tools, such as ChatGPT-4, can relieve project managers of some of these burdensome tasks, like budget monitoring and adjustments. This not only simplifies the management process but also enhances overall effectiveness and productivity.

3.1. Benefits and challenges in project management practices

Project management practices are essential for achieving successful projects, as they ensure that objectives are met promptly, within the defined scope, and within budget. Nevertheless, PM presents its own unique advantages and challenges, which can ultimately impact the outcomes of a project. Integrating AI into project management significantly boosts productivity, efficiency, and accuracy. By automating routine tasks, enhancing decision-making, optimizing resource allocation, and offering real-time insights, AI empowers organizations to achieve greater success in their projects. This not only leads to more effective project delivery but also helps to lower costs and minimize risks. The most frequently mentioned benefits are (Holzmann, Lechiara, 2022, pp. 151-162; Anantatmula, 2008, pp. 34-48; Zadeh, Khoulenjani, Safaei, 2024, pp. 1-10; Khoulenjani, Zadeh, Ghafourian, 2024, pp. 71-85):

- Automation of Repetitive Tasks - AI automates tasks like scheduling, reminders, and reporting, allowing project managers to focus on strategic work, e.g. tools like ChatGPT can draft reports and automate updates;
- Improved Decision-Making - AI analyzes data to provide insights for better decisions, predicting risks and performance trends, e.g. predictive tools forecast delays or resource shortages;
- Enhanced Risk Management - AI identifies risks early by analyzing patterns, helping managers mitigate issues before escalation, e.g. AI predicts resource conflicts and market changes;
- Resource Optimization - AI allocates resources effectively by analyzing workloads and skills, e.g. recommends the best team members for tasks;
- Enhanced Communication - AI chatbots improve collaboration through real-time responses and automated updates, e.g. tools like Talk-to-ChatGPT assist with queries and project information;
- Accurate Time and Cost Estimation - AI provides realistic timelines and budget forecasts, preventing overruns, e.g. scheduling tools adjust timelines based on progress.
- Task Prioritization - AI helps prioritize tasks based on deadlines and resource availability, e.g. flags critical tasks and reallocates resources to meet deadlines;
- Continuous Learning - AI learns from past projects, improving future performance, e.g. suggests best practices from previous lessons learned.

In conclusion, Artificial Intelligence (AI) is revolutionizing PM by automating tasks, enhancing decision-making, and boosting productivity. By incorporating AI tools into their project workflows, organizations can streamline processes, minimize human error, and ultimately achieve more successful project outcomes.

Project management practices inevitably encounter challenges, including scope creep, resource constraints, ineffective communication, and unrealistic expectations. However, by adopting robust planning methods, enhancing communication strategies, and implementing effective risk management, project managers can navigate these hurdles and ultimately increase the likelihood of project success. Typical AI challenges faced by project managers include (Aarseth, Rolstadås, Andersen, 2014, pp. 103-132; Cárdena et al., 2014, pp. 323–339; Zadeh, Khoulenjani, Safaei, 2024, pp. 1-10):

- Scope Creep - One of the most prevalent challenges in PM is scope creep, which occurs when changes or additions to the project's scope are made without appropriate approval. This often leads to delays, increased costs, and overwhelms the team.
- Resource Constraints - Projects frequently face limitations in terms of budget, personnel, and time. Inefficient allocation of these resources can result in delays, diminished quality, and team burnout.
- Poor Risk Management - Neglecting to identify and address potential risks early on can jeopardize project timelines and outcomes. Unforeseen issues can disrupt the flow of the project and escalate costs.
- Communication Breakdowns - Miscommunication among team members or with stakeholders can lead to misunderstandings, delays, and conflicts. Inadequate communication often results in unmet expectations and potential project failure.
- Unrealistic Deadlines and Expectations - Imposing unrealistic deadlines or goals creates undue pressure on the project team, leading to stress, lowered productivity, and a decline in work quality.
- Technological Challenges - Introducing new tools and technologies without sufficient training can pose significant challenges for teams. Ineffective use of these tools may hinder project progression.
- Stakeholder Management - Balancing the expectations of various stakeholders can be daunting, especially when their interests' conflict. Disalignment with stakeholders can lead to dissatisfaction and contribute to project failure.
- Resistance to Change - Teams may resist new processes, tools, or methodologies that are rolled out during the project. This resistance can hinder progress and negatively impact project outcomes.

PM practices encounter a range of challenges that can impede the successful completion of projects. These obstacles can affect timelines, budgets, and overall outcomes. Therefore, it is essential for project managers to recognize and tackle these issues proactively.

The role of AI in PM is indeed transformative, however, its dependence on high-quality data, the potential for factual inaccuracies, and the absence of emotional intelligence in decision-making present significant challenges. In the context of reliance on high-quality data, it is essential to recognize that artificial intelligence (AI) models are fundamentally data-driven. AI systems, including predictive analytics tools and project scheduling software, necessitate accurate, complete, and pertinent data to operate effectively. The presence of poor-quality data can lead to misleading predictions, erroneous recommendations, or suboptimal resource allocation. Furthermore, if the data input into an AI system is outdated, inconsistent, or biased, the resultant outputs will inherently reflect these deficiencies (Zadeh, Khoulenjani, Safaei, 2024, pp. 1-10; McGilvray, 2021).

Regarding the potential for factual inaccuracies, AI systems may misinterpret patterns, particularly within dynamic or intricately nuanced project environments. For example, correlations between project delays and resource allocation might engender incorrect causal assumptions. Additionally, the lack of contextual awareness can be problematic, while AI excels at pattern recognition, it may overlook the unique situational factors that influence a particular project (Manchana, 2022; Kollar, Alshibli, 2024).

Moreover, in terms of bias amplification, biases present in the training data can lead AI systems to perpetuate factual inaccuracies, adversely affecting decision-making processes. It is also vital to acknowledge the impact of emotional intelligence on decision-making within project management. AI lacks the capacity to understand or empathize with human emotions, which are critical in effectively managing teams. For instance, when reallocating resources, AI may fail to consider the potential impact on team morale, which could result in dissatisfaction or decreased productivity. AI systems, being governed by programmed logic, are unable to adapt to nuanced human interactions such as resolving interpersonal conflicts or motivating underperforming team members. Decisions made solely on the basis of AI may overlook ethical dimensions that require empathy and fairness, such as understanding the reasons behind a team member's failure to meet deadlines due to personal challenges (Bammidi et al., 2024).

It is also essential to ensure the effective implementation of artificial intelligence. Companies seeking to adopt this technology should take the following steps into consideration: 1) Foster a culture of learning by educating stakeholders and employees about the fundamentals and potential outcomes of AI; 2) Safeguard employment opportunities, even in the wake of automation technology implementation; 3) Establish clear regulations and empower authority in addressing systemic biases and managing data storage practices; 4) Recruit professionals with AI expertise to ensure optimal maintenance and support, 5) Provide comprehensive training for staff members to equip them with the necessary skills. By following these guidelines, organizations can enhance their AI integration and maximize its benefits, which also concerns project management (Wang, 2019, pp. 1-6).

4. Own research

4.1. Research methods and materials

This paper investigates the pivotal applications of artificial intelligence in project management, emphasizing the advantages, challenges, and future prospects of these groundbreaking technologies in reshaping traditional PM methodologies. The primary objective of this article is to illustrate the potential of leveraging artificial intelligence within project management processes, particularly in medium-sized Polish companies. To achieve this, two key research questions have been formulated: Q1: What impact does AI have on Project Management? Q2: How are AI tools evaluated by its users in Project Management? Regarding the Q1 analysis, respondents were asked about the following issues: In your role, do you frequently engage with project management processes, or are you part of a project team? Do you have any concerns about data security when it comes to the use of AI in the firm's projects? Are you concerned about replacing your job with Artificial Intelligence? Does the use of AI help you save time on your tasks and improve the overall time management of your projects? How much do you trust and depend on the decisions and answers provided by AI? In the analysis of responses to Q2, respondents were asked about: Which AI tools do you utilize on a daily basis? How would you assess the effectiveness of the AI tools you've selected for managing your projects? Which Project Management activities could yield the greatest benefits to the project when automated using AI? Is there a need for AI training and education?

This study adopts a pilot approach, employing an online survey questionnaire that follows an extensive review of the relevant literature. Statistical frequency analysis was used for processing the gathered research material. 53 employees from small and medium-sized Polish enterprises took part in the study.

4.2. Respondent`s profile

Table 2 shows the characteristics of the respondents according to age, gender and job position. The respondents were relatively young, with the majority falling within the 31-40 age range at 49%, and as well as a significant portion 31%, being over 41 years old. Only a small percentage of employees were between 21- 30 years old (12%), while those under 20 represented a mere 8%. The gender identification of survey participants revealed a minor disparity between male and female workers, with 47% identifying as male and 53% as female.

This indicates a diverse workforce that may foster equal opportunities across genders. In terms of occupations, the most populated roles included IT specialists (29%), social media content creators (22%), copywriters (19%), account managers (17.4%), data analyst (12%), graphic designers (11%), Junior social media specialist (7%).

From the above, it can be concluded that the survey questionnaire was primarily distributed to employees who utilize modern IT technologies and AI-driven solutions in their work.

Table 2.
Respondent`s profile

Characteristics	Respondent`s profile					
Age	< 20	21-30	31-40	>41		
	8%	12%	49%	31%		
Gender	male	female	other			
	47%	53%	-			
Job position	Social media content creator	Copywriter	IT specialist	Data Analyst	Graphic designer	Junior social media specialist
	22%	19%	29%	12%	11%	7%

Source: own work based on conducted research.

4.3. Research findings – the use of AI in project management activities

Q1: What impact does AI have on Project Management?

For this research, it is crucial to understand the participants' relationship with project management. As illustrated in Figure 1, 37.8% engage with project management occasionally, while 33.9% participate regularly. Additionally, 17% indicate they are involved from time to time, and only 11.3% report no involvement whatsoever. However, most of the respondents are involved in activities related to PM.

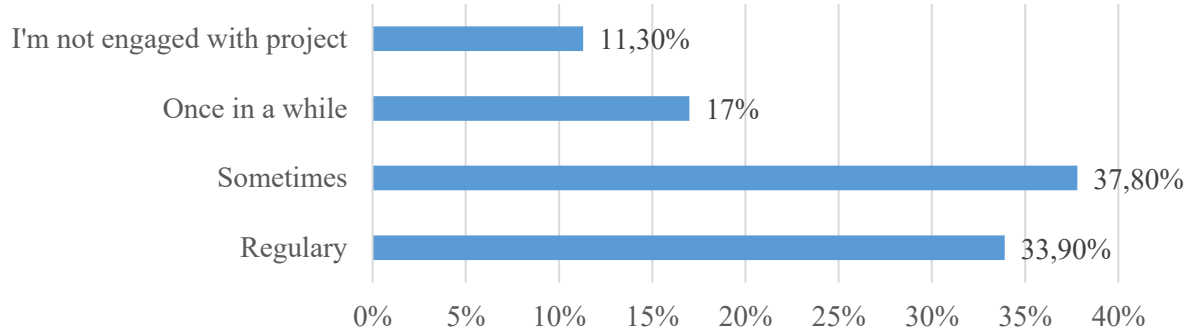

Figure 1. In your role, do you frequently engage with project management processes, or are you part of a project team?

Source: own research.

Data safety is crucial for every organization. In this particular firm, 26% of employees express some level of concern regarding data safety related to AI, while 13% are particularly troubled by the company's data security measures. Additionally, 32% of employees find it difficult to take a stance on the issue, and 21% have no opinion at all, 8% believe there are no concerns at all (Figure 2).

Respondents were also asked about their concerns about their workplaces being replaced by AI. The fear of being replaced by AI was voiced by 45% of participants, indicating concerns about replacement to a limited extent, while 14% felt there was a significant risk involved. In contrast, 27% of respondents did not believe such a risk existed, and 14% were unsure.

Next, respondents were asked about: Does the use of AI help you save time on your tasks and improve the overall time management of your projects? In their opinion AI plays a significant role in enhancing time efficiency. Notably, 49% of participants reported a frequent improvement in their time management when AI is employed, while 35% expressed strong conzfidence in its effectiveness for saving time. 16% of those surveyed had no opinion on this subject.

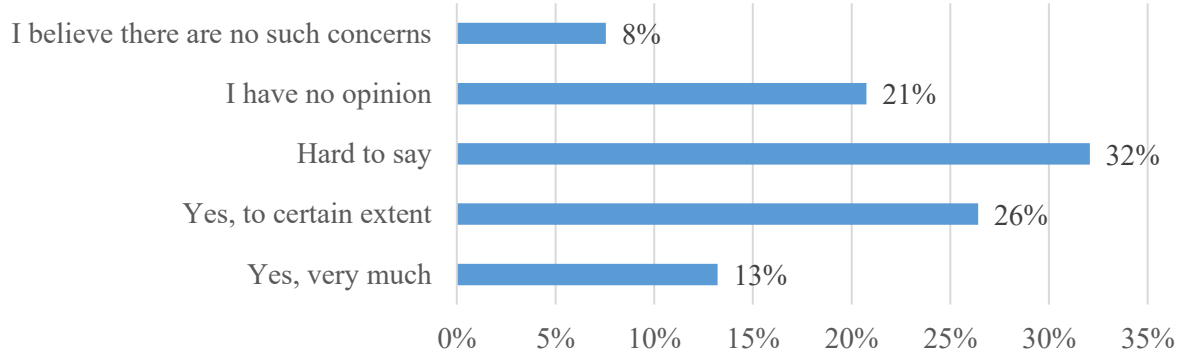

Figure 2. Do you have any concerns about data security when it comes to the use of AI in the firm's projects?

Source: own research.

As indicated in Figure 3, only a small number of workers place complete trust in AI decisions and answers. The majority of employees, specifically 47%, express a significant level of trust in AI, though not entirely unwavering. Meanwhile, 23% remain neutral, and a small percentage exhibit a strong or complete distrust towards AI.

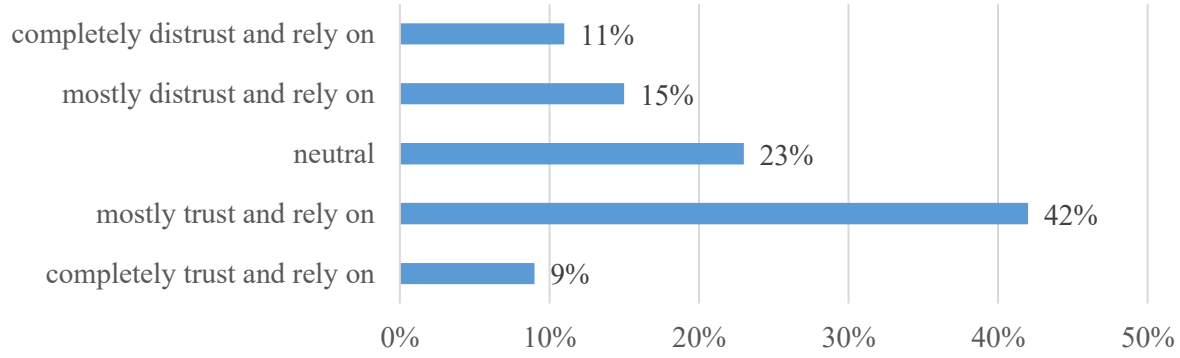

Figure 3. How much do you trust and depend on the decisions and answers provided by AI?

Source: own research.

Q2: How are AI tools evaluated by its users in Project Management?

Respondents were asked what AI tools they use on a daily basis and could choose several of the proposed options. As illustrated in Figure 4, Zoom and ChatGPT stand out as the predominant AI tools utilized by respondents, commanding significant utilization rates of 91% and 89%. Also Data RPM tool and Trello (or Bitrix24) achieving significant utilization rates of 43% and 37%. In contrast, other tools such as Textio, Conversica and Basecamp follow at a distance, with usage rates of 17%, 15% and Basecamp, respectively. This may indicate that employees are still learning how to use more advanced AI technologies in PM.

According to the question: How would you assess the effectiveness of the AI tools you've selected for managing your projects? Employees' feedback on AI tools reveals varying levels of effectiveness. Specifically, 42% of respondents believe these tools are moderately effective when managing projects, while 35% consider them highly effective. Additionally, 23% maintain a neutral stance, and notably, no respondents indicated that they find AI tools ineffective.

The survey respondents were then asked about which Project Management activities could yield the greatest benefits to the project when automated using AI? They also had several answer options to choose from.

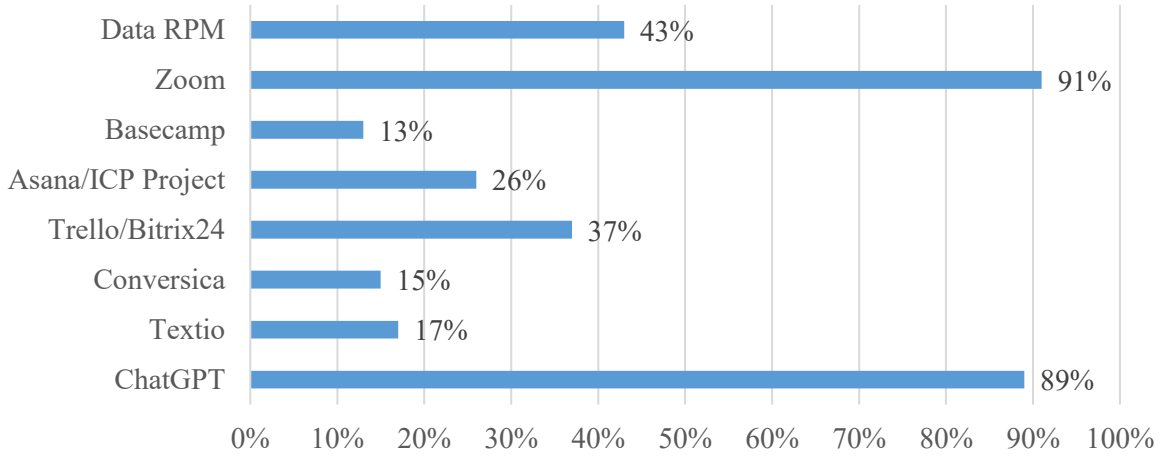

Figure 4. Which AI tools do you utilize on a daily basis?

Source: own research.

Figure 5. highlights the key areas of Project Management that would greatly benefit from automation through AI. These areas include Scheduling and Planning, with 68% of leaders identifying it as advantageous, Progress Tracking at 56%, and Data Collection, which garnered 45% support. The remaining activities had similar values (between 30% and 39%) when it comes to benefiting from the use of AI.

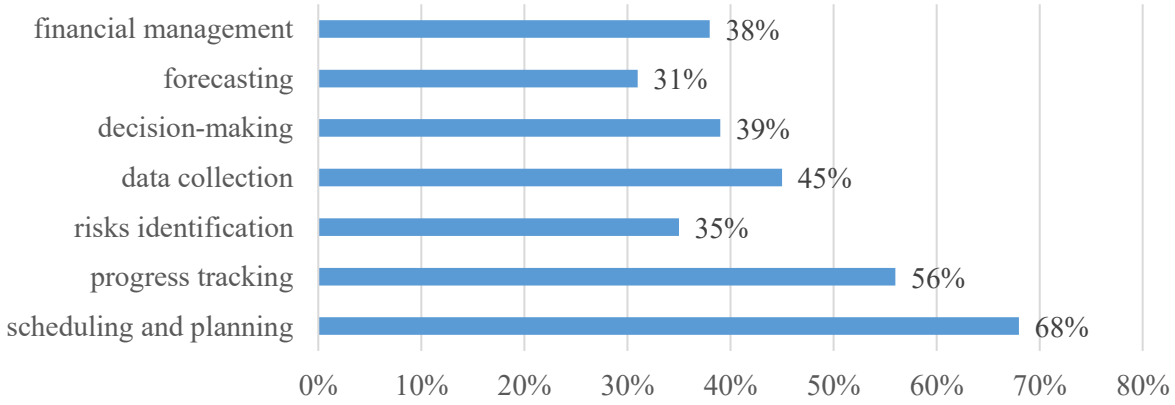

Figure 5. Which Project Management activities could yield the greatest benefits to the project when automated using AI?

Source: own research.

To highlight the importance of deepening competences in the use of AI tools in PM, the respondents were asked about the necessity for training and education in the field of AI, and

40% of respondents indicated that they need such training. Additionally, another 42% occasionally express a desire for it. Meanwhile, 10% have no opinion on the matter, and 8% are not interested at all. The research also showed, that a significant number of respondents have expressed their views on the need for an AI specialist within the firm. Specifically, 31% of the workforce reported a strong demand for this role, while 43% indicated a moderate level of demand. In contrast, 14% of employees remain uncertain about the idea, and 12% would not consider it at all.

5. Conclusion

Artificial Intelligence (AI) is revolutionizing project management by automating repetitive tasks, enhancing decision-making, and improving overall project outcomes. The incorporation of AI tools enables project managers to streamline workflows, minimize human error, and redirect their focus from routine operations to strategic initiatives.

AI-driven solutions can optimize essential aspects of project management, including planning, risk management, resource allocation, and progress tracking. By analyzing historical data and identifying patterns, these AI systems equip project managers with the ability to anticipate potential risks and delays, facilitating proactive decision-making. Furthermore, AI tools offer real-time insights and recommendations, enhancing a project's agility and responsiveness to changes.

However, embracing AI in project management also introduces certain challenges. These encompass ethical considerations, data security risks, and the necessity for upskilling project teams to effectively utilize AI tools. Importantly, AI should be viewed as an aid rather than a substitute for human judgment. Successful project management continues to rely on critical thinking, leadership, and emotional intelligence.

According to the conducted research, and answering the first research question (Q1) the majority of respondents are actively involved in project management activities, with 37.8% engaging occasionally and 33.9% regularly. This indicates that insights gathered about AI's impact are relevant to those with direct project management experience. Also, data safety emerges as a notable concern, with 26% of employees expressing some level of worry about AI-related data security, and 13% being particularly troubled by existing measures. However, a significant portion (32%) remains undecided on this issue, and 21% express no opinion, reflecting mixed sentiments about data safety in AI usage. Concerns about AI replacing human roles are prevalent but not unanimous. While 45% acknowledge limited concerns about replacement and 14% feel a significant risk, 27% do not perceive a threat, suggesting divided opinions on AI's impact on job security. Also, findings highlight a general inclination toward

trusting AI, albeit with some reservations, emphasizing the importance of transparency and reliability in AI systems to build greater confidence among users.

Referring to the second research question (Q2), towards growing reliance on AI tools in project management very important is the need for training to maximize their potential, and the importance of specialized roles to enhance AI implementation. Widely used tools like Zoom and ChatGPT dominate, advanced AI tools remain underutilized, suggesting a learning curve for adoption in PM. A majority of respondents find AI tools effective for project management, with 42% rating them as moderately effective and 35% as highly effective.

In summary, AI has the capacity to transform project management by boosting efficiency and enhancing decision-making. To maximize the advantages of AI, organizations must ensure that project managers possess the skills required to effectively collaborate with AI systems and address any ethical or security concerns that arise. Ultimately, the successful integration of AI into project management hinges on striking a balance between technological innovation and human expertise.

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BRIDGING THE EXPERIENCE GAP: STRATEGIC COLLABORATIONS IN THE AGE OF GENERATIVE AI

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Purpose: The primary aim of this study is to analyze the real-world adoption of generative AI within organizational contexts. This work aims to contribute to the broader understanding of how generative AI is reshaping business processes and driving innovation across industries.
Design/Methodology/Approach: The study adopts a qualitative content analysis approach, grounded in a systematic review of peer-reviewed articles and grey literature published from 2022 to 2024. Articles were screened based on strict inclusion and exclusion criteria, emphasizing documented real-world applications of generative AI. Data extraction focused on identifying sector-specific use cases, challenges encountered during its integration, and the strategies employed by organizations to overcome these obstacles, as well as the organizational impacts of generative AI.
Findings: The review identified six empirical studies documenting real-world implementations of generative AI across diverse sectors, including insurance, finance, creative industries, retail, and fact-checking. Generative AI is shown to enhance efficiency, streamline workflows, and support decision-making, while also fostering creative innovation. Challenges such as data reliability, legal ambiguities, and organizational readiness were commonly observed. Strategies to address these barriers include leveraging human-AI collaboration, ensuring regulatory compliance, and investing in cohesive organizational structures.
Research Limitations/Implications: The research is constrained by the limited number of empirical studies available, reflecting the nascent stage of generative AI adoption. Additionally, the findings are subject to the rapid evolution of AI technologies, requiring ongoing updates through longitudinal research. Expanding future studies to include a broader geographic and sectoral scope is essential for generalizability.
Practical Implications: The study provides actionable insights for organizations considering the adoption of generative AI. It highlights the importance of strategic planning, ethical data management, and fostering collaboration between human experts and AI systems. These findings are particularly relevant for small and medium-sized enterprises seeking to leverage AI to enhance efficiency and competitiveness.
Social Implications: Generative AI democratizes access to advanced technology, enabling non-specialists to use AI tools. However, its rapid adoption demands robust regulation and stakeholder engagement from policymakers.
Originality/Value: This study addresses a critical gap in the academic literature by focusing on the documented implementation of generative AI.

Keywords: Generative AI, organizational challenges, AI adoption
Category of the paper: research paper.

1. Introduction

Artificial intelligence (AI) has emerged as a transformative force across industries, driving innovation and enabling substantial improvements in productivity and efficiency. Despite its potential to optimize processes and enhance decision-making, the adoption of AI technologies within organizations presents significant challenges. Issues related to data governance, scalability, workforce readiness, and ethical considerations remain pervasive, complicating the integration of AI across sectors such as retail, banking, energy, and technology (Sheikh et al., 2023; Bevan et al., 2024; Davenport et al., 2024). These obstacles underscore the need for robust strategies to support AI implementation and maximize its organizational benefits.

The conceptualization of generative AI reflects broader debates surrounding the definition of artificial intelligence, which varies significantly across academic, governmental, and societal contexts. AI is commonly categorized into Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI). Generative AI is situated within ANI, characterized by its focus on specific, task-oriented functions, in contrast to the more generalized and autonomous capacities of AGI, which remains theoretical (Salmon et al., 2021). This distinction underscores the specialized yet impactful nature of generative AI as a tool for addressing targeted applications.

AI can be broadly defined as systems that display intelligent behavior by analyzing their environment and taking actions to achieve specific goals (Sheikh et al., 2023; Bevan et al., 2024;). Various definitions of AI exist, with some focusing on the replication of human cognitive functions while others emphasize its ability to process large datasets and automate decision-making (Kalota, 2024; Strickland, 2024). Among the diverse forms of AI, generative AI has garnered increasing attention for its ability to create novel outputs. Researchers have highlighted its capacity to transcend traditional analytic applications, such as decision-making, by introducing probabilistic techniques that enable creative and often artistic content generation (Feuerriegel et al., 2023). This paper focuses on generative AI, a subset of AI, defined by its capability to produce new content, such as text, images, or even code, based on learned patterns from existing data (Feuerriegel et al., 2023; Strickland, 2024). This form of AI has gained particular attention for its applications in content creation, customer service, and product recommenddations, significantly transforming industries like retail and finance (Buhler, 2024; DeVon, 2024). The adoption of this new technology may significantly enhance and streamline work processes, enabling employees to perform their tasks with greater efficiency and effectiveness. By reducing the time required for numerous tasks, it becomes particularly appealing to organizations

seeking to optimize operations and improve overall productivity. However, the implementation of generative AI (GenAI) may also pose significant challenges, including the potential for substantial workforce reductions, raising concerns about job displacement and the need for strategic workforce planning to mitigate social and economic impacts. Nonetheless, this innovation redefines the role of AI, expanding its potential applications and reshaping the dynamics of human-AI collaboration. The release of ChatGPT in late 2022 marked a pivotal moment in the evolution of AI, significantly broadening its accessibility and public engagement. Unlike earlier systems that often-required technical expertise, ChatGPT democratized AI usage, enabling non-specialists to interact with advanced generative models. This development not only accelerated the adoption of generative AI but also highlighted its potential to transform industries by bridging technical barriers and fostering widespread integration (Kalota, 2024).

Despite these advancements, the challenges associated with scaling generative AI and other AI technologies are substantial, especially in sectors with structural limitations such as inadequate infrastructure and resource constraints (Lamarre et. Al., 2024). While large corporations like Amazon and Walmart have demonstrated success in leveraging AI for logistical optimization and customer service automation, smaller businesses and micro, small, and medium enterprises (MSMEs) face more significant hurdles in their AI adoption journey. These challenges include a lack of technical expertise, financial constraints, and difficulties in aligning AI systems with existing business processes (Bevan et. Al., 2024). For these organizations, strategic collaborations with AI vendors, consultants, and cross-functional teams have become essential in overcoming these obstacles and ensuring successful AI adoption (Davenport et al., 2024).

This paper makes a significant and original contribution by examining the real-world adoption and integration of generative AI within organizational contexts, addressing a critical gap in existing scholarship. While generative AI has captured widespread attention in both academic and industry settings, empirical research on its practical implementation remains scarce. Through a systematic analysis of sector-specific use cases, associated challenges, and the strategies employed to overcome them, this paper provides a deeper understanding of the factors that facilitate successful adoption. Moreover, the research highlights the transformative role of generative AI in driving innovation, optimizing workflows, and enhancing human-AI collaboration. These findings are particularly valuable as they not only advance theoretical discussions but also offer actionable insights for practitioners and policymakers aiming to harness the potential of generative AI while addressing its complexities.

2. Rationale for the literature review

Generative AI has emerged as a transformative technological innovation, characterized by its advanced capabilities and unprecedented accessibility for users with limited technical

expertise. This democratization of AI technology offers significant opportunities for micro, small, and medium enterprises (MSMEs) to enhance their business operations. Generative AI enables the creation of high-quality advertising content, facilitates seamless multilingual communication, and supports automation in workflows—all without the need for specialized IT knowledge. Such low barriers to entry position generative AI as a potentially indispensable tool in driving innovation and operational efficiency within the MSME sector.

The growing enthusiasm for generative AI is evident in industry surveys, such as the Forbes Advisor study of 600 business owners (Haan, 2024), where 97% of respondents expressed confidence in ChatGPT's potential to benefit their organizations. Among the most cited applications were gathering and summarizing information, supporting decision-making process, generation of website content and the creation of multilingual materials and international communication, illustrating its practical relevance to businesses seeking to expand their market reach or improve their operational capacity. The study also shows that business owners overwhelmingly perceive artificial intelligence as a valuable tool for enhancing various aspects of their operations. A significant proportion of respondents (64%) anticipate that AI will strengthen customer relationships and boost productivity, while 60% expect it to contribute directly to sales growth. Additionally, AI is viewed as a critical asset for improving decision-making processes (44%), reducing response times (53%), and minimizing errors (48%). Businesses also foresee AI playing a pivotal role in cost reduction (59%) and streamlining operational processes (42%), highlighting its potential to drive both efficiency and profitability.

These high expectations underscore the optimism surrounding AI's transformative potential. However, they also raise important questions about how these anticipated benefits align with real-world experiences of AI implementation. This alignment between expectations and lived experiences requires empirical insights, particularly in areas where challenges such as technical barriers, organizational readiness, and resource limitations may temper the anticipated benefits.

Bridging the gap between high expectations business owners have towards generative AI and the practical realities faced by organizations adopting AI technologies is essential. Understanding how businesses navigate challenges, optimize strategies, and measure the outcomes of AI adoption is crucial to ensuring that these technologies deliver on their promise. Despite this optimism, there remains a critical need to examine the real-world implementation of generative AI through rigorous empirical research.

3. Research methodology and objectives

This study employed a qualitative content analysis approach to explore how companies implement generative AI across various sectors. The focus on generative AI stems from

its transformative potential to be utilized by non-IT specialists in a wide range of organizational contexts. Consequently, the literature search was restricted to articles published from 2022 onward, reflecting the period after generative AI, Chat GPT became publicly accessible.

A structured set of research questions was developed to guide and organize the systematic review. Integrating research questions into the review process ensures a focused and comprehensive analysis of the relevant literature. These questions were designed to address the practical applications of generative AI, the challenges encountered during its adoption, and the strategies employed to overcome these obstacles. Additionally, the review sought to examine specific companies utilizing generative AI, the sectors in which these technologies are applied, the types of AI technologies implemented, and the barriers to their adoption.

The study was structured around the following key questions:

1. What are the practical applications of generative AI across various industries, and how is it transforming organizational processes?
2. How does the implementation of generative AI impact business performance and organizational outcomes?
3. What challenges do companies encounter during the integration of generative AI technologies into their operations?
4. What strategies have companies employed to successfully overcome the obstacles associated with generative AI adoption?

Through these inquiries, the study aimed to provide a comprehensive understanding of how generative AI is being implemented, the hurdles faced during its adoption, and the practical solutions that enable organizations to realize its potential.

4. Systematic review process

The systematic review was conducted using EBSCO databases, including EBSCO Host and the EBSCO Business Search Interface. The search query utilized was: "(generative artificial intelligence OR GAI OR generative AI OR ChatGPT OR GenAI) AND (companies OR businesses OR corporations) AND (application OR apply OR implementation OR integration OR integrate)". The search was restricted to full-text, English-language, peer-reviewed scientific articles published between January 1, 2022, and December 31, 2024. For the Regional Business News database, an additional filter was applied to include only articles classified as case studies. This initial search identified 191 articles. Also grey literature was incorporated to supplement the analysis with case studies and insights from publicly available, non-peer-reviewed sources. The grey literature search employed a search engine-based approach and yielded an additional 23 articles. These articles included diverse examples from industry and featured publications

by leading consulting firms, such as McKinsey & Company, business media outlets like Forbes, and academic resources such as IEEE.

To refine the dataset of a total of 214 articles, duplicate entries were removed, resulting in 190 unique articles. Further screening excluded articles categorized as book reviews, calls for papers, or editorials, narrowing the selection to 135 articles. The abstracts of these articles were then assessed for relevance. Of the 135 articles, 105 included abstracts, while 30 did not. For the articles lacking abstracts, a manual review of the full text was conducted to determine whether they addressed real-world implementations of generative AI in organizational contexts or merely discussed hypothetical benefits and challenges.

Where the abstract alone did not clarify whether an article focused on hypothetical impacts or documented actual implementations, the full text was reviewed. Following this comprehensive evaluation, 75 articles were deemed suitable for further analysis.

The data extraction process centered on gathering detailed insights into the use of generative AI in organizational contexts. Specific attention was given to identifying real-world applications, challenges faced during implementation, and strategies adopted to address these barriers. Key data points included the companies and sectors involved, the types of generative AI technologies applied, and the practical obstacles encountered.

From the initial pool of 190 articles, only 6 were selected for in-depth analysis based on their relevance of inclusion criteria. These articles were reviewed to extract actionable insights presented in Table 1.

For the purpose of this study, "real-world use or integration" refers to the practical application of generative AI technologies within organizational settings, supported by direct evidence such as case studies, implementation reports, or documented observations. This excludes hypothetical scenarios, speculative analyses, or purely theoretical discussions, focusing instead on instances where generative AI tools are actively deployed to enhance workflows, processes, or decision-making.

The study focuses on actual, documented implementations of generative AI in organizations. This excludes hypothetical scenarios, speculative analyses, or purely theoretical discussions, focusing instead on instances where generative AI tools are actively deployed. Therefore, the following inclusion and exclusion criteria were defined:

Inclusion Criteria:

1. Documented Implementation of Generative AI: Articles must provide evidence of real-world use or integration of generative AI within organizational processes, supported by case studies, examples, or direct observations.
2. Application in Business Operations: Studies must focus on specific applications of generative AI in a corporate setting, detailing its impact on workflows, processes, or outcomes.
3. Empirical Data on Challenges and Solutions: Articles should report observed challenges during generative AI adoption and describe strategies or approaches used to overcome these barriers.

Table 1.
Summary of Systematic Literature Review

Bukhtueva, I.	Dahle, J.				**First**
2024	2024				**Year**
Science	Journal of Total Rewards				**Journal**
	nonprofit organization	multinational technology	broadcast satellite TV	Insurance brokerage	**Sector**
Accenture	Vehicles for Change	IBM	Infinity Dish	Newfront	**Company**
Uses gen AI to help large technology companies automate content creation, like reports, advertising campaigns and multimedia materials	Virtual reality training program: Onboarding and employee training makes training accessible to people in schools and prisons and gives them the experience needed for a career in the much-needed occupation of auto mechanics	Compensation systems: can analyze internal and external data for skills, talent supply, market pay rates and performance ratings to give managers salary increase recommendations	Chatbots - 1. can automate many administrative aspects of the hiring process: screen applicants, schedule interviews and conduct background and reference checks. 2. provide self-guided training,	Customer support chatbot - Can accurately answer complicated benefits questions and point employees to the corresponding section of their benefits guide for verification	**Application of GenAI**
Accelerate the digital transformation of its customers, offering solutions that include automation of processes	Customize learning modules to simulate real workplace scenarios and tailor to specific needs leading to a more effective and engaging learning experience	Make better-informed pay decisions	Save time	Faster, consistent, and round-the-clock support for clients, improved operational efficiency by freeing HR teams to focus on complex issues	**Impact on Business**
Not mentioned	The lack of a clear strategy, appropriate organizational structure, well-defined processes, and cohesive teams may hinder the effective implementation of AI tools, limiting their potential impact.				**Challenges**
Not mentioned	Invest in AI tools and people Navigate data-compliance and information-security regulations Respond to “ hallucination” and false data Prevent the accidental misuse or mishandling of confidential information Address ethical questions Data provided to these tools must be thoroughly examined via the perspective of people knowledgeable about the information, its context and its application to identify quality issues.				**Strategies to Overcome Challenges**

Erickson, K.	Bulau, C. M.	Sheikh, R. A.			First
2024	2024	2024			Year
Creative Industries Journa	Economica	PM World	German International Journal of Modern		Journal
Creative industries	finance				Sector
**	*	Instacart	Bain & Company	Deloitte	Company
Used as a co-creative tool rather than a replacement for human workers, enabling firms to rapidly explore new creative expressions with fewer constraints than traditional methods, used as an experiment	Used to support the accounting profession by providing reliable assessments of financial statements, ratio calculations, interpretations, scoring, ratings, and decision validation	Uses GenAI to improve their core value proposition of providing fast, reliable, affordable grocery delivery to customers at home	Uses GenAI to optimize supply chains and forecast demand in retail and manufacturing. It implements predictive models that help customers predict changes in demand based on analysis of historical data and current market trends	Uses GenAI to automate data analysis processes in the financial sector	**Application of GenAI**
AI allows firms to explore new creative possibilities quickly and at scale, expanding their range of outputs; hypothetical competitive effects from more widespread adoption of AI across the industry, Implementing AI increases overall workload rather than reduces it.	Automates many routine financial analysis and reporting tasks with a high degree of accuracy, significantly enhances efficiency in finance functions through automation	To strengthen this value proposition by increasing the speed and efficiency of ordering groceries online	This allows retailers and manufacturers to bettermanage inventory, reduce storage and logistics costs, and improve delivery accuracy	Uses predictive models to identify financial risks and predict market trends, which helps banks and investment companies minimize risks and increase profitability	**Impact on Business**
Extensive labour involved in AI production, including additional expert in computer software and data curation; collaboration with third parties; intellectual property complexity, audiences are intrigued by the unique flaws of AI outputs, making it harder to replace human creations entirely	Limited compared to employees expertise in depth of analysis, consideration of alternative viewpoints and strategic decision-making, the outcome depends on the professional expertise of the user who builds the interrogation questions.	General challenges were discussed but not company-specific			**Challenges**
Emphasize human involvement alongside AI to refine outputs and reduce risks Policymakers and researchers need to develop coordinated regulations to reduce legal and technological uncertainties	Should be used as a productivity tool to automate basic, repetitive tasks rather than a replacement for experienced professionals	General strategies were discussed but not company-specific			**Strategies to Overcom e Challenges**

First	Year	Journal	Sector	Company	Application of GenAI	Impact on Business	Challenges	Strategies to Overcome Challenges
Cuartielles, R.	2023	Profesional de la Información	fact-checking Spanish platforms	***	Use of ChatGPT3.5, in particular internally, to test the chatbot's performance;	ChatGPT's viralization influences work routines of fact-checkers, by potentially hindering, reinforcing, or expanding their processes. It serves as an auxiliary resource for tasks such as information gathering, detecting falsehoods, and identifying contradictions.	The use and reliability of sources, limitations in data training and processing, scope of chatbot-generated data, and inconsistencies in the production and format of responses	Leveraging ChatGPT as a supplementary tool to improve reporting accuracy, detect misinformation, and expose contradictions in data or statements

Note: * Finance Wizard - a case study of using this GenAI; ** Botnik Studios, Dave's Games, Wayne McGregor Studio with Google Arts & Culture Lab, Uncanny Valley,Generated Photos, Celestino Soddu, Architec; *** Maldita.es, Newtral, EFE Verifica, AFP Factual España, Verificat, VerificaRTVE

Source: Own elaboration based on the conducted research.

Exclusion Criteria:

1. Hypothetical or Speculative Applications: Articles that exclusively discuss potential or anticipated uses of generative AI without providing real-world implementation examples.
2. Theoretical Frameworks Only: Studies focusing purely on conceptual frameworks, model designs, or hypothetical scenarios without practical implementation insights.
3. Lack of Organizational Context: Articles that do not specify how generative AI is applied within an organizational setting or fail to address sector-specific applications.

5. Findings from the literature review

The analysis of the six articles that met the inclusion criteria reveals diverse applications of generative AI across sectors such as insurance, technology, finance, retail, creative industries, and fact-checking. The use cases illustrate both the potential of generative AI to transform organizational operations and the multifaceted challenges organizations encounter during implementation.

Research question 1: What are the practical applications of generative AI across various industries, and how is it transforming organizational processes?

Generative AI is employed to enhance efficiency and support decision-making in various domains. For instance, Newfront, an insurance brokerage, utilizes AI-powered chatbots to streamline HR operations and address client queries more efficiently (Dahle, 2024). In the financial sector, tools such as Finance Wizard automate routine tasks like financial statement assessments

and ratio calculations, significantly enhancing operational efficiency (Bulau, 2024). In creative industries, AI is leveraged as a co-creative tool to explore new artistic expressions, enabling rapid ideation while preserving human input (Erickson, 2024).

In retail and manufacturing, Bain & Company applies AI to optimize supply chains and forecast demand using predictive models, improving inventory management and reducing logistics costs (Bukhtueva, 2023). Fact-checking organizations such as Maldita.es and Newtral utilize ChatGPT internally to enhance workflows by identifying falsehoods and contradictions, though challenges with data reliability and training persist (Cuartielles, 2023).

Research question 2: How does the implementation of generative AI impact business performance and organizational outcomes?

The integration of generative AI has led to tangible improvements in efficiency, decision-making, and customer interactions. For instance, in HR and financial operations, generative AI automates repetitive tasks, allowing professionals to focus on complex, high-value activities (Dahle, 2024; Bulau, 2024). Creative industries benefit from the flexibility and scale generative AI provides for exploring novel ideas, while supply chain optimization improves delivery accuracy and reduces costs (Bukhtueva, 2023). Fact-checking processes have become more robust, with AI assisting in detecting misinformation and enhancing reporting accuracy (Cuartielles, 2023).

However, the impact is not uniformly positive. In the creative sector, AI adoption increases overall workload rather than reducing it, as human expertise remains critical for refining AI outputs and addressing intellectual property complexities (Erickson, 2024).

Research question 3: What challenges do companies encounter during the integration of generative AI technologies into their operations?

Challenges associated with generative AI implementation are both technical and organizational. Key issues include:

- Data-related Challenges: Inaccuracies, limitations in data training, and inconsistencies in AI-generated outputs hinder reliability (Cuartielles, 2023);
- Human Resource Dependency: Extensive human involvement is required for data curation, software expertise, and output refinement, complicating adoption processes (Erickson, 2024);
- Legal and Ethical Issues: Ambiguity around intellectual property rights and the legal status of upstream datasets poses significant risks (Erickson, 2024; Bulau, 2024);
- Organizational Barriers: A lack of clear strategy, cohesive teams, and well-defined processes limits the effective implementation of AI tools (Bulau, 2024).

Research question 4: What strategies have companies employed to successfully overcome the obstacles associated with generative AI adoption?

Organizations have adopted several strategies to mitigate these challenges. In finance and HR, AI tools are positioned as productivity enhancers rather than replacements for human expertise, ensuring experienced professionals retain oversight (Bulau, 2024; Dahle, 2024).

In the creative sector, collaboration between humans and AI is emphasized to refine outputs and address intellectual property concerns (Erickson, 2024). Fact-checking organizations leverage AI as a supplementary tool, with subject-matter experts verifying outputs to ensure accuracy (Cuartielles, 2023).

Additionally, broader recommendations include investing in cohesive organizational structures and regulatory compliance, addressing ethical considerations, and ensuring data quality through rigorous validation processes (Erickson, 2024; Bulau, 2024). Policymakers and researchers are called upon to develop coordinated regulations to reduce legal and technological uncertainties surrounding AI use.

These findings demonstrate the versatility and transformative potential of generative AI across industries. However, they also highlight the need for organizations to address significant challenges proactively. Future research and organizational practices must focus on bridging the gap between generative AI's promise and the practical realities of its implementtation.

The literature reviewed during the process predominantly focuses on theoretical frameworks, research roadmaps, anticipated challenges, and proposed solutions. Although numerous articles were categorized as research or empirical studies, closer scrutiny revealed that much of the purported empirical evidence was grounded in predictive assessments or assumptions about AI's potential, rather than examining concrete instances of generative AI implementation in organizations. In contrast, the primary objective of our study is to analyze the actual deployment and integration of generative AI technologies within companies, emphasizing real-world applications over theoretical predictions or speculative frameworks. However, empirical investigations into generative AI applications remain limited. Existing studies largely explore its implementation in higher education, reflecting academics' interest in testing and evaluating new technologies. While this focus provides valuable insights, it leaves a notable gap in understanding how small and medium-sized enterprises (SMEs) adopt and integrate generative AI.

This study aimed to bridge the gap between industry enthusiasm and documented evidence by systematically analyzing how organizations are adopting generative AI technologies. The focus was to identify the specific challenges encountered during implementation, the strategies employed to overcome these barriers, and the impact of generative AI on business outcomes.

The results of the review reveal a significant limitation in the academic literature. Of the numerous 190 articles initially identified, only 6 met the stringent inclusion criteria, highlighting the scarcity of empirical studies documenting the implementation of generative AI in business settings. This paucity underscores an urgent need for further research to provide evidence-based insights into the integration of generative AI and to inform best practices for its adoption in organizational contexts.

6. Additional findings

While these findings do not stem directly from the targeted review, they emerged as a secondary outcome of analyzing articles that did not meet the inclusion criteria. They provide valuable context by highlighting broader trends and applications of generative AI across various industries. These observations complement the core review by offering a wider perspective on the scope and potential of generative AI.

6.1. Additional findings: sector-specific applications of generative AI

In education, generative AI is frequently used to enhance personalized learning, assist with test preparation, and support academic content creation. Tools like ChatGPT and Grammarly are widely integrated across K-12, higher education, and professional development contexts (Biloš, Budimir, 2024; Urdan, Marson, 2024; Li et al., 2024). The finance sector utilizes generative AI for fraud detection, credit control, and predictive analytics, streamlining decision-making and automating repetitive tasks to improve operational efficiency (Lee et al., 2024; Liu et al., 2024; Zheng, Kim, 2024). Healthcare applications emphasize patient communication, emergency triage, and analytics, with AI tools contributing to improved decision-making and patient interaction processes (Haleem et al., 2024; Sarbay et al., 2023). Generative AI is also widely applied in marketing, where it enhances digital strategies through personalized content creation and improved customer engagement (Yue et al., 2024; Gulati et al., 2024). Cross-industry applications are prominent, demonstrating the flexibility of AI in areas like customer service, marketing, and human resources, where it automates workflows and fosters collaboration (Kelly et al., 2023; McKnight et al., 2024; Ventayen, 2024).

Other sectors, such as manufacturing (Fonseca et al., 2024), gaming (Zhecheva, 2024), and digital entrepreneurship (Duong, 2024), reveal innovative uses of GenAI, ranging from customer personalization to sustainability efforts and exploratory data analysis. Generative AI is also finding a foothold in niche areas like project management (Sheikh et al., 2024) and pet healthcare (Jokar et al., 2024), where it facilitates workflow optimization and client education.

These findings highlight the widespread adoption of generative AI across industries, reflecting its ability to address specific organizational needs while driving efficiency, creativity, and innovation.

6.2. Additional findings: challenges of generative AI implementation

The implementation of generative AI across industries is hindered by several challenges, including scaling difficulties, data quality and governance issues, organizational resistance, and ethical concerns. Scaling AI beyond pilot projects remains a major barrier, as companies often struggle to integrate solutions into broader operations due to infrastructure limitations and workflow complexity (Lamarre et. al., 2024; Buhler, 2024).

Data-related challenges, such as fragmented datasets, inconsistent formats, and insufficient governance frameworks, are widespread, limiting the effectiveness of AI applications and increasing the risk of algorithmic bias (Davenport et al., 2024; Lamarre et. al., 2024). Organizational resistance also poses significant obstacles, with concerns about job displacement and disruptions to traditional workflows necessitating robust change management and reskilling efforts (Buhler, 2024; Davenport et al., 2024).

Ethical concerns, including data privacy and algorithmic bias, further complicate adoption. Ensuring compliance with privacy regulations and maintaining transparency in AI decision-making are critical, particularly in sectors handling sensitive data (Sheikh et al., 2023; Lamarre et. al., 2024). Addressing these challenges requires coordinated strategies encompassing technical, organizational, and ethical dimensions to enable responsible and scalable AI integration.

6.3. Additional findings: overcoming AI implementation challenges

Organizations have employed various strategies to address the challenges of generative AI implementation, including strategic collaborations, reskilling programs, robust data governance, and change management initiatives. Partnerships with external vendors and cross-functional teams have proven effective in accessing expertise and scaling AI across operations (Buhler, 2024; Lamarre et. al., 2024).

To address talent shortages, many companies have invested in reskilling programs, equipping employees with the skills needed to work effectively alongside AI systems. These initiatives have reduced resistance to AI adoption and enhanced workforce efficiency (Davenport et al., 2024; DeVon, 2024).

Improvements in data governance have been critical to overcoming data-related challenges. By standardizing and integrating data management practices, organizations have ensured the quality and availability of data for AI applications, leading to more accurate outcomes and better system performance (Davenport et al., 2024).

Change management strategies, emphasizing employee engagement and role redefinition, have helped organizations mitigate resistance to AI adoption. Framing AI as a tool for augmenting rather than replacing human decision-making has eased concerns about job displacement (Davenport et al., 2024; DeVon, 2024).

Finally, companies have implemented ethical oversight frameworks to address concerns around data privacy and algorithmic bias. Transparent AI practices and third-party audits have been employed to mitigate risks and maintain public trust (Sheikh et al., 2023; Lamarre et. al., 2024).

7. Limitations

This study is subject to several limitations that should be acknowledged to contextualize its findings and inform future research directions.

While generative AI has gained immense popularity since becoming available to the general public two years ago, it is often not clearly distinguished from other types of artificial intelligence by users and non-experts. This lack of differentiation in terminology may have limited the ability to capture nuanced perspectives or distinct applications of generative AI in the literature.

The research and conclusions presented are constrained by a specific time frame, reflecting the state of generative AI technology during the first two years of its widespread public availability. Given the rapid and ongoing advancements in generative AI models, the findings are inherently dynamic and subject to change. Longitudinal studies are recommended to track how evolving generative AI capabilities impact adoption, challenges, and outcomes over time.

Only a small number of articles met the strict inclusion criteria, underscoring the relative scarcity of empirical studies documenting real-world generative AI applications in organizational settings. This limitation may reflect the nascent stage of generative AI adoption, as two years may be insufficient to establish a robust body of empirical research. Future research in partnerships between academia and industry could revisit this topic as the adoption of generative AI matures and more comprehensive case studies become available.

The literature reviewed may not fully represent all sectors or regions, as the included articles were predominantly focused on specific industries or geographic contexts. Expanding future research to include a more diverse set of industries and international perspectives could enhance the generalizability of findings.

By addressing these limitations, future studies can provide a more comprehensive understanding of generative AI's evolving role in business contexts and its implications for organizational processes and outcomes.

8. Conclusions

This study underscores the transformative potential of generative AI while addressing the multifaceted challenges associated with its implementation in organizational contexts. The findings demonstrate that generative AI has been adopted across a range of industries, including insurance, finance, retail, creative sectors, and fact-checking, with applications focused on automating workflows, enhancing decision-making, and facilitating creative innovation. These

technologies have proven instrumental in streamlining operations and improving organizational outcomes; however, their adoption is accompanied by significant obstacles.

Key challenges include data governance issues, organizational resistance, legal and ethical concerns, and the technical complexities of scaling AI solutions beyond pilot projects. The strategies employed to mitigate these challenges emphasize the importance of human-AI collaboration, the establishment of robust data governance frameworks, and the development of ethical oversight mechanisms to ensure transparency and accountability in AI adoption.

Despite these insights, the limited number of empirical studies meeting the inclusion criteria highlights a notable gap in the literature, particularly regarding the adoption of generative AI by small and medium-sized enterprises. This paucity of evidence underscores the need for future research to prioritize longitudinal studies that explore the evolving implications of generative AI adoption, while also broadening the scope to include diverse industries and geographic contexts.

By addressing these challenges and capitalizing on the opportunities presented by generative AI, organizations can harness its potential to drive innovation, enhance operational efficiency, and foster sustainable growth. This research contributes to bridging the gap between the theoretical promise of generative AI and its practical implementation in business environments.

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USING SEMANTIC FIELD ANALYSIS TO UNDERSTAND THE PERCEPTION OF CIRCULARITY IN REGIONS

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Purpose: The purpose of this research is to identify the meanings attributed to the circular economy (CE) by Polish regions at the NUTS-2 level. It explores how CE is characterised in regional development strategies up to 2030, examining the associations and actions linked to CE, and analysing the differences and similarities between regional definitions and the national framework provided by the Polish CE Roadmap.
Design/methodology/approach: A semantic field analysis was conducted on regional development strategies (2030) and the Polish CE Roadmap. The study examined 12 regions that defined CE, comparing their definitions with the national framework. Semantic categories-equivalents, descriptors, associations, oppositions, actions of the subject, and actions towards the subject-structured the analysis.
Findings: Definitions varied significantly among regions. While some view CE as an economic model, others consider it an element of such a model. CE is commonly linked to extending resource lifecycles, minimising waste, and addressing economic and environmental challenges. Regional definitions often supplemented the national framework by adding categories such as actions or oppositions, which are absent in the national definition.
Research limitations/implications: The study focuses on explicit CE definitions, excluding broader contextual references. Future research should examine full strategy documents and assess the alignment between regional and national strategic goals.
Practical implications: Harmonising CE definitions at regional and national levels could enhance policy implementation and provide clearer guidance for regional governments. Cross-sectoral collaboration and unified frameworks are essential for effective CE management.
Social implications: Coherent CE definitions can improve public understanding and acceptance, fostering greater societal engagement in circular practices. Regional adaptation can address local challenges while promoting sustainable development.
Originality/value: This paper applies semantic field analysis to CE definitions, addressing a gap in research on CE multi-level governance. It offers insights for policymakers and public sector managers on improving CE institutionalisation and aligning regional and national strategies.
Keywords: circular economy, regional policy, semantic analysis, public sector management, regional development
Category of the paper: research paper.

1. Introduction

Implementing a Circular Economy (CE) in regions addresses the challenges of environmental degradation and the depletion of natural resources, making this process one of the most significant trends in contemporary regional development (Leipold and Petit-Boix, 2018). The European Union (UE), alongside China, holds a pioneering position in implementing CE, developing policies and strategies that support circular transformation (Geng et al., 2009; Reike, Vermeulen and Witjes, 2018; Cramer, 2022). In particular, the European Green Deal and the Circular Economy Action Plan (CEAP) play a crucial role in promoting the shift from a linear economy to a closed-loop resource system. CEAP, by necessitating the implementation of CE at national, regional, and local levels, significantly influences economic transformation. This is evidenced by the fact that over half of CE initiatives are applied in economic practice across various administrative levels (Sileryte et al., 2020; Mhatre et al., 2021; COM (2023), 2023).

However, there is a lack of studies that comprehensively present circular economic transformation at the regional level (Avdiushchenko, 2018; Meglin, Kytzia, Habert, 2022), integrate regional and central approaches (Ranta, Keränen and Aarikka-Stenroos, 2020; Christensen et al., 2022; Kruse and Wedemeier, 2023), and expand the definitional overview of the circular economy concept. The diversity in approaches to defining CE, stemming from differences in governance levels and local contexts, highlights the need for further research on the semantic coherence of this concept, particularly regarding its implementation at the regional level (Homrich et al., 2018; Scarpellini et al., 2019).

Studies of the bioeconomy, a concept related to CE, in Polish regions underline a clear research gap in this area, further emphasising the necessity of deeper analyses in the regional context (Sobol, 2022). Similar conclusions can be drawn from the analysis of regional CE aspects in the Małopolska region, where the need for research on the semantic coherence of this concept in practical implementation has been identified (Smol et al., 2018). While existing analyses of regional strategies related to CE provide valuable insights, they do not focus on the issue of semantic coherence, despite indicating significant variations in CE implementation across regions (Ćwiklicki et al., 2024; Ćwiklicki, Mirzyńska, Żabiński, 2024).

This article addresses these research gaps, contributing to the international discourse on CE institutionalisation by employing a semantic perspective. This approach represents an innovative methodology for studying CE in Poland. Semantic field analysis enables the examination of the definitional coherence of the CE concept between the central and regional levels, addressing a significant gap in existing academic literature. Considering that unclear or conflicting definitions across different governance levels and policy areas may lead to inconsistencies and hinder the effective implementation of policy measures (Eberl, Gordeeva, Weber, 2021; Shawoo, 2023), this study responds to the need to analyse how key concepts are understood

and defined in practice. The analysis of how Polish regions define CE in alignment with the national approach set out in the CE Roadmap is a key element in implementing policy.

Consequently, the main aim of this study is to identify the meanings attributed to CE by Polish regions (NUTS-2 level). This research seeks to answer the following questions:

1. How is CE characterised in the strategies of Polish regions up to 2030?
2. With what associations and actions is CE linked?
3. What are the differences and similarities between the definitions of CE in regional strategies and the Polish CE Roadmap?

2. Literature review

2.1 Circular economy: a review of definitions

The concept of Circular Economy (CE) is dynamic, evolving as it finds applications in economic practice, adopting various perspectives and creating new fields of meaning (Blomsma, Brennan, 2017) There is no single, consistent definition of CE, even in the academic world (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016).

Analyses indicate that CE is often treated as an economic vision aimed at transforming the traditional linear model of production and consumption into a circular system characterised by maximising resource use and minimising waste (Kirchherr, Reike, Hekkert, 2017). The foundation of this concept lies in managing resources and materials efficiently and sustainably, optimising their use in production and consumption cycles, and reducing dependence on primary natural resources (Ghosh, Bhola, Sivarajah, 2022; Alizadeh et al., 2023) Similarly, Kirchherr and co-authors (Kirchherr, Urbinati, Hartley, 2023) emphasise that a key aspect of circularity is closing material loops, which involves maintaining resources in use for as long as possible. Accordingly, scientific literature often derives CE from the "R" framework—reuse, reduce, recycle, rethink (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016; van Buren et al., 2016; Ghosh, Bhola, Sivarajah, 2022; Alizadeh et al., 2023)

CE is a concept of growing importance (Kirchherr, Reike, Hekkert, 2017; Murray, Skene, Haynes, 2017; Kirchherr, Urbinati, Hartley, 2023) particularly in the context of sustainable development goals (Ghisellini et al., 2018; Schöggl, Stumpf, Baumgartner, 2020; del Río et al., 2021; Ghosh, Bhola, Sivarajah, 2022) and climate policy. Some studies (Blomsma, Brennan, 2017) suggest that it could serve as a framework for strategies aiming at socially just and environmentally responsible development. CE is linked to numerous economic areas—state, regional, business, and consumer activities (Ghisellini et al., 2018) - and discussed from the perspective of cooperation with emerging trends such as design (Alizadeh et al., 2023), technology and digitalization (Bressanelli et al., 2022) or decoupling (Ghisellini et al., 2018).

The primary challenge in defining CE lies in the variations in detail and scope of interpretation. Authors like Alizadeh (2023) and Ghosh (2022) limit their focus to general conceptual principles that highlight directional changes in the economy, while Kirchherr et al. (2023) and Bressanelli et al. (2022) delve into more detailed implementation mechanisms, incorporating technological and operational aspects of circularity. The lack of conceptual coherence also manifests in viewing CE either as an instrument (a tool for policy-making to build an economic system) or as a system in itself (del Río et al., 2021). Moreover, the significance attributed to CE varies depending on the context: in China, it is treated as a national political goal, whereas in the European Union, it is regarded as a tool for promoting bottom-up policies in environmental protection and waste management (Ghisellini et al., 2018). Despite these differences, the shared denominator remains the idea of reducing resource consumption and transforming the economy into a more sustainable system, positioning CE as a future-oriented model capable of addressing climate, social, and economic challenges (Blomsma, Brennan, 2017; Ghisellini et al., 2018).

From the perspective of institutionalising this concept within European policy, the most critical document is the 2015 European Commission Communication "Closing the loop – An EU action plan for the Circular Economy" (COM 2015). CE is defined in this document as "a system of maintaining the value of products and materials in circulation and minimising waste, aiming to create an innovative, competitive, and resource-efficient economy addressing climate and environmental challenges" (COM 2015, 12). While introducing a definition, this document encompasses a broad range of activities and stakeholders under the CE framework, highlighting the need for coordinated circular actions. Regions and member states play a key role in implementing CE, aligning their efforts with EU legal frameworks and leveraging funds for projects supporting circularity (COM 2015).

Implementing CE at the regional level faces numerous barriers arising from its complexity and the multi-level governance mechanisms within the EU. Publications on CE highlight that its implementation in administrative regions remains under-researched, necessitating greater academic attention to better understand the dynamics of this process (Arsova, Genovese, Ketikidis, 2022). Although Poland benefits from a clear administrative division at the regional level, enabling more precise coordination of activities, experiences from other countries reveal that circular actions often remain uncoordinated and inconsistent with national and EU policies (Avdiushchenko, 2018; Cramer, 2020, 2022).

At the same time, efforts to standardise CE implementation should consider specific local and regional conditions, including the level of socio-economic development and environmental initiatives undertaken (Avdiushchenko, 2018). A differentiated approach is particularly significant given the administrative divisions between countries, which influence how CE strategies are implemented at the regional level (Koop, van Leeuwen, 2017; Merli et al., 2020).

2.2 Circular economy in regional strategies

Effective implementation of the CEin regions requires the involvement of a broad range of stakeholders representing different levels of governance and social sectors. The EU plays a pivotal role in this process, setting goals and directions for transformation through the CEAP, such as achieving climate neutrality by 2050 (Kovacic, Strand, Völker, 2019; COM (2023), 2023). Member states, including national and regional authorities, are responsible for adapting these strategies to local conditions, necessitating effective coordination of actions across various administrative levels (Kinnunen et al., 2021; Kruse, Wedemeier, 2023).

In Poland, the key document outlining national CE policy is the 2019 "CE Roadmap: Transformation Towards a Circular Economy". It defines CE and highlights specific areas for action, including sustainable industrial production, sustainable consumption, bioeconomy, and new business models. It also outlines general principles for implementing, monitoring, and financing the transition (CE Roadmap 2019, 29–39).

In this process, local authorities act as intermediaries between policies and local communities, facilitating the more effective implementation of circular initiatives. Enterprises, as key economic actors, influence the efficiency of CE goals by introducing innovative solutions such as industrial symbiosis and eco-design, which enhance the potential of regional economies (Ghisellini, Cialani, Ulgiati, 2016). At the same time, regional residents, as recipients and users of these solutions, play a crucial role in their social acceptance and effectiveness, which requires educational initiatives and raising awareness about the benefits of the circular transformation (Smol et al., 2018).

The mere existence of policy instruments is insufficient for the effective implementation of CE in regions. Both bottom-up and top-down initiatives must be engaged, supported by clearly defined goals and progress monitoring systems (Winans, Kendall, Deng, 2017; Smol et al., 2018). Stakeholder concentration and waste management infrastructure availability, particularly in regions with significant industrial potential, are critical success factors. Equally important, however, are cooperation models in less-developed areas, which can benefit from cross-sector synergies (Mattiussi, Rosano, Simeoni, 2014; Niang, Bourdin, Torre, 2023).

The efficiency of the transition to CE depends on regions' ability to create synergy patterns among stakeholders and on the level of engagement of local communities. This approach allows for identifying priority actions and effectively allocating resources while considering local conditions (Igić et al., 2020; Pavloudakis et al., 2023). Collaboration among all groups involved in the process—from EU administration to residents—is fundamental to the practical implementation of circular strategies.

A key document describing this process is the regional development strategy. These documents serve as tools for implementing plans related to CE, as they combine formal-legal requirements with the flexibility to adapt actions to regional specifics. Regional governments play a crucial role in programming and implementing intra-regional policies, based on clearly

defined administrative and territorial competencies (Dymek, 2020; Sabal, 2023). The strategic and operational goals contained within these strategies, along with indicators for their realisation, enable the practical implementation of CE principles in line with the EU's cohesion policy (Churski, 2023). Regional strategies not only fulfil a formal function but also enable the integration of different levels of governance, which is critical in the context of the multi-level governance required for CE (Stimson, Stough, Roberts, 2006).

3. Methods

Given that language contributes to understanding decision-making mechanisms and how specific concepts shape public policy formulation (Gormley, 2007), and that predicting the political feasibility of proposals requires considering the semantic perception of key related concepts (May, 1986) this study employs the method of semantic field analysis.

Semantics, which examines the meaning of words, phrases, and sentences to convey the sense encoded in language (Yule, 2010, p. 112), is thus a suitable method for studying meanings embedded in definitions. Semantic fields refer to groups of words that are conceptually related and form a shared semantic space (Nerlich, Clarke, 2000). Their analysis focuses on examining relationships between linguistic signs and their meanings to understand how language reflects social and cultural reality (Robin, 1980). This approach utilises logical and formal methods to describe connections between linguistic elements and their real-world references, enabling the development of systematic theories of meaning (Lepore, Stone, 2007).

Semantic analysis plays a crucial role in theoretical linguistics, aiding in understanding the mechanisms through which language conveys abstract concepts, emotions, and social values (Zimmermann, 2015). Moreover, semantics intersects with other disciplines such as philosophy and psychology, exploring the influence of context on the interpretation of meanings (reference). This approach facilitated identifying meanings and relationships associated with the concept of the CE in strategic documents of Polish regions up to 2030. The primary material for analysis comprised the regional development strategies up to 2030, sourced from the Public Information Bulletin portals of individual regional governments. These documents serve as official sources of information on development plans, strategic goals, and regional policy priorities, making them a reliable basis for analysis. To ensure data completeness, full versions of the strategies for each region were collected, resulting in 16 documents with an average length of 131 pages. Additionally, the document CE Roadmap: was obtained, and its definition of CE was extracted to serve as a reference point for the analysis.

After collecting the documents, several key analytical steps were undertaken, following the approach proposed by Robin et al. (1980): **(I) Semantic analysis of the CE definition** provided in the CE Roadmap (the national definition). **(II) Identification of keywords**

associated with the core concept of CE, including [gospodarka o obiegu zamkniętym – eng. closed loop economy – the most common name for CE in Poland], [circular economy – eng. version], [cyrkularność – eng. circuality], [obieg zamknięty – eng. closed loop], [gospodarka cyrkularna- eng. Circular economy]. Fifteen strategy texts contained one or more of these phrases, while the West Pomeranian region was the only one not to use any term commonly associated with CE. **(III) Extraction of CE definitions**: Highlighted sections were analysed to identify the definiendum and definiens. Three regions (Lubelskie, Podlaskie, Śląskie) did not include a definetion of CE, leading to their exclusion from the analysed dataset; thus, the number of analysed texts was reduced to 12. **(IV) Content categorisation** of definitions into six key categories: subject identification, associations, oppositions, equivalents, synonyms, actions by the subject, and actions towards the subject. **(V) Comparison with the national definition**: a comparative analysis was conducted to identify consistencies and discrepancies between the definitions of individual regions and the national definition, as well as collectively across all regions. The analysis focused on parts of the definitions according to their categories from the semantic analysis.

The results present the semantic analysis of the national CE definition, regional definitions grouped by semantic field categories, and a comparison of the categories in the national definition with those in the regional definitions. This structured approach enabled a systematic examination of how the concept of CE is framed at the national and regional levels, providing insights into linguistic and conceptual consistencies and divergences.

4. Results

4.1. Semantic field of the national definition

The results of the semantic analysis of the CE definition are presented in Table 1. This table is an integral part of the document CE Roadmap … and is included as its first element in the introduction. The definition is concise in nature, containing an equivalent, two fragments identified as descriptors, and two as associations.

The national understanding of CE defines this concept primarily as an economic model. This distinction is significant in highlighting the overarching role of the model compared to a mere tool. The defining characteristic of this model is the fulfilment of one of two principles—a sufficient condition.

At the core of its associations are:

a) raw materials, resources, materials, products, and
b) waste.

Table 1.
Semantic analysis of the CE definition

	The CE definition "Circular economy is..."
Equivalent	a model of economic development
Descriptors	in which the following fundamental principles are fulfilled: a) the added value of raw materials/resources, materials, and products is maximised, or b) the amount of waste generated is minimised, and any waste produced is managed in accordance with the waste management hierarchy
Associations	- while ensuring efficiency, - prevention of waste generation, preparation for reuse, recycling, other recovery methods, and disposal

Source: author's analysis based on CE Roadmap (2019).

Actions directed towards these elements—maximising the value of [a] or minimising the amount of [b] in accordance with the waste management hierarchy—are what qualify the economic model as CE. CE is accompanied by economic elements, such as ensuring efficiency, and specific actions concerning waste, including the "R" actions—reuse and recycle.

4.2. Semantic fields of regional definitions

The analysis of the semantic fields of the CE concept for the regions allowed for the identification of categories within each definition and a collective summary of what CE signifies for Polish regions. None of the collected definitions included all semantic categories. The most frequently occurring were equivalents [CE is], followed by descriptors [CE is characterised by…] and associations [CE is connected with/occurs with]. Oppositions and actions towards the subject appeared the least frequently. The frequency of occurrence of these categories across all 12 regional definitions is summarised in Table 2.

4.3. Equivalents

In the strategies, regions used various terms to describe the Polish term of CE (pol. Gospodarka o obiegu zamkniętym): "gospodarka o obiegu zamkniętym" (ang. closed loop economy) (R1, R9), the English equivalent "circular economy" (R2, R11), "economic concept" (R4), "economic model" (R6, R7, R13), "modern waste economy" (R8), "a panacea for reshaping the current system" (R9), "zero waste economy" (R15), "configuration of the economy's functioning" (R13), and "a significant element of a low-emission, resource-efficient, innovative, and competitive economy" (R9).

In the national definition, CE is described as an "economic model," which aligns with the equivalents used by three regions. Terms such as "economic concept" and "configuration of the economy's functioning" can also be considered partially consistent. Equivalents such as "circular economy" and its English translation are synonyms of the examined term, adding no analytical value.

Table 2.
Semantic categories in definition of CE in polish regions

No.	Region name	Source	Equivalents	Descriptors	Oppositions	Associations	Actions of the subject	Actions towards the subject
R1	Dolnośląskie	(SRWD 2019)	1	1	1	1	1	0
R2	Kujawsko pomorskie	(SRWKM 2020)	1	0	0	0	1	0
R3	Lubelskie	(SRWLUBE 2021)	No CE definition in the region's strategy					
R4	Lubuskie	(SRWLUBU 2021)	1	1	0	1	1	0
R5	Łódzkie	(SRWŁ 2021)	0	1	0	1	1	1
R6	Małopolskie	(SRWMAŁ1 2020)	1	1	0	1	0	1
R7	Mazowieckie	(SRWMAZ 2022)	1	1	0	1	0	1
R8	Opolskie	(SRWO 2021)	1	0	0	1	0	0
R9	Podkarpackie	(SRWPODK 2020)	1	1	1	1	1	0
R10	Podlaskie	(SRWPOD 2020)	No CE definition in the region's strategy					
R11	Pomorskie	(SRWPOM 2021)	1	1	1	1	1	0
R12	Śląskie	(SRWŚL 2020)	No CE definition in the region's strategy					
R13	Świętokrzyskie	(SRWŚW 2019)	1	1	1	1	1	1
R14	Warmińsko - mazurskie	(SRWWM 2020)	0	1	0	0	0	0
R15	Wielkopolskie	(SRWW 2020)	1	0	0	0	1	0
SUM OF CATEGORIE			**10**	**9**	**4**	**9**	**8**	**4**
R16	Zachodniopomorskie	(SRWZ 2019)	No CE definition in the region's strategy					

Source: author's analysis.

"Modern waste economy" narrows the scope of meaning compared to the national definition by focusing solely on waste, as does "zero waste economy." Referring to CE as "a significant element" simultaneously narrows and specifies its role relative to the CE Roadmap. Defining CE as "a panacea" introduces a potentially elevated tone to the definition, exceeding the boundaries of the national framework.

4.4. Descriptors

The primary element characterising CE is understanding this concept through the lens of waste and resources. Extending the duration materials and resources remain in the economy and minimising waste generation were identified as features of CE by six regions (R4, R6, R7, R9, R11, R13). Regions R6 and R13 expanded this characterisation by referencing the "R" principle—reuse and recycling—as well as prevention, recovery, or disposal of waste. They also emphasised efficiency in using resources, materials, and products. In the characterisation

provided by R6, waste is to be understood as a resource. Meanwhile, R13 stressed the universality of CE across the state's organisational structures—"at all levels of territorial organisation of the state.

The characterisation introduced by R5 presents the issues of waste and resources differently. CE is associated with the reuse of waste in a production process other than the one in which it originated and the rational use of resources from the perspective of "minimising the consumption of non-renewable resources." Regions R5, R13, and R14 also characterised CE through the lens of extending the lifecycle of waste/products.

For three regions, CE was characterised by its role in supporting the environment (R1, R5, and R13). CE is described as "environmentally friendly" and as characterised by "minimising the negative environmental impact of the process associated with CE." R13 recognised CE as a transformation that brings environmental, economic, and social benefits.

A distinct approach to defining CE was presented by R14. It listed various concepts associated with CE in the region, including eco-innovation, resource-efficient economy, green entrepreneurship, cleaner production, and extending the lifecycle of products currently on the market. These are considered descriptors.

The national definition does not characterise CE as a model defined by its role in supporting the natural environment. It does not use other existing concepts or ideas to define CE, as R14 did. The descriptors in the national definition strictly relate to the circularity of materials and resources and the minimisation of waste. Therefore, only six regions (R4, R6, R7, R9, R11, R13) can be considered fully consistent with the national definition. Although R1 uses the term "efficient" in its description—a term included in the national definition—it does not provide a characterisation consistent with the national definition. R5, while addressing waste, interprets waste management differently than the national definition

4.5. Oppositions

Within the analysed definitions, oppositions to CE were rarely introduced by the regions**. When oppositional terms were included, they primarily referred to: "linear economy" (R1 and R13) and the principles of "take – make – use – dispose" (R1, R9, R13). Additionally, attention was drawn to a contrast between CE and current economic realities, using terms such as "the previously prevailing system," "the current economic model," and "traditional economy, past and present methods of resource utilisation.

The national definition does not include a category identified as oppositions**. The four definitions that introduced oppositions expanded the semantic field of the CE definition they presented.

4.6. Associations

CE is primarily associated with economic and environmental issues. The availability of natural resources was an association with CE for four regions (R5, R6, R9, R11), each focusing

on different aspects: the negative social and economic impacts of depleting resources (R5), dependence on resource suppliers from third countries (R9), rising resource prices (R6), and as a complex geopolitical issue, such as restricted access to resources due to armed conflicts and supply-demand dynamics (R11).

Connections were also made between CE and the natural environment (R9), climate change (R6), and more specifically, environmental pollution (R11) and waste disposal (R13). Three regions linked CE with sustainable development (R1, R7, R9), and one region associated it with low-emission development (R1). Among these connotations, R13's strategy stands out, associating CE with "a new economic model combining economic, environmental, and social issues" (Świę...). This region was the only one to reference European environmental and economic policies in its definition.

Associations with CE also extended to meso- and micro-levels**. CE was linked to opportunities for enterprises (R5), product lifecycle stages (R4), and the waste management system (R8).

The associations presented include concepts describing a broader context than those contained in the national definition. None of the regions used the term "efficiency" as an association with CE, nor did they refer to R-type actions such as recycling. The proposal most aligned with the national definition was made by R8, which included associations such as "efficiency of use" and "waste reduction." However, these terms are not synonymous with those used in the national definition, leading to their classification as partially consistent.

4.7. Actions of the subject

CE activities are described in the regions exclusively in positive terms. Primarily, they are associated with enhancing the competitiveness of economic entities (R1, R9, R13), developing new business opportunities and innovations (R1, R9, R13), and increasing the efficiency of consumption and production (R1, R9). According to the R1 definition, CE serves to protect enterprises from resource shortages and the associated price instability. One region (R13) highlighted CE's impact on creating new products, while another (R5) focused on shifting consumption models towards more conscious and responsible practices.

Another element considered in the definitions is CE's positive impact on the natural environment (R4, R11) and slowing climate change through reducing the carbon footprint (R2). Four regions linked CE activities with resources. These connections emphasised the rational use of resources (R4, R11), the creation of so-called closed loops (R9), and a range of specific actions such as implementing blue-green infrastructure solutions, improving air quality, and reducing urban heat islands (R15).

The national definition does not include a category identified as actions of the subject**. The expansion of the CE definition by the regions to include activities does not contradict the national definition but rather extends or specifies the concept.

4.8. Actions towards the subject

Actions towards the subject were less frequently referenced in the strategies' definitions**. This classification was noted in only four definitions. These included: technological modernisation (R5); actions related to product lifecycle stages, such as resource extraction, design, production, consumption, repair, product regeneration, and waste collection (R6); reduction of waste mass and the elimination of inefficient waste disposal methods (R7). R13 dedicated considerable attention to this category. The actions listed by this region included the development of advanced technology and organisational solutions, comprehensive economic restructuring based on product lifecycle stages, building public ecological awareness, environmental education, and fostering a local community ethos of respecting natural and cultural resources to protect and preserve them for future generations.

The national definition does not include a category identified as actions towards the subject. However, these actions do not contradict the national definition; instead, they complement and enrich it.

4.9. CE in regions – collective image

Considering the frequency of words and concepts within the semantic fields enabled the reconstruction of a shared definition for CE. Two semantic categories that appeared in fewer than half of the definitions were excluded from this reconstruction.

CE is defined as an economic model or a component of an economic model associated with waste management. It is characterised by extending the time materials and resources remain in the economy and minimising waste generation, which can be linked to prolonging the lifecycle of waste/products. The existence of CE is tied to economic and environmental challenges, in cluding resource depletion and environmental degradation. CE positively impacts the economic sphere by increasing innovation and competitiveness among enterprises and transforming production models.

Table 3.
Convergences of Semantic Field Categories of Regional Definitions with the National Definition

	Consistent	**Partially consistent**	**Inconsistent**
Equivalents	R6 R7, R13	R4	R8, R9
Descriptors	R4, R6, R7, R9, R11 R13		R1, R5, R14,
Oppositions	-	-	-
Associations		R8	R1, R4, R5 R6, R9, R10, R11, R12, R13
Actions of the subject	-	-	-
Actions towards the subject	-	-	-

Source: author's analysis.

The regional definition of CE is not identical to the definition provided in Poland's CE Roadmap. Regional definitions often narrow or expand specific categories. Most regions also added categories that are absent in the national definition. A comparative summary of these differences is presented in Table 3.

In two categories—equivalents and descriptors—R6 and R7 were the most consistent with the national definition, i.e., Małopolskie and Mazowieckie. The remaining regions should be considered partially consistent, such as R4 (Lubuskie), or entirely inconsistent.

5. Discussion

The comparative analysis of the semantic fields of CE definitions at the national and regional levels highlights the need for further research on the coherence of this concept across regions (Ranta, Keränen, Aarikka-Stenroos, 2020; Christensen et al., 2022; Kruse, Wedemeier, 2023). The differences in defining CE between the CE Roadmap and regional strategies in Poland point to potential challenges in transferring central assumptions to lower levels of administration. As previous studies have indicated (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016), the lack of consistency in defining key concepts such as CE can pose a significant barrier to their institutionalisation, which is also evident in the analysis of Polish regions. The differences between regional and national definitions stem from attempts to adapt CE to regional specificities, which is crucial for implementing this concept (Avdiushchenko, 2018) and therefore understandable. However, the specificities of regions are not reflected in the analysed definitions.

The dual meaning of CE (Ghisellini, Cialani, Ulgiati, 2016) is visible in the strategies of Polish regions. For some, CE is equivalent to an economic model, while for others, it is an element of an existing model. The national definition, which describes CE as a model, aligns with more recent scientific publications that assign systemic significance to the concept (Alizadeh et al., 2023). Descriptors, the category with the highest degree of alignment with the national definition, are focused on the idea of material circularity within the economy. The emphasis on waste management, visible in most regions, reflects their practical approach to CE. The importance of waste management infrastructure, as highlighted by Niang et al. (2023) and Mattiussi et al. (2014) confirms its role as a key success factor for this model.

The lack of overlap in the association category between the compared definitions does not imply that regions fail to recognise elements identified in the national definition as linked to CE. As Geeraerts observes, semantic fields do not have strictly defined boundaries; their scope and interpretation can be subject to debate, meaning that the connections between associations and

descriptors may be fluid. The non-restrictive nature of the semantic method represents a research limitation noted by the author. To verify the semantic fields of the definitions, conducting a context analysis is a potential future research direction.

The alignment of definitions in regions with strong academic and business potential, such as R6 and R7, can be interpreted as an effect of advanced implementation in these areas (Ćwiklicki et al., 2024). Research confirms that CE develops better in cities and regions with a high concentration of knowledge (Smol et al., 2018; Niang, Bourdin,Torre, 2023). In these two regions, the cities of Warsaw and Kraków, Poland's two largest urban centres, exert significant influence on their surroundings. This suggests the possibility of a reverse effect—regional approaches may influence the national definition of CE, warranting further study.

The national definition does not include all the components distinguished by semantic field theory. In regional definitions, these components were often described as actions of the subject or occasionally as oppositions or actions towards the subject. Regions' independent inclusion of semantic categories absent in the national definition allows for a broader contextualisation of the CE concept. At the same time, as noted in studies on the importance of conceptual coherence in policy implementation (Eberl, Gordeeva, Weber, 2021; Shawoo et al., 2023), such inconsistency may become a barrier to the institutionalisation of CE in Poland.

In the past, proposed ideas emphasising the economic sector's focus on environmental issues have experienced conceptual dilution, which has hindered their successful implementation (Engelman, 2013; Loiseau et al., 2016; Janoušková et al., 2019) To obtain a comprehensive understanding of the semantic fields of the concept, it is necessary to analyse entire documents, comparing fragments with one another. Selecting only the parts designated as CE definitions for analysis constitutes another research limitation. Future research directions include analysing the coherence of CE-related provisions in regional strategies and the CE Roadmap.

The expansion of CE definitions by regions focused primarily on economic opportunities, followed by environmental benefits. CE is primarily understood as an economic concept and, secondarily, as an environmental or social one. Actions of the subject identified in the definetions were consistent within the regional definitions' associations. Regions described problems associated with CE in the association category, while in the action category, they indicated CE's impact on these problems.

The broad connections between CE and economic, social, and even geopolitical issues align with observations on the development of CE as a comprehensive and universal concept (Ghisellini, Cialani, Ulgiati, 2016; Blomsma, Brennan, 2017). The most frequently mentioned actions included in regional definitions focused on supporting entrepreneurship and production, fostering innovation, and increasing market competitiveness. Kirchherr (2023) and Reike (Reike, Vermeulen, Witjes, 2018) highlight the growing role of business models in implementing CE, and this observation is confirmed in the analysis.

Regions often expanded definitions to include operational actions such as implementing innovative technologies, extending product lifecycles, or developing green entrepreneurship.

This approach, consistent with Bressanelli (2022) strengthens the practical aspects of CE but may be challenging to harmonise with broader national frameworks.

These findings indicate the need for further integration of regional and national approaches, which would enable more coherent implementation of CE goals in Poland. Hatti-Kaul et al (2020) emphasise that such integrated approaches require both ex-ante policy evaluation and an analysis of potential trade-offs between different policy goals. This context is missing from the presented studies. An analysis of the alignment between regional and national strategic goals is therefore proposed as a future research direction, especially since no clearly defined goal was found in the analysed definitions. This direction is particularly important because, as noted by Smol et al. (2018) and Winans et al. (2017), the lack of a transparent and stakeholder-understandable goal for translating the concept into economic practice hinders its implementtation.

The analysed definitions also lack emphasis on the EU's role in driving CE implementation, despite research indicating that this pressure significantly influences the institutionalisation of the model (Kovacic, Strand and Völker, 2019; Ćwiklicki, Mirzyńska, Żabiński, 2024). The limited use of the term "sustainable development" in associations with CE, as well as in the definitions themselves, is also surprising given research by Ghosh (2022), del Rio (2021), and Schöggl (2020)

6. Conclusion

The aim of this study was to determine the meanings that Polish regions attribute to the circular economy (CE). To achieve this objective, three research questions were posed:

1. How is CE characterised in the strategies of Polish regions up to 2030?
2. With what associations and actions is CE linked?
3. What differences and similarities exist between the way CE is defined in regional strategies and the Polish CE Roadmap?

The study analysed 12 regions that defined CE in their strategies up to 2030. Three regions did not provide a definition of CE despite using the term in their strategies, while one region did not include the term CE at all.

The results of the analysis showed that the meaning of CE in Polish regions varies and depends on the region. Some regions treat CE as an economic model, while others see it as an element of such a model. CE is characterised by the extension of the time materials and resources remain in the economy and the minimisation of waste generation. Some regions also linked CE with the concept of extending the lifecycle of waste/products in the economy.

In most regions, CE is associated with the economic sphere—issues of natural resources—and the environment, particularly its degradation. Regions highlighted CE's influence on production and enterprises. Frequently mentioned actions of CE included its impact on the innovation and competitiveness of entities. Only a few regional definitions included oppositional terms or actions towards CE. CE was positioned in opposition to the "current," "traditional," or "linear" model. Actions towards CE included technological modernisation and activities related to the product lifecycle. One region characterised action towards CE in a social context, mentioning education and upbringing.

The definitions of individual regions in Poland are not consistent with the definition included in the Polish CE Roadmap. Exceptions are the strategies of Małopolskie and Mazowieckie regions. The national definition consists of equivalents and descriptors, with minor inclusion of associations, while regional definitions have varying structures, either supplementing or narrowing the CE definition.

Evaluating the coherence of concepts at different levels of EU policy implementation is a crucial element in analysing potential barriers to the institutionalisation of such concepts. As people represent reality through language, they become co-creators of its shaping (Jørgensen and Phillips, 2002, 9) Therefore, the way CE is defined will not only affect executive documents at the regional level but also influence public awareness and perception of the concept among residents.

This study addresses the gap in semantic analyses of the CE concept and its implementation at various state levels, partially contributing to knowledge about circularity in Poland. The findings provide practical recommendations for public sector managers and those responsible for implementing CE in practice. Above all, it is essential to create a shared definitional framework that will enable the harmonisation of policies at the national and regional levels.

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THE EDUCATION OF ENGINEERS, ENTREPRENEURS, CONSTRUCTION MANAGERS AND ENVIRONMENTAL ENGINEERS AT THE UNIVERSITY OF BIELSKO-BIALA – SURVEY RESEARCH

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Purpose: The paper aims to outline the findings from a questionnaire survey conducted among students of Construction and Environmental Engineering programmes at the University of Bielsko-Biała. In particular, the paper discusses the application of teaching methods in the education of engineers, entrepreneurs, construction managers and environmental engineers. Its purpose is also to highlight the advantages and the drawbacks of the selected teaching methods; its aim is to present the selected methodical aspects of the discussed issues.
Design/methodology/approach: Due to the nature of the publication, it mainly focuses on the results of the survey carried out among students of Construction and Environmental Engineering programmes at the University of Bielsko-Biała, i.e. engineers, entrepreneurs, construction managers and environmental engineers. The research covered students of undergraduate and graduate programmes who, in most cases, had already been in employment and acquired hands-on experience in their fields. The survey used questionnaires as the basic research technique. The questionnaires followed up a review of scholarly literature. The paper uses the fundamentals of deduction and synthesis. At the same time, in the publication the authors drew on their own knowledge and experience gained when educating attendees of technical and business programmes.
Findings: The paper constitutes an empirical verification of the knowledge presented in the scholarly literature. It addresses the selected methodical aspects of the discussed issues.
Research limitations/implications: The presented research concerned the selected teaching methods. It covered a relatively small group of students. The vast majority of the respondents had already been working in organisations, i.e. these were mostly students attending extramural programmes.
Practical implications: The findings of the empirical research, referred to in the publication, may serve as a starting point for any efforts aiming to improve the range of methods used when educating students attending technical programmes but also managerial and business ones. Arguably, the knowledge conveyed to engineers and engineer-entrepreneurs i.e. individuals who are often at the helm of organisations, must be based on practical aspects.
Originality/value: The paper is an attempt to cast light onto the process of educating future engineers as well as managers in charge of organisations (construction, environmental engineering) by a technical university. The research findings should help us to improve the teaching methods used in these areas. This is particularly important as the main issues discussed

in the paper are presented predominantly from students' perspectives. The paper also addresses the advantages and the drawbacks of the teaching methods used at the time when e-learning was the main formula i.e. during the Covid-19 pandemic and the post-pandemic period.
Keywords: construction, environmental engineering, teaching methods, technical university, management
Category of the paper: research paper.

1. Introduction

Undoubtedly, the education of engineers, as well as future managers of organisations, poses a big challenge. This applies to basically all universities with a variety of educational profiles. In technical universities, in particular, the utilitarian aspect of knowledge is gaining importance. By definition, technical programmes are highly practical fields of study. Therefore, academic teachers face many challenges which, on the one hand, stem from the continuous development of knowledge in the field of education and, on the other hand, result from the emergence of new situations in the organisation's environment (technical universities); an example of such a situation is the Covid-19 pandemic (Tworek, 2023). The Covid-19 pandemic has affected the traditional methodology previously applied by academic teachers not only in Poland, but all around the world (Tworek, 2023). Classes conducted remotely (Garrison, and Vaughan, 2008; Mokwa-Tarnowska, 2015; Picciano, 2017; Pokrzycka, 2019) are a common practice now, and this derives directly from the times of the Covid-19 pandemic (Szczygieł, 2021; Jarosz, et. al., 2021; Garwol, 2022; Wiatr, 2022; Czajka, 2023; Tworek, 2023). It is worth noting here that phenomena such as the Covid-19 pandemic are referred to in the scientific literature as black swans (Kotnis, 2014; Taleb, 2021; Kisielnicki, 2021; Myrczek, et. al., 2021; Myrczek, and Tworek, 2022).

The aim of the publication is to present the issues related to the education of engineers, entrepreneurs, managers of the construction industry and environmental engineers, based on the example of the University of Bielsko-Biała. In particular, the publication draws on the results of the surveys conducted among the students of two fields of study, i.e. construction and environmental engineering. The paper focuses on the case study as a method used when implementing teaching processes. It is one of the methods included in the methodology exploited not only in teaching, but also in the field of scientific research.

The survey was conducted in May 2022, i.e. at the time when not only Polish but also foreign universities adopted a hybrid formula for the delivery of classes. The research was carried out among full-time and part-time (extramural) students attending undergraduate and graduate programmes in Civil and Environmental Engineering at the Faculty of Materials, Civil and Environmental Engineering of the University of Bielsko-Biała. These are technical fields

of study. The research covered mainly part-time students, and the proportion of full-time students was negligible. The respondents in the survey were mainly people who had obtained their university degrees before and who, in the vast majority, had already been employed. The research was carried out in a direct way. The research tool was a survey questionnaire. The survey involved 54 respondents who answered 11 questions, supplemented by open-ended answers. Therefore, the research maybe seen as a pilot study.

In the paper, the authors drew on their own knowledge and experience gained during many years of work with students both at the University of Bielsko-Biała and the University of Economics in Katowice. This applies, in particular, to studies with a practical profile. The paper is mainly empirical in its nature, but it should be emphasized here that it is based on a review of scholarly literature. In general, the literature does not contain any studiessimilar to the research outlined in the paper. In particular, this applies to the research conducted among students of technical universities. This, in a way, may be seen as implying that the paper is original in its content.

2. Methods

The Covid-19 pandemic has contributed not only to some revolutionary organisational changes embraced by universities, but it has also affected the way of thinking about work in general (Tworek, 2023). These issues are related, inparticular, to the performance of remote work in management in general (Wolniak, 2022). As stated in the introduction, management can be viewed here more broadly i.e. in the context of educating engineer-entrepreneurs and managers in charge of organisations (in the area of both civil and environmental engineering). With this in mind, it is important to emphasize the role that teaching plays in the life of every student. Regardless of this, however, it should be remembered that the basis for successful and effective education of students is the ability to apply appropriate teaching methods (Kember, 2009). Such a conclusion results from the review of scientific literature, in which, from a theoretical point of view, teaching methods can be broadly divided into expository methods, problem-based methods and practical methods (Turos, 1999; Nalaskowski, 2000; Kawecki, 2000; Kupisiewicz, 2000; Bereźnicki, 2001; Półturzycki, 2002; Pilch, 2003; Perch, 2003; Zawadowska, 2004; Richardson, 2005; Okoń, 2007; Ziółkowski, 2015; Bereźnicki, 2015). As regards the specific implementation of teaching processes at technical universities, a set of practical methods is of particular importance, due to the very nature of suchprogrammes of study. It should be noted that these methods indicate the education of students through practical activities (Nalaskowski, 2000; Michalski, 2001; Bereźnicki, 2001; Półturzycki, 2002; Pilch, 2003; Zawadowska, 2004; Richardson, 2005; Okoń, 2007; Bereźnicki, 2015; Ziółkowski, 2015). The best example here are student internships.

From a theoretical point of view, „(...) the teaching method involves the need to meet at least three conditions, i.e. firstly, precisely define and name the activities that [a student] will have to perform in order to ensure that the objective of the classis achieved; secondly, to create conditions in which the teaching process will be carried out; thirdly, to determine the skill that [the student] should acquire as a result of the specific method" (Traszka, 2005). In general, „(...) in order to choose the appropriate teaching method, [the academic teacher] should determine: firstly, how many [students] will participate in the class; secondly; how well they have acquired the material from previous classes; thirdly, what the potential interest [of students] in the topic is; fourthly, what technical teaching aids are available for use during the class; fifthly, which activating methods to choose – in accordance with the principle ofone method per class; sixthly, how [students] canpossibly prepare to the class at home; seventhly, whether it is possible to use any correlation between subjects; eighthly, whether the chosen teaching method is implementable from the organisational point of view; ninthly, whether the chosen teaching method can be applied to the topic in question; tenthly, whether any outsiders [e.g. people from construction companies and environmental engineering organisations] may participate in the class; eleventhly, how to motivate [students] to actively participate in the class; twelfthly, how to builda tool for measuring [a student's] activity during teamwork; thirteenthly, how to create a self-assessment test for [students]; fourteenthly, how to evaluate [students'] work in order to motivate them and to avoid putting them under stress" (Trzaska, 2005).

In the teaching processes carried out, for example, at business universities, the importance of the case-study method can be emphasized (Pizło, 2009; Matejun, 2011; Kożuch, March, 2014; Gaweł, Pietrzykowski, 2014; Mielcarek, 2014; Czakon, 2015). What should be clearly noted here is the fact that its importance is equally valid in technical universities. What is more, in the area of scientific research the case-study method is classified as a qualitative method (Konecki, 2000; Pizło, 2009; Creswell, 2009; Matejun, 2011; Gaweł, Pietrzykowski, 2014; Mielcarek, 2014; Kożuch, March, 2014; Czakon, 2015). Another group of methods are quantitative methods. When looking atthe case-study method through the lens of teaching, however, it is classified as a problem-based method (Trzaska, 2005; Jaques, 2008; Zelek, 2021). It is widely applicable or even versatile, i.e. it may be used in lectures, classes, laboratories, as well as for writing diploma theses and implementing projects. Its main advantages and drawbacks are presented in Table 1.

The benefit that Table 1 offers is the fact that it presents the content (case studies) considered in terms of both advantages and disadvantages, and from the perspectives of academic teachers, on the one hand, and of students, on the other hand. When looking at the features of the case-study analysis, we can see that academic teachers must have adequate knowledge of the strengths and weaknesses of this method in order to be able to use it in a skilful way in the process of educating engineers, entrepreneurs, construction managers and environmental engineers. This remark applies, in principle, to all other methods used in teaching processes at universities, with a particular focus on technical universities.

Table 1.
Advantages and drawbacks of the case-study analysis as a method used for the teaching of students

Item	Teacher	Students
Strengths	Gets to know students and their possibilities It is easy to motivate learners Evaluates solutions given by a group Evaluates involvement It does not physically burden and does not stress Work can be directly monitored It is easy to correct errors Improves methods and tools	Highly motivated to work Actively involved It enhances their creativity It improves their time management skills It allows them to get familiar with business practice It helps them to acquire practical skills It helps the group to integrate It is not stressful
Weaknesses	It is difficult to keep discipline It is time consuming to prepare It requires an updated knowledge from a number of areas	Groups and individuals work at a different pace Some individuals are not active Other groups' solutions can be copied No critical feedback Lack of discipline Noise

Source: Trzaska, 2005.

3. Results

As stated above, the case-study analysis belongs to the most commonly used methods for teaching students. In the empirical research, the respondents – when asked whether they think that academic teachers should support their lectures with numerous examples from business practice (and use the case-study analysis), as many as 94.4% of them answered yes. In addition, almost 100% of the surveyed students answered yes, when asked whether they personally find the case-study method useful (i.e. because it makes it easier for them to gain an understanding of business practice), with only 1 respondent having given a no answer. This proves that engineers, entrepreneurs, construction managers and environmental engineers appreciate the advantages of this method, some of which are listed in Table 1.

What, then, are the benefits of solving specific cases from the point of view of the respondents and what makes the case-study method most interesting? The research posed such aquestion to the respondents, who replied that – as quoted in the same order– the method helps them toconsolidate and acquire the knowledge more easily; the analysis of specific cases allows them to memorize important things faster and more effectively; it helps them to gain a better understanding of issues and to find quicker solutions; it offers them an opportunity to solve problems as a team and exchange views; it teaches them how to solve problems in a team and integrates the group; it provides them with an opportunity to share their views; it is more interesting for participants; solving specific cases allows them to draw conclusions that may be useful in the future; it may help them to avoid mistakes; it provides an opportunity to learn by example; it develops creativity and gives them 'a chance to shine'. The answers given to

the following question are also worth considering: What percentage do you think case studies should represent in relation to the strictly theoretical knowledge provided at the university? The results of the research in this area are shown in Figure 1.

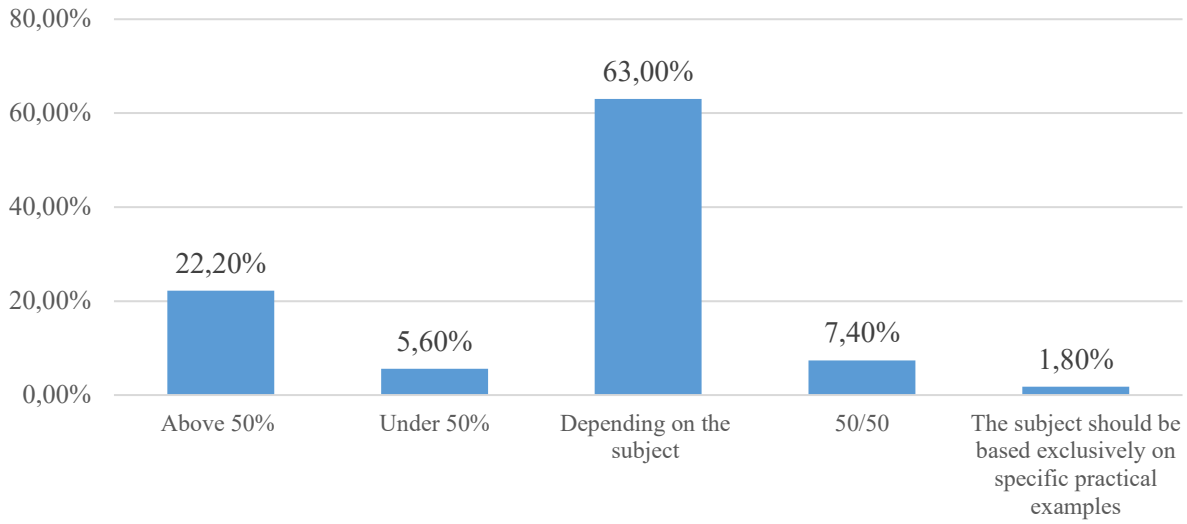

Figure 1. Percentage participation of case studies in relation to the general theoretical knowledge provided to students at a university.

Source: authors' own research.

As can be seen in Figure 1, the vast majority of respondents (63% of the surveyed students) stated that the participation of case studies in relation to theoretical knowledge should depend on the type of subject being taught. There are subjects where it is not possible to use this method or there are significant limitations in its use. In the survey, 22.2% of the respondents indicated the option that this participation should exceed 50%. On the other hand, the other results obtained were: below 50% (5.6% of the respondents); it should be 50/50 (7.4% of the respondents); the subject should be based exclusively on specific practical cases (only 1.8% of the respondents). Therefore, a fundamental conclusion can be drawn here that in general, the knowledge provided to engineers, entrepreneurs, managers of the construction industry and environmental engineers should be largely based on business practice. The empirical research findings may serve as clear evidence for this.

Other interesting research results concerned e-learning, i.e. the form of course delivery which was so widespread during the Covid-19 pandemic and the post-pandemic period. In particular, when asked whether they think that some lectures can be held online only, almost 93% of the respondents answered yes; with the remaining 7% giving a negative answer and no one choosing the 'I don't know' answer. When explaining why they gave negative replies, the respondents indicated the following reasons: students not showing interest in the topics taught; the fact that it often has an adverse impact on student involvement and the fact that online knowledge is easily accessible.

On the other hand, when considering the presented issues through the lens of the theoretical aspects, one can refer here to the previously mentioned division of methods, offered in the literature, into expository methods (a lecture, a discussion, working with a textbook), problem-based methods (a case study, brainstorming, etc.), as well as practical ones (internships, student workshops) (Turos, 1999; Nalaskowski, 2000; Kawecki, 2000; Kupisiewicz, 2000; Bereźnicki, 2001; Półturzycki, 2002; Pilch, 2003; Perch, 2003; Zawadowska, 2004; Richardson, 2005; Okoń 2007; Ziółkowski, 2015; Bereźnicki, 2015). The results of the surveys in this area are presented in Figure 2.

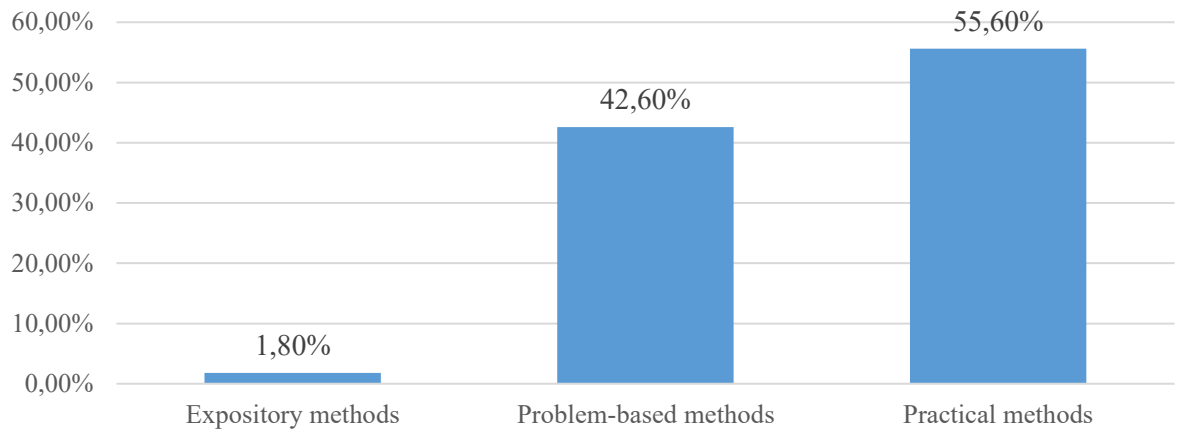

Figure 2. Usefulness of expository methods, problem-based methods and practical methods in the light of the empirical research findings.

Source: authors' own research.

The research findings (Figure 2) clearly indicate that practical methods are the preferred group of teaching methods (55.6% of the respondents). When justifying their choice, the following arguments were given by the respondents, namely: practice often differs from theory; they clarify theoretical issues; practice makes perfect; smoother acquisition of knowledge; the possibility of combining theory with practice; easier to gain an understanding of one's future profession. It is also worth looking at the lowest figure, i.e. only 1.80% of the respondents chose methods in which knowledge is conveyed (expository methods). As you can see, attending lectures or working with a textbook, for example, are not perceived by engineers, entrepreneurs, construction managers and environmental engineers as interesting forms of acquiring knowledge.

As for how classes should be organised and conducted in the ways perceived by the respondents as the most valuable ones, i.e. in response to the question of how classes should be conducted by lecturers in order to ensure that students are provided with knowledge, skills and competences in a comprehensive and effective manner, the following answers were obtained: in a demanding way but without stifling a student's ambition; (a lecturer should) talk more with students and ignite their ambitions; encourage students to participate (actively) in classes; conduct classes with students, not for students; satisfy the curiosity of students; allow students to speak; avoid being boring; provide examples; encourage discussions; conduct classes in an

easy-to-understand manner; avoid using slides only, as this is tedious; many examples from construction sites should be given; the changing tone of voice attracts listeners' attention. What is more, lectures, in addition to classes, are the basic form of tuition at universities in general.

Equally interesting results were obtained concerning obligatory student internships, with 72.2% of the respondents claiming that student internships should continue to be an obligatory requirement and 16.6% of the students surveyed holding the opposite view. The remaining respondents said that they did not know. This means that the vast majority of the respondents have a positive attitude towards student internships. These results, to some extent, correspond to the subsequent research findings. In particular, almost 91% of the students, when asked if classes organised by lecturers outside classrooms (e.g. showing a construction site to students) are a good way of supporting the teaching process, gave a yes answer. Only 9% of the surveyed ones expressed a different opinion. In the light of the results obtained, the reasons provided are also important, i.e. the answers stated that: it was possible to get acquainted with one's future job; it is worth seeing how specific work is performed and compare it with the theory; even one visit illustrates the reality of work; some students have never been to a workplace (a construction site), which would allow them to verify their interests; it shows the actual reality of the construction site; it enables the comparison between theory and practice; it will provide an opportunity for some students to see the construction site for the first time. The answers obtained are, therefore, the best evidence for the practical value of the knowledge provided to students in the surveyed faculties.

The other research findings should be viewed in a similar way. In the survey, when asked whether academic teachers should invite business practitioners to their classes or lectures more often, 87% of the respondents answered yes and only 5.5% of the respondents gave a negative answer. The remaining part of the respondents (7.5%) simply did not express any views, i.e. they did not have any opinion on the topic. The reasons provided by engineers, entrepreneurs, managers of the construction industry and environmental engineers included the following ones: it is the best system of education; it increases the attractiveness of classes; it gives the opportunity for personal analysis of the issue; it helps (students) to easier absorb knowledge; it makes the group more interested. On the other hand, when asked whether classes conducted by academic teachers possessing hands-on experience in the fields of construction and business have a positive impact on the education process, as many as 98% of them answered yes, only 2% said no (none of the respondents stated that they had no opinion on this topic). The obtained results reconfirm the applicability of the knowledge taught in an organisation such as a technical university.

4. Conclusion

The discussions contained in this publication can be summarized by stating that the utilitarian aspects of knowledge provided to students of technical universities, which – by definition – offer practical programmes, are an inseparable element of the general knowledge conveyed in course of the teaching process. This is evidenced by the results of the empirical research conducted among the students of Civil and Environmental Engineering at the Faculty of Materials, Civil and Environmental Engineering of the University of Bielsko-Biała.

What is worth emphasizing in the conclusion is that: firstly, academic teachers should support their lectures with examples from business practice (as many as 94.4% of the respondents); secondly, due to the advantages the method demonstrates (Table 1), they should use the method of case-study analysis (based on the case studies surveyed, it facilitates the understanding of practical issues); thirdly, they should prefer practical methods (55.6% of the respondents), i.e. also due to the advantages indicated by the respondents; fourthly, student internships should be obligatory (72.2% of the respondents) and should provide an excellent opportunity for students to acquire practical knowledge in a direct way, for example, on construction sites; fifthly, they should invite business practitioners more often to their classes and lectures (87% of the respondents); sixthly, they should have practical experience (as many as 98% of the respondents stated that it generally adds value to the teaching processes) – engineers, entrepreneurs, construction managers and environmental engineers stated that: experience translates into the knowledge to be conveyed; it helps in gaining experience; lecturers may expand students' knowledge by giving them some non-typical examples; they have work experience and present things in a better way; practitioners are better at conveying professional knowledge; (lecturers may use it) to support theory with practice; practitioners present a true picture of work on a construction site; seventhly; the e-learning formula should be used (almost 93% of the respondents had a positive attitude towards classes conducted remotely). In the context of theoretical knowledge in the field of teaching methodology, however, this result should be considered as a support for the teaching process carried out in a traditional way, i.e. due to the specific character of technical studies. It should be added that not only the points made in this paragraph, but also the general considerations presented in the paper, should be analysed in terms of learning outcomes, divided into the ones related to the acquisition of knowledge, skills and competences.

To sum up, it should be stated that the applicability and the utilitarian dimension of knowledge provided to engineers, entrepreneurs, managers of the construction industry and environmental engineers, slightly prevails over the theory itself, considered, for example, in the context of academic knowledge resulting from scientific research conducted by academic teachers. It is important that the respondents in the research were not only seen as typical engineers, but

also as people managing organisations in the areas of civil and environmental engineering. Many of them perform or will perform managerial functions, entering management and supervisory bodies in such organisations – hence the managerial context of the discussions outlined in the paper.

The research presented in the paper addresses the selected methods and ways of teaching and, in addition, it has covered a relatively small group of students. These may be seen as limitations of the conducted study. Undoubtedly, any future research needs to be carried out on a much wider population. The results of the research will shed more light on the knowledge provided to engineers and engineers-entrepreneurs, i.e. the people who tend to manage organisations, as such knowledge must be based on practical aspects. Nevertheless, the results contained in the paper make an interesting input for the improvement of the methodology by academic teachers lecturing at technical universities.

In its theoretical part, based on a review of the literature on the subject, the paper points to the advantages and disadvantages, mainly of the case-study method, which should be treated as adding a cognitive value. The survey material shows that it is particularly valuable for respondents. This is primarily due to the nature of the studies and their technical profile.

The authors of this publication hope that its content will inspire potential readers to conduct more extensive empirical research in this area. Future research may focus slightly more on the managerial aspect of knowledge provided to would-be engineers attending engineering programmes offered by technical universities.

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PROACTIVE PERSONALITY AND ENTREPRENEURIAL INTENTIONS OF GEN Z INDIVIDUALS

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Purpose: Generation Z is specific in many areas of life, including entrepreneurship. Since entrepreneurial intentions are indicated as an antecedent of actual entrepreneurship and since it is indicated that Gen Z individuals are characterized by greater entrepreneurial intentions (EI) compared to other generations, it is worth examining the traits that may additionally strengthen the entrepreneurial intentions of young people. One such personality trait is proactivity. Hence, the main goal of the study is to determine how proactive personality (PP) affects the entrepreneurial intentions of Gen Z individuals in Poland.
Design/methodology/approach: To address the research goal, a survey using the CAWI method was conducted in 2024 among 370 Gen Z individuals in Poland. The respondents expressed their opinions on a 5-point Likert scale. The participants in the study were selected through purposeful random selection. Following acceptance of the reliability indicator values, a statistical analysis was conducted using a multiple regression model, descriptive statistics, and correlation indicators.
Findings: The research confirmed the relatively high level of EI of Gen Z individuals. Regression analysis confirmed the strong dependency between PP, as an independent variable, and EI, as a dependent variable, in the study group. A 76.4% increase in the EI variable level in the Gen Z group follows a 100% increase in the PP predictor.
Research limitations: The main limitation of the study was that the research group was not entirely representative, which made it impossible to extrapolate the findings and make specific predictions about the likely use of PP in the workplace.
Practical implications: For management practitioners, the development or adjustment of HR management tools is recommended to select candidates for job positions requiring an entrepreneurial orientation who are characterized by proactivity.
Originality/value: The paper's contribution is visible by highlighting the significance of enhancing the proactivity of individuals to create entrepreneurial intentions as an antecedent of entrepreneurial actions.
Keywords: entrepreneurship, entrepreneurial intentions, Generation Z, proactive personality, proactivity
Category of the paper: research paper.

1. Introduction

Young individuals born between 1997 and 2012, known as Generation Z, hereinafter "Gen Z", are beginning a new phase in the corporate world with distinctive traits, fresh perspectives, and digital abilities. More than 25% of the world's population is already members of Generation Z as of 2023, and it is predicted that they will account for 27% of the workforce by 2025. Previous research in this area is limited, in part due to a lack of data availability, as Gen Z members are still very young and have been in the workplace for a relatively short time, whereas older generations are well-studied (Lopes, Gomes, Trancoso, 2024).

Entrepreneurship is a means of job creation, economic development, and lifestyle improvement, and it is also a way to generate income, independence, livelihood, and self-confidence. However, it takes time for entrepreneurial activity to emerge. It concerns how people's behavioral attitudes and cognitive processes interact with social, economic, and cultural issues (Hossain et al., 2023). Previous studies confirm that strong entrepreneurial intention (EI) is associated with a high potential for entrepreneurship (Amofah, Saladrigues, 2022). Moreover, in recent years, some studies have been conducted to examine the entrepreneurship of Gen Z, which have shown greater entrepreneurial intentions compared to other generations such as Generation Y (Dreyer, Stojanová, 2023).

The proactivity of an individual in the context of Generation Z may prove to be a factor that stimulates their entrepreneurial intentions. Thanks to this feature, the younger generation has a greater chance of using available tools, developing skills, creating valuable networks of contacts, responding to changing market conditions, and, finally, taking business initiatives, which are key to fulfilling dreams of having their own business. Proactivity not only promotes the development of entrepreneurship but also allows for better coping with challenges and quick response to changes in the dynamic world of business. Thus, the main goal of the study is to determine how proactive personality (PP) affects the entrepreneurial intentions of Gen Z individuals in Poland.

This article makes multiple contributions to the body of knowledge regarding Gen Z's business aspirations. First, it adds to the body of research by addressing the topic of how personality factors, such as proactivity, affect the creation of entrepreneurial activities. This topic hasn't been examined much in the past. Second, by taking a theoretical approach, this study can contribute to the development and expansion of ideas on young people's proactivity, particularly that of Gen Z. Third, the study can offer insightful information to enhance entrepreneurial education programs, such as those that enhance and expand Gen Z members' proactive competencies, making them more competitive in the dynamic business world. For management practitioners, the development or adjustment of HR management tools is recommended to select candidates for job positions requiring an entrepreneurial orientation who are characterized by proactivity.

2. Literature review

2.1. Entrepreneurial intentions

Among various stages of entrepreneurship, the most crucial stage is the formation of EI (Selvan et al., 2024). Intentions are mental states that direct individuals toward behavior and describe a person's readiness to conduct this behavior in the future (Ajzen, 2011). Thus, the literature identified EI as an effective means for subsequent entrepreneurial action (Kautonen, Van Gelderen, Fink, 2015).

EI is considered a conscious awareness or process that results in the decision to establish and manage a business in the future (Otache, Edopkolor, Kadiri, 2022). It is identified with the goal of establishing a new business or exploring new opportunities within an existing business (Silesky-Gonzalez, Lezcano-Calderon, Mora-Cruz, 2025). Vamvaka et al. (2020) defined EI as a planned, controlled, voluntary, and innate behavior where people continuously think about entrepreneurial ideas and tasks before establishing new ventures. Bae et al. (2014) defined EI as the antecedent of entrepreneurial action or behavior that demonstrates an individual's willingness to own and run new ventures. Individuals can start their own business ventures only when they have sufficient EI toward an entrepreneurial career (Wu, 2010).

Entrepreneurial intentions are the foundation for subsequent entrepreneurial ventures, emphasizing the important role of shaping a solid educational framework that activates individuals' intentions. However, the stimulation of entrepreneurial intentions is not solely dependent on participation in entrepreneurship programs, and as Kariv, Giglio and Corvello (2025) point out, it also depends on endogenous factors, such as individual characteristics of a person.

Thompson (2009) stated that EI is not a binary "yes or no" decision; rather, it extends along a nomological continuum, ranging from mere preference for self-employment over paid employment to commitment to an entrepreneurial career and finally to nascent entrepreneurship.

EI can be characterized as a stage when an individual develops an initial idea or concept to create a new business, product, or service, or implement a specific initiative (Liñán, Chen, 2009). In other words, EI is part of the phase of reflection, concept development, and planning, involving market research, the business plan, the search for initial financing, and the validation of the idea (Ruiz-Alba et al., 2021). The EI role is decisive in the early stages of conception and planning, even before the company or project is officially launched or incorporated into a legal structure (Grande, Camprubi, Séraphin, 2025).

In the entrepreneurial context, a general definition is that EI is the state of mind that directs and guides a person's attention, experience, actions, goal setting, communications, commitment, organization, and other kinds of work toward the enactment of entrepreneurial behavior (Vamvaka et al., 2020).

Thompson (2009) defined entrepreneurial intention as a self-acknowledged conviction of the individual's mind regarding the possibility of starting a new business with a sincere and

committed plan to do so at a specific moment. As such, the intention may result from necessity or opportunity-based entrepreneurial activity (Szabó, Aranyossy, 2024). However, usually, EI comes from the internal desires of the individuals rather than compulsion (Pribadi et al., 2023).

The wide variety of EI terms may be related to the view that entrepreneurial activity is perceived and studied as a process (Held et al. 2018). At the same time, it is indicated that the process is developed over time, and the entrepreneurial mental activity of individuals can be developed, especially in the early stages of life (Bergmann, Stephan 2013).

2.2. Proactivity as a dimension of entrepreneurial orientation

Entrepreneurial orientation (EO) refers to top-level managerial propensities or beliefs about dimensions of risk-taking, innovativeness, and proactivity that can influence firms' strategic decisions at the individual, group, or organization level (Lumpkin, Dess, 1996). EO has gained considerable attention as a key concept in the strategy process and as an antecedent of outcomes such as firm performance, innovativeness, and relationships with other firms and the changing environment (Choi, Kim, Roh, 2024).

EO is a completely strategic propensity toward entrepreneurship development as a dominant idea, according to Gupta & Gupta (2015). Additionally, EO describes a company's propensity to operate independently, creatively, risk-takingly, and proactively in response to potential market situations. EO is an individual's overall perception of individuals directly involved in venture creation, whether in a new startup or an existing company. The idea of EO is commonly used by academics to analyze or understand an organization's entrepreneurial behavior. Therefore, EO can also be described as the various approaches to strategic initiative development that key decision-makers employ to carry out their company's overarching objective, maintain its viewpoint, and establish a competitive edge (Al-Mamary, Alshallaqi, 2022).

Proactiveness, according to Lumpkin and Dess (1996), is the promptness with which businesses respond to both current market demands and emerging market prospects. A company that keeps a very proactive attitude will be able to predict new markets' needs and combine resources to better satisfy them than rivals. According to Lumpkin and Dess (2001), companies that are highly proactive are able to predict potential changes in the business environment or even influence it to their advantage. Being proactive enables companies to profit from first-mover advantages and advantages that latecomers never acquire, such as expanding their customer base and improving their reputation in the eyes of their clients (Khan et al., 2021). Businesses that have a proactive mindset are able to predict the wants of their clients and the responses of their rivals in the marketplace. Additionally, proactive businesses concentrate on building their capacity to sway legislators and mold markets to their benefit in terms of market share or position. Additionally, proactive initiatives enable companies to stay up to date with technological developments and consistently work to develop and incorporate resources that correspond with them (Loan et al., 2023).

A proactive organization, as opposed to a reactive one, is characterized by an exceptional opportunity mindset. The ability of a business to react to business opportunities by exerting effort in the competitive marketplace is referred to as proactiveness. The ability to anticipate and adjust to new goods and services rather than merely reacting to future events as they happen is known as proactivity. Being proactive keeps businesses ahead of the competition and puts pressure on the market (Al-Mamary, Alshallaqi, 2022).

2.3. Proactive personality

PP can be defined as a relatively stable personality or behavioral tendency of individuals to act in order to actively influence their environment (Chen et al. 2021). Even with excellent workplace management, an individual's personality remains a strong factor in determining motivational attitudes in the workplace, and one of the personality characteristics, especially often considered in terms of work performance, is PP. PP is considered to be an antecedent of proactive behavior in an organization, also supporting organizational creativity and innovation. This is due to the fact that a proactive employee has greater skills in recognizing and solving problems, as well as initiating changes (Suseno et al., 2020). PP translates into active behaviors and efforts of organizational members, which, on the one hand, allow them to influence its external environment and on the other hand, effectively shape the intraorganizational environment, allowing them to perceive opportunities and overcome limitations on the way to set goals (Shi et al., 2023). Comparing people with more and less PP, it can be indicated that those with a strong proactive character are more emotionally stable, which allows them to cope better with stress in a changing and hostile environment and more often seize opportunities to improve performance (Bateman, Crant, 1993). In addition, strong PP allows individuals to strive to carry out tasks in accordance with their interests and makes them more willing to take the initiative and take action to solve problems. Meanwhile, when people who are not very proactive internally accept the external environment in its current state, passively react to changes, and allow this external environment to shape them (Crant, 2000).

Proactive individuals are more likely to adapt to the requirements and specifics of the organization, presenting positive styles of coping with challenges (Wang et al., 2024). In addition, people with PP show an increased willingness to help colleagues and are particularly engaged in effective knowledge acquisition (Chai, Hu, Niu, 2022).

An individual’s PP should be shaped from the earliest years. It has been confirmed that PP significantly affects the career course of students, as they have higher self-efficacy, are more confident in making career decisions and conducting job searches, and are less afraid of changes in the work environment (Park, 2015). Thus, PP is a factor of personal success, as highly proactive individuals have higher levels of affective commitment, intrinsic motivation, pursuit of autonomy, career self-efficacy, and creativity (Shi et al., 2023). Such individuals also show higher levels of job and career satisfaction (Wang, Lei, 2023). Presbitero (2015) also demonstrated the importance of shaping PP already at the stage of education, proving the moderating

role of PP in the relationship between proactive career planning and proactive career implementation.

2.4. Hypothesis development

In the literature to date, there have been studies on both the general impact of proactivity on EI and the specific impact of PP on young people's EI. Among the studies on the relationship between proactivity as an element of entrepreneurial orientation and EI of Generation Z representatives, we can indicate the research on the entrepreneurial behavioral intentions of 341 Saudi Arabian students, which confirmed the actual influence of proactivity on EI among college students who are interested in venturing into new businesses (Al-Mamary, Alshallaqi, 2022). Another cross-sectional survey among 381 students at Indonesian universities revealed that EO, as a three-factor instrument consisting of the three dimensions of risk-taking, innovativeness, and proactiveness is positively correlated with EI (So et al., 2017). Moreover, the research on 300 male and 300 female senior students in Saudi Arabia's eastern province. Confirmed the positive influence of proactiveness, as one of the EO dimensions, on students' entrepreneurial intention. Moreover, there is no difference between male and female groups when examining the proactiveness-EI relationship (Sobaih, Elshaer, 2022).

Among the studies on Gen Z individuals' PP and its impact on EI, one can mention the study of Travis and Freeman (2017), who investigated PP and EI on a group of 471 students of a private college and a public university in the southeastern United States and confirmed the positive correlation between these variables. In turn, Naz et al. (2020), based on research on 700 university students in universities in Pakistan, didn't confirm the direct influence of PP on EI; however, they found the positive serial mediation effect of different self-efficacy dimensions on PP-EI relations. In the study of Hu et al. (2023) on 647 students from 24 universities in China, the structural equation model confirmed the positive effect of PP on their entrepreneurial intention. Moreover, findings indicated that entrepreneurial passion mediates the relationship between PP and EI under controlled entrepreneurial self-efficacy. Similarly, Chen (2024) presented the results of the study on a total of 764 university students from two Chinese universities, which confirmed a positive effect of PP on EI when entrepreneurial attitude exerted a partial mediating effect in this relation.

The above allows for the following hypothesis:

H1: There is a dependency between the proactive personality and entrepreneurial intentions of Gen Z individuals.

3. Methods

To address the research goal, a survey using the CAWI method was conducted in 2024 among 370 Gen Z individuals in Poland. The participants in the study were selected through purposeful random selection. The respondents expressed their opinions on a 5-point Likert scale. The survey questions were prepared based on a literature review. The variable of PP consists of 9 items developed based on Crant and Kraimer (1999):

PP1. I am constantly looking for new ways to improve my life.
PP2. I am usually the one who initiates constructive change.
PP3. I like to watch my ideas turn into reality.
PP4. If I don't like something, I try to fix it.
PP5. I assume that if I believe in something, I will make it happen.
PP6. I like to convince others of my ideas, even if I encounter opposition.
PP7. I excel at identifying opportunities.
PP8. I am always looking for ways to improve.
PP9. I can see a good opportunity long before anyone else.

In turn, the variable of entrepreneurial intentions consists of 5 items developed by Liñán and Chen (2006):

EI1. My career goal is to become an entrepreneur.
EI2. I am willing to do whatever it takes to become an entrepreneur.
EI3. I will do my best to start and run my own business.
EI4. I am determined to start my own business in the future.
EI5. I intend to start my own business one day.

The internal consistency of variables was investigated using Cronbach's alpha coefficient, which level seems to be satisfactory (Table 1).

Table 1.
Cronbach's alpha reliability test

EI	PP
0.921	0.896

Source: own research.

Cronbach's alpha coefficient was used to assess the internal consistency of a set of items. Since a value of 0.7 is generally considered the acceptable threshold, it is worth noting that the Cronbach's alpha levels for all variables are high (above 0.8).

Following acceptance of the reliability indicator values, a statistical analysis was conducted using descriptive statistics, correlations (Kendall Tau correlation coefficient), and multiple regression. The calculations were carried out using the Statistica 13.3 statistical software.

4. Results

The first step of the statistical analysis of the data from the conducted study was the analysis and evaluation of descriptive statistics for the independent variable PP and the dependent variable EI.

It should be noticed that the respondents, who are the Gen Z members, assessed the 9 subvariables of PP relatively high. As a 5-point Likert scale was used for assessment, each variable achieved a mean above 3.00 (Figure 1). The lowest score was given to the element concerning initiating constructive changes (PP2) and being a leader in finding opportunities (PP7). In turn, the highest score (4.10) was given to the factor indicating one's own satisfaction with implementing ideas turn that into reality (PP3).

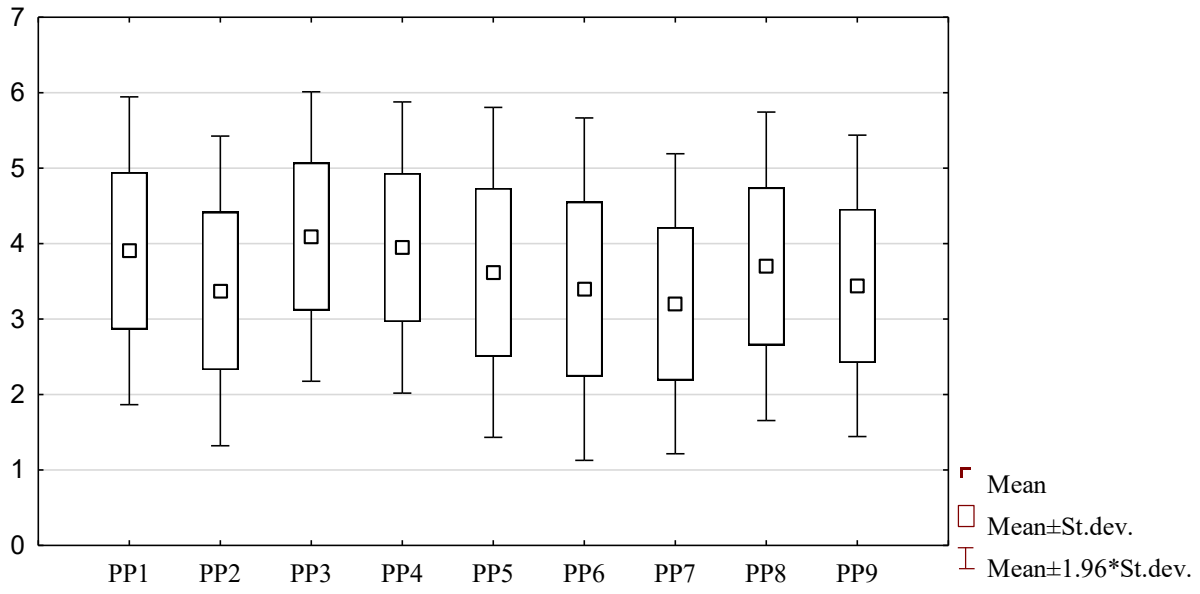

Figure 1. Descriptive statistics for development potential (DP).

Source: own research.

In the area of the EI variable, the study results revealed quite similar opinions of reviewers belonging to Gen Z. The mean responses ranged from 3.22 for EI2 to 3.80 for EI5, using a 5-point Likert scale (Figure 2). Considering that the highest rating directly concerned the respondents' plans to start a business in the future, it can be concluded that young people have a high level of intentions towards entrepreneurship.

The next stage of data analysis was to examine the correlation between the items of both variables (Table 2). The use of the Likert scale to express the respondents' opinions resulted in treating the variables as nonparametric, which prompted the use of the Kendall Tau correlation coefficient to determine the relationship between the predictors. All correlations were statistically significant for $p < 0.05$. The strength of correlation between the variables ranged from weak to moderate, which allows for conducting a multiple regression analysis.

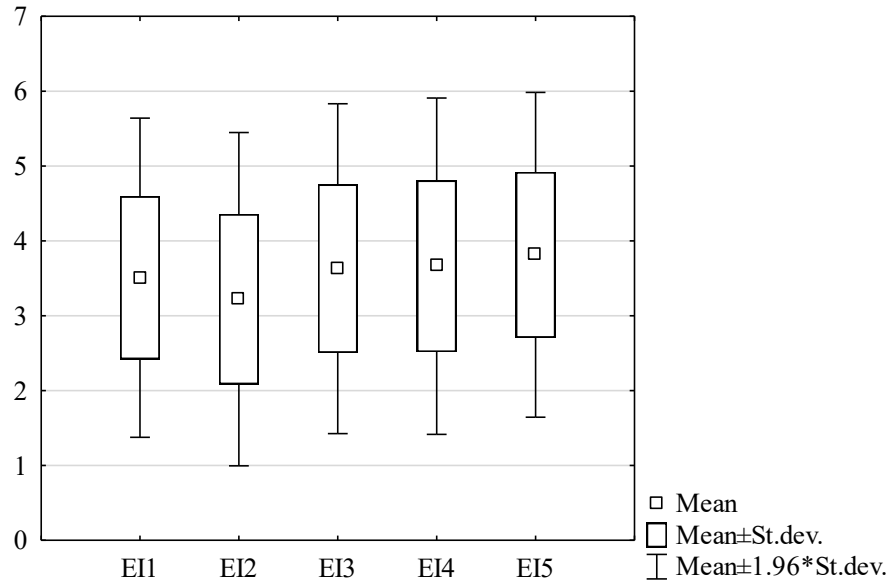

Figure 2. Descriptive statistics for entrepreneurial intentions items.

Source: own research.

Table 2.
Correlation analysis (n=370; p<0.05)

	PP1	**PP2**	**PP3**	**PP4**	**PP5**	**PP6**	**PP7**	**PP8**	**PP9**
EI1	0.286	0.340	0.320	0.279	0.369	0.354	0.411	0.407	0.381
EI2	0.288	0.332	0.307	0.270	0.301	0.319	0.338	0,370	0.458
EI3	0.214	0.300	0.304	0.312	0.341	0.300	0.321	0.327	0.403
EI4	0.219	0.306	0.316	0.311	0.350	0.334	0.367	0.323	0.382
EI5	0.270	0.333	0.348	0.310	0.367	0.257	0.317	0.319	0.353

Source: own research.

Multiple regression analyses were used to evaluate dependency between PP as an independent factor in the group of Gen Z individuals. The EI level was included as dependent variable in the regression model (Table 3).

Table 3.
Multiple regression results

n=370	R=0.605; R2=0.365; Adjusted R2=0.364; F(1,368)=211,88; p<0,000; Standard error of estimate=0.77960					
	b*	**std err***	**b**	**std err**	**t**	**p**
Intercept			0.794	0.195	4.075	0.000
PP	0.604	0.042	0.764	0.052	14.556	0.000

Source: own research.

It was verified by Table 3's summary of the multiple regression model that the entire model was statistically significant ($p < 0.00$). Additionally, the complete model was able to account for 36.4% of the response variability, which is a promising outcome. The PP predictor within the model seems to have a statistically significant and positive impact on EI. A 76.4% increase in the EI variable level in Gen Z group follows a 100% increase in the PP predictor.

Our findings are consistent with many previous researches, as PP has long been recognized as a significant predictor of entrepreneurial outcomes (Luo, Huang, Gao, 2022; He, Lu, Qian, 2019; Claes, Beheydt, Lemmens, 2005). It should be noted that in many studies the PP-EI relationship is mediated or moderated by additional variables, which poses a challenge to the authors' past research. As an example, we can cite the research of Huang and Kee (2024), derived from a sample of 250 final-year students from public universities in China, demonstrating that PP partially influences EI through its effects on attitude towards entrepreneurship and perceived behavioral control. Similarly, Kumar and Shukla (2023), in a survey study of a total of 531 college students of 18–28 years of age in India, confirmed both the direct effect of PP on EI and the indirect effect via entrepreneurial self-efficacy.

5. Conclusion

Entrepreneurial intentions are a key basis for undertaking entrepreneurial activities (Kautonen, Van Gelderen, Fink, 2015), both in the form of establishing one's own company and entrepreneurial activities in existing organizations. Hence, the intensification of EI seems to be an important task not only for the interested parties but also for the state, for which entrepreneurship is a factor of economic development and improving competitiveness.

When considering whether proactivity as a manifestation of entrepreneurial orientation and PP as an individual feature constitute a significant determinant of EI, it should be pointed out that previous studies have confirmed the possibility of such a relationship (Chen, 2024; Hu et al., 2023; Naz et al., 2020; Travis, Freeman, 2017).

The current study focused on the diagnosis and assessment of the impact of PP on EI in a group of Gen Z individuals in particular. The designed and conducted quantitative research allowed us to achieve the main goal of the study, which was to determine how PP affects EI of Gen Z individuals in Poland. Regression analysis confirmed the strong dependency between PP, as an independent variable, and EI, as a dependent variable, in the study group. It was therefore possible to confirm hypothesis H1. The research results suggest the need to build proactivity in young individuals, starting from the early stages of education, which may translate into success in later professional life.

There are several research limitations that can be identified in this study. The main limitations of the study was that the research group was not entirely representative, which made it impossible to extrapolate the findings and make specific predictions about the likely use of a PP in the workplace.

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„SOCIAL PROJECTIFICATION" – HOW TO DEVELOP SOCIAL ENTREPRENEURSHIP WITHOUT GRANTS?

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Purpose: The purpose of the paper is to present the results of research on the phenomenon of projectification of the social economy sector. The main reason for scientific inquiry is to try to understand the conditions needed for social entrepreneurship activity without the addictive role of projectification related to external financial support.
Design/methodology/approach: The cognitive assumption is to identify a strong correlation between the activity of social enterprises and their receiving external funding for the implementation of projects under the system of supporting the social economy. The research on this topic was built on qualitative methods based on in-depth interviews and participant observation. The theoretical dimension conceptualizes the phenomenon of social projectification in social economy sector and explores the rationale for moving away from the addictive role of external funding projects to implement pro-social activities.
Findings: The most important findings of the research concern the identification of structural prerequisites (conditions) that enable social enterprises to become independent of the institutional projectification system of activity in the social economy sector.
Practical implications: The practical implications of the research results obtained can serve as a guideline for designing a more sustainable and long-term system of support for the development of the social economy sector within central and local government institutions.
Social implications: Social implications are related to the possibility of applying the results of the research, that is, the identified factors decoupling from social projectification in the practice of social enterprises and the institutional system. They can also serve as recommendations for the implementation of more resilient, flexible and agile ways of operating in the social economy sector.
Originality/value: The originality and value of the article consists in discovering issues that belong to the research gap related to the development of the social economy sector beyond the traditional approach based on the projectification of social initiatives and institutional systems.
Keywords: social entrepreneurship, projectification, social economy, qualitative research
Category of the paper: research paper.

1. Introduction

In a sense, projects have become a fundamental element of human activity in the conditions of modern civilization. Projects organize the professional and private spheres, pro-social activities and civic activism (Jensen et al., 2016). The dominance of project-based thinking and action, which phenomenon is called projectification, is developing in the private, public and non-profit sectors. Among others, it is manifested in the increase in the number of projects underway, the evolution of business and social projects, and the scaling of economic and social efficiency through projects.

Projects are playing an increasingly important role because they are fostering goal achievement and strategy execution in many leading organizations (Nieto-Rodriguez, 2019, Kuura, 2011). Referring to the work of C. Midler in describing the phenomenon of projectification, it is worth noting not only project-oriented organizations but also the management of programs and project portfolios (Aubry, Lenfle, 2012). An integrated approach to project, program and portfolio management, is also of particular importance (Muller, 2009).

By combining core activities with project implementation, organizations develop inter-organizational and cross-sectoral relationships. Cooperation in a multi-project environment fosters the continuous improvement of mechanisms and structures for initiating and managing projects, thus encouraging the search for new dimensions and forms of socio-economic activity. It is also touching on social and civic issues, as well as entering the cultural and political realm (Chell et al., 2010).

The sphere of social entrepreneurship is also project-based, in fact. In Poland, this activity is mostly carried out through implementation of projects most often financed with grants, which aim to solve problems and create value for the community (Peredo, McLean, 2006; Weerawardena, Mort, 2006). Projects in the social enterprise environment are somehow treated as an ongoing and inevitable process. On the one hand, this translates into certainty and stability of funding. On the other hand, however, it generates many constraints and makes people dependent on external funding sources. As a result, restrictive project rules can hinder the flexible development of solutions to current social needs and problems. And, to some extent, the financing of activities mainly from public funds, may make it necessary to subordinate the scope of activities to the priorities and conditions of the support offered.

The context of social entrepreneurship functioning outside the system of projectification, i.e. the system of institutionalized financial support, becomes an interesting subject for analysis. Therefore, the issue of identifying the conditions that can create solutions involving the operation of social entrepreneurship initiatives outside the system of external grant funding, was identified as a research gap. The purpose of the article is to present the social economy sector in the context of the determinants of social entrepreneurship outside the system of projectification understood as the use of external grants for the core activities of the organization.

2. Literature review

The first studies of the essence of projectification cite the example of Renault where the classic functional organization saw a reorientation of the organization and management system toward project execution and the functioning of autonomous project teams (Midler, 1995). Projectification includes individual actions by individuals, social groups and communities, as well as initiatives by organizations and institutions. Projectification has entered virtually all spheres of socio-economic life and is increasingly operating in a networked environment (Barondeau, Hobbs, 2019). Not without reason, it is recognized that projectification is present almost everywhere, affects almost everything and involves almost everyone (Jensen et al., 2016), leading to a peculiar, purposeful philosophy of activity.

Projects simplify structures, organize activities and deliver results (Godenhjelm et al., 2015). At the same time, attention is also very clearly drawn to the possibility of so-called "over-projectification" and the consequences associated with it (Kuura, 2020). The "ubiquity" of projects is accompanied by the development of a project society. At the core of description of the project society trend is a social organization focused on the widespread implementation of diverse projects (Lundin, 2016). However, it is important to note the emerging temporary society. In this sense, one identifies episodicity (as a consequence of abandoning fixed structures and formats) and openness (marked by less predictability and greater risk) while co-creating the formalized structures necessary to meet the needs of security and belonging (Packendorff, 2002). The focus on a single project is evolving to recognize an open, flexible and dynamic system of structural, process and social relationships in project-oriented environments (Bergman et al., 2013).

The conceptualization of the multidimensional phenomenon of projectification on the basis of an analysis of the state of existing research leads, on the one hand, to a distinction between project activity of individuals, communities, organizations and institutions. On the other hand, it leads to an evolutionary change towards a project person and society, a project organization and institution. Personal, social and organizational contexts determine the level of projectification. Personal projectification refers to the professional and/or private activities of individuals. It is expressed through the intensity and commitment to project work and its consequences. The social level encompasses a broader context, including, among others, the functioning of public institutions, implementation of policies, inclusion of and impact on societies. Organizational projectification involves reconfiguration of organizational and management systems (Jacobsson, Jałocha, 2021) for the development of project practices (Kuura, 2011). The personal, social and organizational levels are closely intertwined.

When describing the phenomenon of projectification, it is necessary to pay attention to the context of the formalization of the organizational environment of projects, programs and portfolios. Standardization undoubtedly simplifies and organizes procedures, mechanisms and

systems. However, it can be challenged whether excessive standardization actually promotes innovation and creativity in projects. Rather, it seems to be more limiting and artificially "locking" the project environment into a rigid organizational and functional framework. The trend of projectification studies points to the need to develop effective mechanisms for combining temporary and permanent structures. Undoubtedly, the lack of such mechanisms can result in a loss of flexibility and innovation in projects, as well as excessive fragmentation, which is particularly visible in the public sector (Godenhjelm et al., 2015). It is hard to disagree with the notion that public services are becoming more flexible as a result of projectification. However, the functioning project structures often provide short-term solutions to problems that are generally long-term in nature (Hodgson et al., 2019). Hence, coordination of activities in the scope of coexisting temporary and permanent structures remains crucial.

Social entrepreneurship operates in a social economy environment and is embedded between the private and public sectors. It takes a hybrid form in the functional spaces normally belonging to the private, non-profit and public sectors (Roper, Cheney, 2005). However, in the American model of the social economy, social entrepreneurship clearly operates in the space of the market economy (Hoogendoorn et al., 2010). Social entrepreneurship is often directly referred to as social business. However, the inclusion of an economic activity component alongside social activities remains important. And striking a balance between social mission and profitability is undoubtedly the foundation of social entrepreneurship (Smith et al., 2013).

In principle, social entrepreneurship is based on balancing the social and business contexts. The social context defines the mission, purpose and values. The business context, in turn, corresponds to the creation of competitive market value (Weerawardena, Mort, 2006). Social business is associated with the potential for change for the better. And, importantly, it is an integral part of the modern economic structure (Yunus, 2011). It is also an important link in the third sector, taking on the attributes of non-profit organizations and for-profit businesses (Dees, 1998).

Social entrepreneurship operates in a space of cross-sector cooperation. Both with institutional entities and with for-profit businesses (Huybrechts, Nicholls, 2013). The joint activities of entities from different sectors respond to contemporary social, economic, environmental and civilization issues (Gigauri et al., 2022), resulting in the creation of universally accepted values (Weaver, 2019). Because by effectively and efficiently solving social problems, social entrepreneurship helps public power, i.e. it is something more than just community-based entrepreneurship (Tan et al., 2005). It participates in the process of improving the quality of life and achieving social benefits using institutional support (Gigauri, Damenia, 2020).

Social entrepreneurship integrates the spheres of social and business activity. It implements an innovative approach to achieving social goals and social change as a result of doing business (Dees, 1998). The perception of business activity then goes beyond the classic business dimension. Economic goals are not a priority but, importantly, interact with social goals. The profit

generated is subject to distribution for the development of individuals, social groups and communities and the implementation of social activities. Innovation is reflected in non-standard ways of meeting social needs, as well as in designing new solutions to problems in the face of the need to create social value. The result is social innovation (Peredo, McLean, 2006; Bacq, Janssen, 2011).

3. Methods

The research problem concerned the depiction of the social economy sector in the context of the determinants of social entrepreneurship outside the institutionalized projectification system. Projects in this case are seen as using external grants for the organization's core activities. The research procedure used a qualitative approach that responds to the challenges of empirical verification of social entrepreneurship by relying on a multi-faceted analysis (Dacin et al., 2011; Murphy, Coombes, 2009; Spear, 2006). The empirical research was concerned with exploration of the phenomenon of projectification of social economy, especially of social entrepreneurship, on the basis of specific activities of institutions and organizations at the local level.

The main area of empirical research covered organizations following the model of the financing system for development of the social economy, particularly social entrepreneurship initiatives in accordance with the framework of the National Programme for the Development of the Social Economy until 2030 and the Social Economy Act of 5 August 2022. The study covered the functioning of the Social Economy Support Center (Ośrodek Wsparcia Ekonomii Społecznej (OWES)) in Częstochowa and social economy entities, including social enterprises operating in the area of the neighboring municipalities. The survey included management and staff of OWES, representatives of associations, foundations and social cooperatives (Table 1).

Table 1.
Interview structure

Scope of research	Local institution area	The area of social enterprises
Number of interviews	IDI1; IDI2; IDI3	IDI4; IDI5; IDI6; IDI7; IDI8; IDI9; IDI10; IDI11; IDI12; IDI13; IDI14; IDI15
Period	2020-2022	2021-2023

Note: IDI 1 … 15 - in-depth interview no. 1 … 15.

Source: own research (in-depth interview questionnaire).

The research was conducted in 2020-2023. A structured in-depth interview (IDI) was used as the main research method. The content of the questions addressed to survey participants was prepared in two subject areas. The first one was about illustrating the importance of projectification in the activities of a support institution and social enterprises. The second one focused

on obtaining information on the potential for development of social enterprises operating outside the institutionalized system of external funding.

The interviews were conducted at the headquarters of each organization and lasted between 45 and 60 minutes. The interviews yielded a primary data set, which was then subjected to qualitative content analysis. An important addition to the research procedure was participatory action research. The observation consisted of the author's participation in the development of concepts of project in the scope of social entrepreneurship and practical interaction, with social economy entities, in their implementation. It concerned 7 social enterprises and was conducted in 2021-2023. It was based on social activism aimed at helping to develop local initiatives. Although associated with certain limitations, the use of qualitative research techniques seems to have made it possible to present scientifically valuable results.

4. Results

The empirical research allowed us to gather a set of information on the phenomenon of projectification in the field of social entrepreneurship. The content of the questions and sets of answers were divided into two subject areas. The first one concerned the functioning of projecttification in social entrepreneurship. All the respondents participating in the survey, both those representing a social economy support organization and social enterprises, unanimously stresssed that the grant system leads to concentration of activities on project-based fundraising and not necessarily on the long-term operations or sustainability of the organization. The statements included: “yes, the most important thing is to get funding for the project” (IDI7), “we never know if we will definitely get support, and only then will it become clear whether we can operate” (IDI5).

The respondents very often emphasized uncertainty and instability. Attention was paid to the temporary nature of the activities, because projects are always time-limited. For example, they made the following statements: “it's always a bit unknown whether our project will be suitable and our goals will be met” (IDI4), “we would like to have more stability, because now you never know what will happen, either we will get the project or not” (IDI12). Also, OWES representatives stressed that social entrepreneurship is basically based on project implementation. At the same time, interestingly enough, OWES not only becomes the user of funds for implementation of social projects, but at the same time, in order to carry out its mission, it has to become a beneficiary of the project competition itself. They made the following statements: “we cooperate with social enterprises but we also have to implement a project ourselves, which makes it possible to distribute funds to projects” (IDI1), “it's kind of like a pyramid - we get a project so that others can implement theirs” (IDI2).

The interviews clearly indicate the existence of a system of activity projectification, which involves multiple hierarchical levels, from the macro level of the conditions of the European Union (EU) policies, through national, regional and local policies. The following answer is noteworthy: “you can say that everything is based on projects - in the system, projects come kind of from the top” (IDI3). It occurs that social enterprises are aware that they are in a kind of unstable funding system based on projectification. Examples of statements made by survey participants include: “Well, sometimes it was the case that we had to wait with our activities and people for the opportunity to apply for funding because we were running out of some funds” (ID 11), “we know that our activities are so phased, kind of cyclical, that is, either there will be money or there won’t” (IDI15). At the same time, the social economy projectification system is highly bureaucratic. As respondents indicate: "we know that we get these funds and we are happy but all the time we have to handle some bureaucracy” (IDI8), “our activities in supporting the social economy are also based on a project so it's obvious that we have to follow the provisions of the project and meet lots of indicators, quantitative results and account for our activities all the time...” (IDI2).

The content from the interviews provides a good glimpse into the picture of a kind of institutional projectification, i.e. a phenomenon involving projects of varying scope and size, interrelated, built on the principle of an institutionalized pyramid from the EU system down to very local activities of small scope and budget. The statements included, for example: “and so we heard that this project of ours that we are implementing is all money from the EU” (IDI 9), “we basically operate and think in terms of projects all the time, part of our activity is a project activity and depends on the status of competitions for funds from the EU” (IDI1). The research shows, one the one hand, the emerging picture of projectification of the social economy sector as a mosaic of many complementary projects and valuable results and committed people. On the other hand, it constitutes very unstable structure of bureaucratic programs and projects, and ad-hoc measures with little potential.

The second set of questions on the conditions that develop the potential for social entrepreneurship activities without reference to external funding, yielded an interesting set of data. In general, the respondents representing social enterprises questioned how easy it is to create conditions that allow social needs to be met without raising external funding in the formula of a systemic project. For example, the survey participants commented as follows: “I think it will be very difficult because everyone is used to this kind of activity although I know it is not good for the continuity of work but otherwise it will be difficult” (IDI14), “I don't know how this could work without specific funding for activities” (IDI13).

The respondents displayed a rather conservative and skeptical attitude towards the challenge of operating outside the projectification system. Concerns were primarily financial, i.e. operating based on market principles. Among the statements were the following: “I don't know if we would be able to cope with the current competition” (IDI13), “for our business to survive we would have to compete more intensively” (IDI11).

Interviews conducted among representatives of social enterprises confirm that the time limitation of projects influences the perception of the implemented projects as single and episodic - most often without continuation. The respondents pointed out that such project-based thinking is a significant impediment to planning activities outside the projectification system. One survey participant stated that "most often, we do some project that is socially useful, the project ends, and we can then try to get another project" (IDI9). Another person emphasized that "on the whole, our life goes from project to project (IDI10).

At the same time, representatives of social enterprises expressed concerns about whether they have sufficient competence to operate in a competitive market environment. For example, they commented as follows: "it seems to me that in order to operate without projects, you probably need to know more about business" (IDI7), "maybe some courses or business training would be useful - I think that could help if we needed to operate without projects" (ID8). In turn, representatives of OWES agreed that the operation of social enterprises outside the projectification system must involve strengthening and better preparing these organizations for the rules of competition. They stated that "it is possible for such companies to operate outside the funding system but this would require investment in strengthening business competencies and also in management and economic knowledge in general" (IDI1). One OWES representative stated: "I can imagine some kind of training system or specific workshops on how to run a business outside of the external funding system, but I don't think all the social enterprises would be suitable to do that" (IDI3).

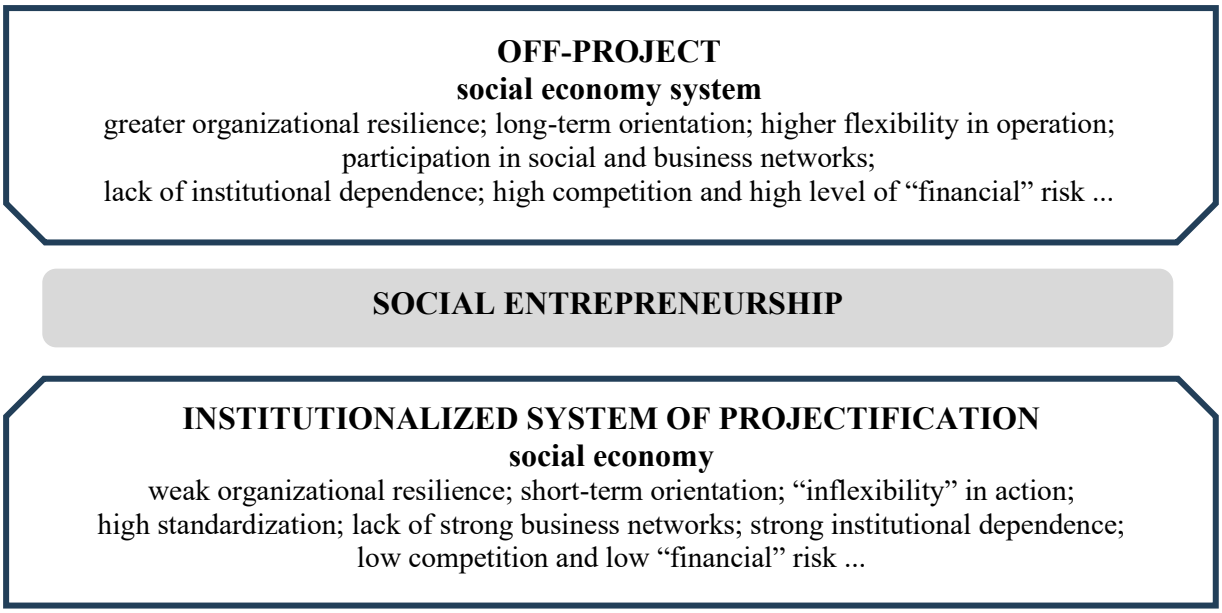

Figure 1. Dimensions of social entrepreneurship.

Source: own study on empirical research.

The respondents representing social enterprises also expressed concerns about their social competence manifested in broad business relationships. They commented: "we don't have many partners and when we do a project we rather manage on our own" (IDI12), "we don't have many

companies we cooperate with - these are rather ad hoc contacts" (IDI10). At the same time, social enterprises, just like OWES, expressed the belief that business contacts and social networks are crucial when operating outside the projectification system. The statements included: "in our activity, business and social contacts are the basis of operations" (IDI2), "when operating without projects, strong contacts with other businesses are what's most important" (IDI15), "good contacts provide more stability and you can always reach an understanding with someone" (IDI13).

The interviews depict some aspects of how social entrepreneurship operates within the projectification system and outside external systemic funding (Figure 1). Underlying characteristics include organizational resilience, functioning in social and business networks, or institutional dependence. The phenomenon of projectification requires standardization of operational procedures and structures, periodicity of activities (i.e., from project to project), accountability for the purpose and outcome of the project. In turn, in a system not based on projects, greater flexibility of activities and freedom of decision-making are allowed, which promotes the development of solutions that are more responsive to current social needs and problems.

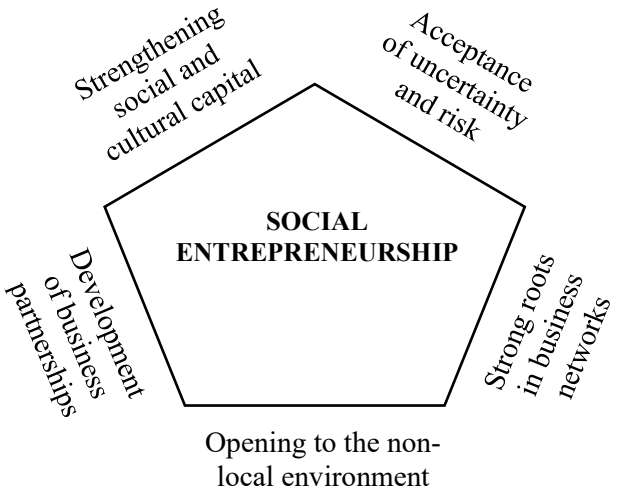

Figure 2. Conditions for the social entrepreneurship outside the projectification system.
Source: own study on empirical research.

The above interview procedure was supplemented by participant observation conducted during the period of 2020-2023. The observation consisted in the author's cooperation, with seven social enterprises, in the process of co-creating elements of business models and conducting workshops on entrepreneurial activity. Observation and informal conversations with company representatives allowed to gather an additional set of information. The main conclusion of this stage of the research confirms the strong dependence of social enterprises on the social economy projectification system. However, this does not exclude the possibility of transforming social entrepreneurship embedded in projectification into operating outside of external systemic funding. Undoubtedly, at the core of such a transformation is, on the one

hand, the preparation of social entrepreneurship to adopt a market-based orientation. On the other hand, recognition of the conditions that enable social business to be remodeled for increased market attractiveness and competitiveness (Figure 2). It is worth noting that creating conditions for activity outside the institutionalized system of funding projects in the area of social entrepreneurship requires a significant reinforcement of the business profile of social enterprises, as well as a comprehensive system of training and consulting on organizational resilience. What is also significant is openness to appearing in non-local environments and the development of social and cultural capital for successful functioning in business networks.

5. Discussion

Projectification is considered one of the most important trends in development of the public sector. It is a multifaceted and multilevel phenomenon. One of the most significant contemporary challenges for social entrepreneurship is becoming the search for self-funding opportunities. Solving economic problems without support from public resources is part of the essence of entrepreneurship and innovation (Gigauri et al., 2020). Therefore, it can be believed that by increasing economic efficiency from business activities, it becomes possible to expand the scope and scale of social activities. Social entrepreneurship requires external funding, as it is most often unable to finance the implementation of its social projects from commercial activities. Bugg-Levine et al. (2012) refer to this phenomenon as the "financial-social return gap." At the same time, they note that the issue of funding through external grants is the most important challenge for social entrepreneurship. Chong and Kleemann (2011) note that there is a kind of tension between the return on investment (commercial activities) and philanthropic activities in social entrepreneurship, a kind of paradox that is difficult to overcome.

Social entrepreneurship can play a significant role in creating a more equitable society with a focus on active and effective socio-professional integration and the prevention of exclusion (Dacin et al., 2010). The ability to respond flexibly to current social needs and problems is becoming crucial. As is openness to new challenges and adaptation to the changing socio-economic environment. Since success requires the integration of three dimensions: economic, social and environmental (Elkington, 1998), it seems reasonable to look for opportunities to scale the effectiveness of social entrepreneurship operations. It is becoming desirable to achieve social and economic goals outside the typical project cycle.

Social enterprises often face various barriers that keep them from achieving scale and expansion. These constraints can include limited institutional recognition, lack of access to markets and finance, and poor measurement of real social impact. Policymakers can therefore play a key role in helping social enterprises overcome these problems and barriers by shaping favorable legal ecosystems that foster greater synergy and coherence Another crucial aspect

is the synergy of cooperation in policy-making at various local, national or even international (EU) levels (OECD/EU 2019). Moving away from classic cyclicality in favor of continuity of priorities and activities and adopting a long-term perception of social business operation seems to be an important direction for development of social entrepreneurship.

6. Conclusion

The research conducted confirms that social entrepreneurship is strongly rooted in the institutional system of social economy projectification. Projects are considered sustainable, and representatives of social enterprises often find it difficult to imagine functioning without financial support. Which is not to say, however, that public funds must be the primary source of funding for the activities of social enterprises. By strengthening development capacity, creating business relationships, and opening up to partnerships and cooperation, it seems possible to move away from the typical pattern of doing social business based on obtaining grants. Projects undoubtedly unite the community around a common goal. Which, from the point of view of integration and activation of people at risk of social and work exclusion, promotes the creation and maintenance of new, publicly-funded jobs. However, to some extent, social entrepreneurship depends on the funding institutions, project conditions and criteria. Own funds provide greater institutional independence and guarantee decision-making freedom. It seems that the research presented in the following paper is one more contribution to the recognition of the phenomenon of social entrepreneurship, but it should be noted that there is a need for further research. In particular, as it can be assumed that trends related to the need for increased social activity associated with the development of civil society will be increasingly necessary in the face of growing risks.

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SOCIAL ECONOMY AND EMPLOYMENT. INSIGHTS FROM POLAND

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Purpose: This study examines the role of social economy entities in Poland's labor market, particularly their efforts to professionally and socially reintegrate individuals at risk of social exclusion. It evaluates their contributions to employment and social inclusion while addressing their challenges.
Design/methodology/approach: A desk research methodology was employed, drawing on secondary data and theoretical frameworks related to social economy.
Findings: The results show that the social economy sector in Poland is experiencing steady growth, including in the area of socio-professional reintegration. However, despite its contribution to employing vulnerable groups and filling gaps in socially relevant sectors, the sector accounts for only 1.5% of total employment in Poland, reflecting the need for increased public policy support and targeted development efforts.
Research limitations/implications: The research is limited by the availability and scope of data, particularly regarding the detailed dynamics of employment in social economy entities and their long-term outcomes. Future studies should focus on expanding the use of satellite accounts and longitudinal analyses to better understand the sector's impact and address its development challenges.
Practical implications: The findings highlight the need for policymakers to strengthen support for social economy entities, particularly in health, education, and social services. Enhancing financial and organizational resources is crucial for these organizations to provide employment opportunities for marginalized individuals effectively.
Social implications: This study underscores the social economy's value in fostering inclusive and equitable economic models, contributing to reduced social inequalities. By supporting social economy entities and promoting volunteering, social cohesion, and well-being can be achieved by integrating individuals facing employment barriers.
Originality/value: This paper advances the understanding of the social economy's role in Poland, focusing on social inclusion and labor market participation. It offers practical insights for policymakers, researchers, and practitioners seeking to enhance the sector's capacity to promote socio-economic development and mitigate social exclusion.
Keywords:
Category of the paper: research paper.

1. Introduction

Labor markets worldwide are undergoing significant changes due to demographic, technological, globalization, and other factors. Solutions are being sought at global and national levels to contribute to sustainable development and equitable transformation (ILO, 2022). In this context, the social economy is attracting increasing attention from public policymakers due to its potential in employment, social inclusion, public service provision, and local development (OECD, 2023a, 2024). The concept encompasses a variety of organizations, including cooperatives, non-profit organizations, mutuals, and social enterprises, which aim to solve social, economic, and environmental problems by combining social objectives with economic activities. For more than two decades, the role of this group of actors in filling the gaps created by both the public and private sectors has been increasing, as recognized in different worlds (Compère et al., 2021; OECD, 2023b, 2024).

The literature identifies various functions that social economy actors play in the economy and society. One of the functions commonly attributed to the social economy is job creation. P. Sałustowicz describes this function as a 'jobmachine' referring to the expectations of social economy actors to create new jobs, especially for groups marginalized or at risk of social marginalization, as well as to provide vocational training services and enable the transition to the so-called 'first labor market' (Sałustowicz, 2007). In turn, Chaves and Monzón (2012), about the socio-economic approach to the social economy, indicate that three functions are realized: labor market regulation, regulation of the supply of goods and services, and capital market regulation. The regulatory function of the social economy in the labor market is to increase the resilience of social enterprises in difficult times, helping to maintain jobs and facilitating the integration of the unemployed and other excluded people. The social economy has also played a key role in mitigating economic crises, such as the 2008 financial crisis in Europe, by providing stable employment opportunities (Lambin, 2014).

The contribution of the social economy to employment is multifaceted. It creates jobs through direct employment in social economy organizations, supporting inclusive labor markets, and promoting the integration of vulnerable groups such as young people, the long-term unemployed, migrants, people with disabilities, and other missing entrepreneurs. Social enterprises, in particular, are increasingly recognized for their ability to offer stable and meaningful employment, prioritizing social benefits over profit maximization, and meeting economic and social needs. In addition, social economy actors often emphasize quality employment practices, such as fair wages, decent working conditions, and worker empowerment, essential to promoting social justice and reducing inequality (Yi et al., 2023). As mentioned above, social economy actors create and sustain employment in traditional sectors and promote decent work by providing quality and stable jobs, facilitating women's access to the labor market, integrating workers from disadvantaged groups, and supporting the transition from informal to formal

work. In this context, social economy entities are seen as a source of new jobs, "employment-oriented" enterprises, and "employment infrastructure" in emerging jobs and sectors (Borzaga et al., 2017).

OECD data indicate that at least 11.5 million people from the European Union, or about 6.3% of the workforce, work in the social economy. The most significant numbers employed in the social economy are Germany (3.4 million), France (almost 2.6 million), Italy (over 1.5 million), and Spain (almost 1.4 million). This is followed by Belgium (over 592,000), Poland (around 250,000), and Portugal (almost 245,000). Among economic actors in the EU, associations are the most employable, employing 6.2 million people (54.1%) and cooperatives (3.3 million; 29%). Social enterprises employ at least 3.9 million people (33.7% of those employed in social economy organizations) (OECD, 2024).

In Poland, the social economy has become an important element of social and labor market policies, a factor of social development, including a source of innovation, fostering the achievement of strategic goals (Krajowy Program…, 2022; Małecka-Łyszczek, 2017). The activity of social economy organizations is placed in the context of public policies on sustainable and balanced development, socio-economic cohesion, combating social exclusion, and, in particular, job creation.

The main objective of this article is to analyze the role of social economy actors in the labor market in Poland. The study highlights the employment function of social economy entities as a key aspect, underlining their impact on socio-economic development and the inclusion of marginalized groups. By examining the participation of social economy organizations in the Polish labor market, this research offers valuable insights into their contributions to social cohesion and the measurable outcomes of reintegration initiatives of social economy.

The article is structured into four parts. The first section offers a comprehensive review of the literature on the social economy, emphasizing its employment function. The second part details the data sources and research methodology employed. The third section presents an analysis of findings based on data from Statistics Poland. Finally, the conclusion synthesizes the results, offers policy recommendations, and identifies avenues for future research on the role of the social economy in Poland.

2. Literature review

2.1. Social economy – conceptual frameworks

The social economy (SE) is a global phenomenon recognized under various names and definitions (OECD, 2023c). The literature on SE presents different approaches to understanding it, including normative, institutional and legal perspectives (Defourny, Develtere, 1999). There

are also different views on the scope of the social economy, with some taking a narrow and others a broader perspective (Moulaert, Ailenei, 2005). The bibliometric review by Macías Ruano et al. (2021) offers a comprehensive analysis of the topic, integrating various terms and perspectives related to SE. Broadly, the social economy is an umbrella term encompassing diverse concepts that prioritize social and environmental needs over profit and wealth generation, adhering to principles that diverge from those associated with capitalist and individualistic ideologies (Macías Ruano et al., 2021; Utting, 2023; Yi et al., 2023).

SE is defined by a range of non-market (redistribution) and non-monetary (reciprocity) initiatives, which emphasize a diverse set of market behaviors that extend beyond the mere maximization of individual utility (Moulaert, Ailenei, 2005). SE organizations are established for the collective or general interest. They are guided by principles such as the primacy of social purpose over capital, voluntary and open membership, democratic control by members, independence and autonomy, and limited or prohibited distribution of profits (Social Economy Charter, 2015). The values espoused by this organization prioritize care for people and the planet, promote equality and justice, emphasize interdependence, uphold self-governance, and ensure transparency and accountability. The objective is to achieve decent work and sustainable livelihoods. These include using diverse resources, sustainable practices, inclusive governance, local engagement, and cooperation (OECD, 2020).

The term SE is also interpreted as a constellation of diverse organizations united by common attribute, that distinguishes them from the traditional private and public sectors. Although the concept of the social economy is new, it encompasses a wide range of pre-existing organizations that have been regulated for a long time. The family of organizations recognized as SEs is large and includes: cooperatives, mutual societies, associations and foundations (Defourny, Monzón, 1992). Social enterprises are also considered an integral part of the social economy (Borzaga, Defourny, 2004). Following the specific circumstances prevailing in each national context, the SE may encompass other informal or registered entities that comply with the relevant statutes or laws and the SE values and principles set forth above (Bouchard, 2023). Hence, SE organizations are characterized by considerable diversity in terms of their legal status, size, scope, sectors, and roles (OECD, 2020). This approach to the social economy is of considerable utility in the design and implementation of policies, the collection of statistics and the conduct of research (Compère et al., 2021).

Social economy terminology and explanations can vary according to national traditions and cultural norms (OECD, 2023b, 2024). From a global perspective, SE is a multifaceted concept encompassing many practices and ideas. However, the concept is widely recognized and understood globally and in society. The growing interest in the term 'social economy' is evidenced by data from the Internet using Google Trends (Figure 1).

Google Trends is a novel big data source that analyzes user interests across various fields. It is an open online tool that examines the popularity of search terms on Google over time, offering insights into public interest and search behavior (Mavragani et al., 2018). A study by

Jun et al. (2018) revealed that the utilization of Google Trends has increased over the past decade among academics specializing in various subjects. Furthermore, there has been a notable shift in how this tool is employed, moving from a descriptive and diagnostic approach to one that enables forecasting changes. The methodological framework established by Mavragani et al. (2018) was utilized with Google Trends to present global interest in social economy. The results demonstrate a growing trend in interest in social economy, indicating the presence of this topic on all continents in the last five years.

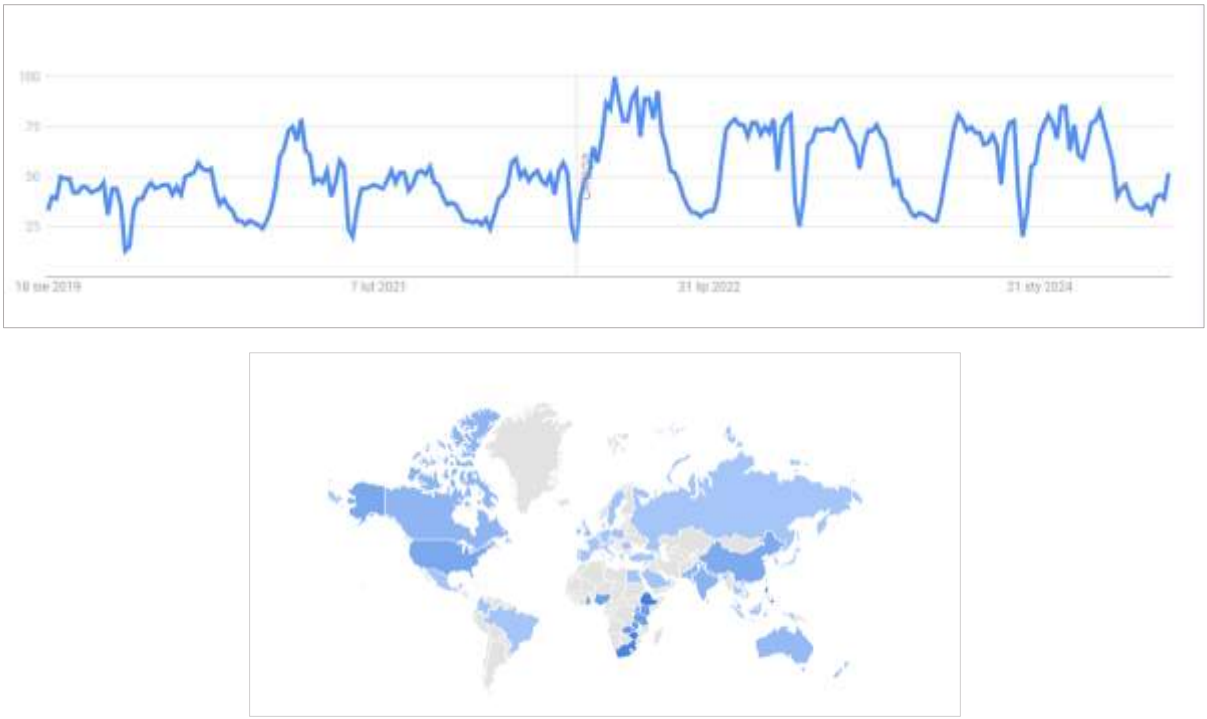

Figure 1. Global interest in the concept of 'social economy'.

Source: own elaboration using Google Trends.

2.2. The employment function of the social economy

The social economy plays an important role in developing the labor market by fostering professional activation and promoting inclusive, stable forms of employment. Its importance lies in its multidimensional approach to employment issues, balancing economic objectives with social needs.

The social economy contributes to job creation directly through social enterprises, cooperatives, and non-profit organizations and indirectly by promoting inclusive labor markets. By tackling structural barriers to employment, these organizations help to integrate socially and professionally excluded people, such as the long-term unemployed, migrants, and young people (ILO, 2017; OECD, 2020, 2024). Their efforts highlight the sector's ability to address systemic inequalities and create opportunities for vulnerable groups.

A distinctive feature of the social economy is its ability to provide stable and meaningful employment that meets economic and social needs. Unlike traditional businesses, which focus

primarily on profit maximization, social economy organizations (including social enterprises) prioritize social benefits. This is evident in their promotion of fair wages, decent working conditions, and worker empowerment. Such practices enhance social justice and contribute to reducing labor market inequalities. In addition, social economy organizations often support gender equality by facilitating women's entry into the labor market, thereby strengthening their economic and social position (ILO, 2017; OECD, 2024).

The social economy demonstrates adaptability to modern labor market challenges such as automation, technological advances, and demographic changes. In sectors that are less susceptible to automation, such as personal services, social economy organizations provide alternative employment models that meet the evolving needs of the workforce. These organizations are critical in emerging areas such as the 'silver economy,' providing secure and stable employment frameworks. This adaptability positions the social economy as a viable response to the growing gig economy and the erosion of traditional employment structures (Borzaga et al., 2017).

Moreover, the social economy contributes to the formalization of work by supporting the transition from informal to formal work arrangements. This stabilizes labor markets and promotes sustainable development by addressing the challenges of precarious employment. In doing so, the social economy promotes inclusiveness, fairness, and resilience in the labor market, making it a cornerstone of equitable economic development.

2.3. Social economy in Poland

The term social economy appeared and gained importance in Poland at the time of accession to the European Union in 2004, even though practices in this area were known earlier (Ciepielewska-Kowalik, 2020). It became the subject of interest of practitioners and theoreticians (Pacut, 2022, pp. 73–87) and public administration, which for ten years processed the issues of regulating this topic in the law (Bohdziewicz-Lulewicz et al., 2022). In 2022, the Act on Social Economy in Poland was adopted (Ustawa, 2022). The social economy has become part of the policy capacity in Poland (Kruk, 2022; Zybała, 2022) and the subject of strategic documents such as the National Program for the Development of the Social Economy (to 2030), the Strategy for the Development of Social Services (to 2030), the National Program for Combating Poverty and Social Exclusion (2021-27) and the Action Plan for Social Inclusion and Integration (2021-2027).

Following the Act, the social economy includes the activities of social economy entities for the benefit of the local community in the field of social and professional reintegration, creating jobs for people at risk of social exclusion and providing social services, carried out in the form of economic activity, public benefit activity and other paid activities. Social economy entities comprise three distinct categories: cooperatives, social and professional reintegration units, non-governmental organizations, and certain related institutions/similar organizations (Table 1) (Małecka-Łyszczek et al., 2023).

Table 1.
Categories of social economy entities in Poland according to the Act on Social Economy

Social economy entities in Poland		
Non-governmental organizations and related institutions	**Socio-professional reintegration units**	**Cooperatives**
Association Foundations Non-profit companies Church entities Association of local government units Rural Housewives' Circles	Social Integration Centers Social Integration Clubs Occupational Therapy Workshops Vocational Activity Centers	Workers' cooperatives Cooperatives for the disabled and blind Social cooperatives Agricultural production cooperative

Source: own elaboration.

3. Materials and methods

The article employs desk research analysis, underpinned by secondary data sources, and incorporates a narrative review of pertinent literature. Peer-reviewed texts published in Scopus and bazekon were included in the analysis, and the literature review was used to develop a theoretical introduction. Statistical data on social economy entities from Statistics Poland (Główny Urząd Statystyczny, GUS) was utilised for the analysis. Since 2009, the social economy has been officially included in public statistics and is the subject of regular, cyclical and representative surveys conducted in Poland by the Social Economy Research Centre of Statistics Poland (Ośrodek Badania Gospodarki Społecznej GUS) (Pacut, 2024). These seconddary sources of information were used to illustrate the phenomenon under study in Poland.

4. Results

Employment function in the social economy in Poland - selected aspects

4.1. Structure of the Social Economy Sector in Poland

The number of social economy organizations in Poland has grown steadily over the last decade (GUS, 2024)). In 2023, the social economy sector comprised 106.2 thousand organizations (Figure 2), the majority of which were non-profit organizations (105 thousand, 98.8%). Cooperatives meeting the definition of social economy units numbered 1.2 thousand, of which the most significant group was social cooperatives (67.4%), followed by labor cooperatives (24.3%), and the smallest group was cooperatives of the disabled and blind (8.2%) (GUS, 2024a). In 2023, there were 1,246 socio-occupational reintegration units, of which 863 were set

up by non-profit organizations, including associations, foundations, and social-religious entities (GUS, 2024b). In 2023, there were 0.7 thousand social enterprises among the social economy units, of which 47.6% were non-profit organizations and 52.4% were cooperatives (GUS, 2024a).

Statistics Poland data from 2017-2020 show growth in the social economy sector, particularly in non-profit organizations, which increased the number of entities, employment, and revenue. Over the same period, worker cooperatives saw a decrease in the number of active entities and their employment and financial potential, mainly due to the closure of large cooperatives. Although social cooperatives increased their capacity, they did not compensate for the decline in worker cooperatives (GUS, 2021b, 2023).

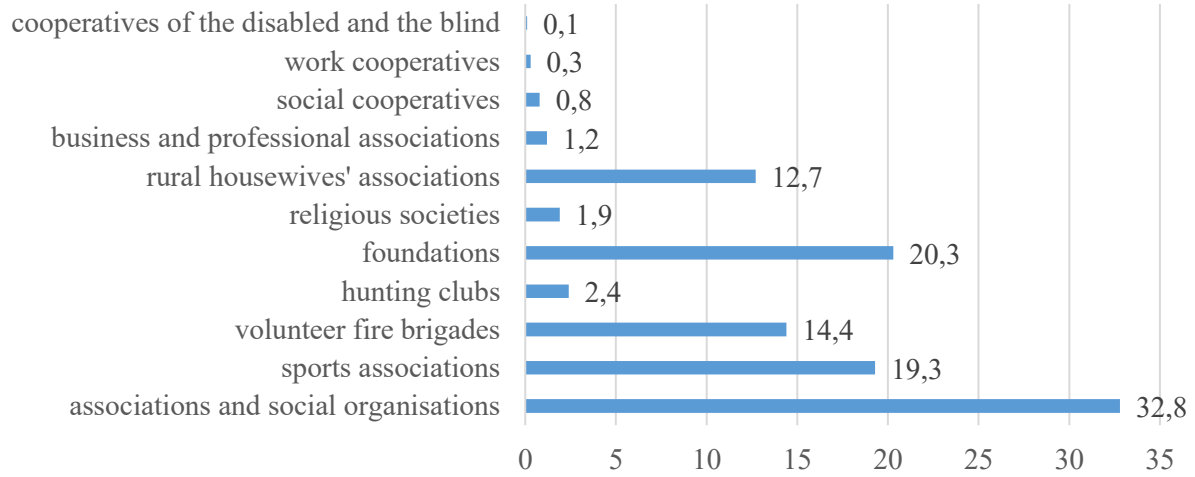

Figure 2. Number of active social economy enterprises by type of organisation in 2023 (in thousands). Source: Author's compilation based on (GUS, 2024a).

4.2. Labour resources in the social economy sector

Social economy enterprises achieve their objectives by using a variety of resources. The labor resources used by the social economy sector consist of workers employed based on civil law contracts and employment relationships and volunteers working on an unpaid basis. In 2018, paid work in the social economy sector corresponded to 323.2 thousand full-time equivalents. On the other hand, considering work performed in the context of volunteering, the dimension of this work increased threefold to 867.9 thousand full-time equivalents. According to the statistics of Poland, direct voluntary work accounted for the largest share of work in the social economy sector (47.6%) (GUS, 2024a).

Statistics Poland compared the labor resources generated by social economy enterprises (excluding volunteering) with the total labor resources in the economy and, on this basis, indicated the sectors in which the social economy plays the most significant role. The analysis, carried out using the Polish Classification of Economic Activities (Polska Klasyfkacja Działalności), allows the activity of social economy entities to be allocated to specific sectors. In 2018,

the largest share of the social economy was in section R - Activities related to culture, entertainment, and recreation, where it generated more than a third (34.2%) of labor resources in relation to the national economy. It also played an important role in section S - Other service activities, accounting for 28.7% of the labor resources, indicating its importance in community support services. Furthermore, in sectors Q - Health and Social Work (12.5%) and P - Education (8.9%), the social economy was an important element in supporting the provision of essential social services such as education and social work (GUS, 2024a).

Gross value added produced by the social economy stood at 1.94% compared to the GDP (GUS, 2021a).

In 2023, non-profit organizations employed 187,600 people, and cooperatives 23,400 (Figure 3). NPOs employed an average of 12 employees, and cooperatives 21 employees. The highest employment rate was characterized by cooperatives for the disabled and blind (91 persons).

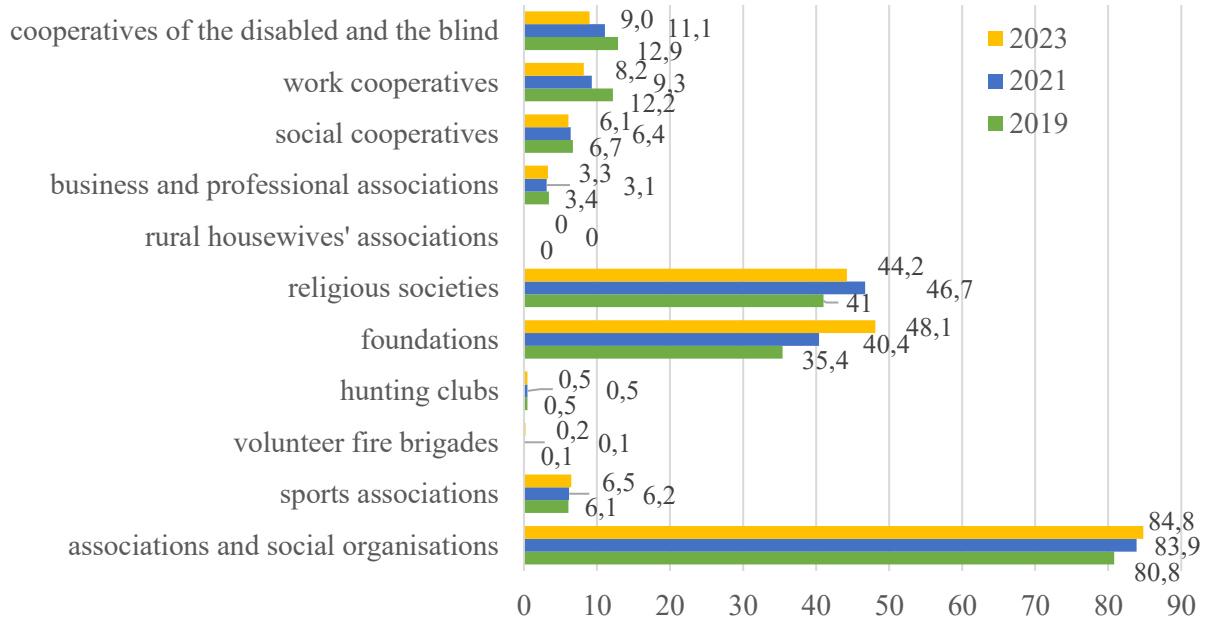

Figure 3. Number of persons employed on a contract of employment in social economy entities (in thousands).

Source: (GUS, 2024a).

The dynamics of change in the number of full-time employees looked different in the communities of non-profit organizations and cooperatives. In all the years analyzed, more than 4/5 of the employees worked in non-profit organizations. The number of people employed in this group increased by 12% in 2023 compared to 2019. In cooperatives, on the other hand, there was a decrease in the number of employees by 26.% from 2023 to 2019. This situation was due to the successive decrease in the number of workers' cooperatives and of invalids and blind people, and therefore, in employment in this group of entities.

Compared to the number of persons employed based on an employment relationship in the national economy, employment in social economy entities in 2023 accounted for 1.5%, and about the total number of employees - 1.2%.

4.3. Reintegration dimension of employment in the social economy

Vocational reintegration is an important objective of social economy entities. In 2023, social economy entities in Poland employed 27.2 thousand persons belonging to groups at risk of social exclusion, which accounted for 12.8% of their total workforce.

Between 2017 and 2023, social cooperatives and cooperatives of the disabled and blind had a much higher proportion of people at risk of social exclusion among full-time employees than non-profit organizations (Figure 4). In the case of cooperative organizations, changes in the percentage of people at risk of social exclusion are relatively small (e.g., in social cooperatives, a change of 2.4% over 6 years). On the other hand, non-profit organizations have an apparent increase in this percentage (e.g., in foundations and sports associations, an increase of several percentage points over 6 years).

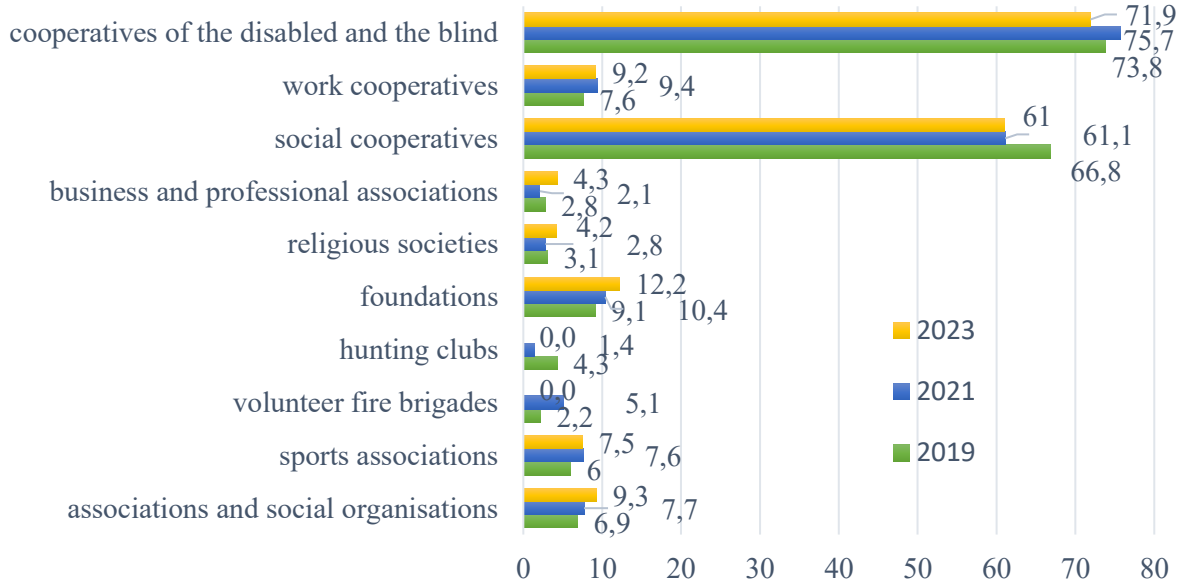

Figure 4. Percentage of people from groups at risk of social exclusion among contracted employees in social economy entities (%).

Source: Own study based on (GUS, 2023, 2024a).

In 2021, the structure of employed persons from groups at risk of social exclusion was dominated by persons with disabilities (81.8%), followed by unemployed persons (12.6%), and other persons at risk of social exclusion (5.6%). Between 2017 and 2022, there is a decrease in the number of people with disabilities (from 86.2% in 2017 to 81.8% in 2021) which can be linked, among other things, to a significant decrease in the number of disability and blind cooperatives (GUS, 2023).

In 2023, employees' social or professional reintegration activities were carried out by 7.9% of employing social economy entities - 4.9% of non-profit organizations, and 49.1% of cooperatives (GUS, 2024a).

5. Discussion

An analysis of selected aspects of the employment function of the social economy in Poland leads to a reflection on its effectiveness.

On the one hand, social economy organizations represent only a fraction of employers of people from excluded groups. Moreover, the employment rate of the social economy sector in Poland (1.5% of total employment) can be considered low compared to countries such as Canada (3%), Belgium (12.1%) or France (10%) (OECD, 2024). However, taking into account the historical and socio-political circumstances of Poland, which has been transforming its social sector since the 1990s, this indicator is similar to the results in other CEE countries such as Latvia (1.6%), Slovenia (2.7%) or Hungary (3%). This points to a specific context for the development of the social economy in the region, as highlighted by numerous studies (Ciepielewska-Kowalik et al., 2021; Defourny, Nyssens, 2021). The social economy sector in Poland is growing, with non-profit organizations playing a dominant role, accounting for more than 98% of the sector's entities. They are the ones that create the most jobs and have a significant impact on the development of reintegration units and social enterprises. At the same time, social cooperatives and cooperatives of disabled and blind people play a key role in the professional reintegration of people at risk of social exclusion, offering employment to people in difficult situations. Despite their importance, the role of these entities is underestimated in public policies, which indicates the need for better support and research on their needs and challenges in the context of further development.

On the other hand, data from the experimental satellite account of the social economy in Poland (GUS, 2021a) show the importance of the activities of social economy entities in areas of high social relevance, such as culture, social services, education, and health care. The social economy plays an important role in filling market gaps and supporting communities, which is crucial for social and economic sustainability. It is worthwhile to continue and develop research on satellite accounts to obtain a more complete picture of the opportunities and outcomes of the social economy sector, which could help support it more effectively.

6. Conclusions

In conclusion, the social economy sector in Poland, while still developing and shaped by its historical and social context, plays a significant role in job creation, vocational reintegration, and addressing market gaps in socially critical areas. The growth and dominance of non-profit organizations underscore their potential in fostering an inclusive labor market and supporting local community development. Simultaneously, the cooperative sector continues to serve

as a vital mechanism for the professional reintegration of individuals at risk of social exclusion, despite limited institutional support. Research findings and the experimental satellite account of the social economy highlight the sector's importance for sustainable development, emphasizing the need for targeted policies and a deeper understanding of its societal and economic contributions.

Future growth of the social economy sector necessitates a cohesive strategy that prioritizes the inclusion of socially excluded individuals. Tailored support programs, with a focus on financial and organizational assistance, are essential for enhancing initiatives aimed at professional reintegration. Policymakers should focus on strengthening support for social economy entities, particularly in sectors like health, education, and social services, where their impact is most pronounced. Increased collaboration between the social economy and these sectors can improve its capacity to integrate excluded groups into the workforce and broader society. Additionally, expanding and promoting volunteering within the social economy is crucial, as it not only fosters social engagement but also provides pathways for professional development and inclusion for those facing employment barriers. Future policies should place greater emphasis on the value of volunteerism, recognizing its transformative role in advancing social and economic integration.

Future research should focus on examining the specific mechanisms through which social economy entities influence labor market dynamics, including their role in reducing unemployment, fostering vocational reintegration, and creating stable employment opportunities for marginalized groups. Studies should also investigate the long-term economic and social effects of social economy initiatives on workforce inclusion. Additionally, research should explore how policy interventions and financial support can enhance the effectiveness of social economy organizations in addressing labor market challenges and promoting sustainable employment growth.

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SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

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GENIUS LOCI OF UNIVERSITY CITIES: STAKEHOLDER PERSPECTIVES ON ACADEMIC IDENTITY

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Purpose: The paper aims to explore the genius loci, or the unique identity of university cities shaped by their academic character, as perceived by various stakeholders. It seeks to identify how different audiences, such as students, residents, and university staff, describe and evaluate the distinguishing features of university cities and assess the positioning of Polish cities within these characteristics.
Design/methodology/approach: The research employs a hybrid methodological approach, including in-depth interviews and Multiple Factor Analysis (MFA). Data was collected from respondents across the city's stakeholder groups. The analysis combined qualitative insights with quantitative techniques, using MFA to identify dimensions defining the genius loci of university cities and positioning Polish cities based on these dimensions.
Findings: The study identified two key dimensions shaping the genius loci of university cities:
1. Cultural and Academic Integration: Reflecting the impact of universities on urban identity and life, with Kraków receiving high scores for its strong academic and cultural presence. Conversely, cities like Białystok scored lower, indicating less visible academic influence.
2. Infrastructure and Urban Greenery: Emphasizing the quality of campus infrastructure and integration of green spaces. Gdańsk emerged as a positive outlier, showcasing effective urban planning, while Łódź and Katowice scored lower, highlighting challenges in infrastructure.
Research limitations/implications: The research conducted was of an exploratory nature. The purposive sampling limits the statistical representativeness of the findings.
Practical implications: The study offers actionable insights for city branding strategies, particularly for university cities. Cities with strong academic and cultural profiles, like Kraków, Warszawa and Gdańsk, can leverage these strengths to enhance their global appeal. Cities with lower scores, such as Łódź and Katowice, could improve their image by investing in campus infrastructure, green spaces, and better integration of universities into urban life.
Originality/value: The paper provides a novel application of the genius loci concept to university cities. The use of MFA to integrate qualitative and quantitative data represents an innovative methodological contribution.
Keywords: university city, genius loci, city branding, multiple factor analysis, mixed methods
Category of the paper: research paper.

1. Introduction

City's branding is an increasingly prominent focus for both researchers and urban practitioners (Tomaszewska and Glińska, 2018). It offers a framework for enhancing a city's identity, competitiveness, and attractiveness by strategically leveraging its unique characteristics. The growing interest in brand management among cities stems from the need to establish a distinct identity that sets them apart from competitors and ensuring their qualities are effectively recognized and utilized by various audiences (Kavaratzis, Ashworth, 2006). Hence, a city brand can be understood as a network of associations formed in the minds of its audience (Anttiroiko, 2015; Casais and Poço, 2021; Florek et al., 2006). The literature studies provide insights into the key elements relevant to place branding. A theoretical framework is emerging that highlights the interrelationships and interactions among these elements, offering a deeper understanding of city branding (e.g.: Duque Oliva et al., 2022; Gaggiotti et al., 2008; Glińska, 2016; Stephens, Balakrishnan, 2009). Studies emphasize the key elements involved in the branding process, the role of branding activities, and the interrelationships among crucial components such as place identity, image, and positioning. Branding activities are applied to various territorial products, including cities. Emerging sub-disciplines within territorial marketing focus on understanding the unique characteristics of different types of places and aim to define the core essence of place branding (Skinner, 2011).

Cities possess distinguishing features that form the foundation for managing their image and building a coherent city brand. These features often reflect the dominant functions of a city, enabling the classification of cities into categories such as cultural cities, tourist cities, or industrial cities. Similarly, university cities are distinguished by their academic function, which contributes significantly to shaping their identity and positioning. The academic nature of such cities not only defines their role as hubs of education, innovation, and intellectual activity but also embodies their genius loci – the unique spirit of place that captures their essence. As a core aspect of the city's identity, the academic character serves as both a tangible and intangible asset, central to its cultural, social, and economic significance (Adamczuk, 2015; Domański, 2013; Glinka, 2017).

The concept of a university city itself serves as a descriptive category and one of the models of cities, often used in the typology and ranking of urban spaces (Rewers, 2016). Nonetheless, the academic nature of a university city is among its most valuable assets, significantly shaping its identity and positioning within the competitive global landscape. Universities contribute to the intellectual and cultural vibrancy of the city, shaping its social dynamics, fostering innovation, and driving economic development. This academic character not only attracts students, researchers, and industries but also defines the city's reputation and recognition. The synergy between the university and the surrounding urban environment creates a unique sense of place, or genius loci, which embodies the city's spirit and sets it apart from other urban

centers. This genius loci are reflected in the physical, cultural, and social dimensions of the city, making it a vital element of its brand identity. Exploring how this academic nature is perceived by different audiences – such as students, residents, and visitors – provides valuable insights into the interplay between the university and its city, helping to uncover its full potential as a dynamic and competitive urban space.

The aim of this article is to explore how the genius loci, or unique identity of cities shaped by their academic character, is perceived by different stakeholders (understood as groups targeted by the territorial megaproduct). The first part of the paper introduces the concept of genius loci and examines its relationship to city image and branding. This is followed by a discussion of how the university city category has been conceptualized in the literature. The results of the author's research are then presented, focusing on how different audiences perceive the dimensions of genius loci of university cities and how Polish cities are positioned within these identified characteristics. Finally, the findings are discussed, and the limitations of the study are outlined. The originality of this paper lies in the novel application of the genius loci concept in the context of university cities, offering a new perspective on their distinctive characteristics. Furthermore, using Multiple Factor Analysis (MFA) to integrate qualitative and quantitative data represents a significant methodological advance, enhancing the rigour and depth of the analysis.

2. Literature review

2.1. Uncover genius loci concept

Norberg-Schulz (1980) conceptualizes place as "a space with a distinctive character", defined by its tangible elements – form, texture, color, and materiality – which together create its genius loci or spirit of place. This "environmental character" encapsulates the essence and atmosphere that uniquely defines a place. A place is, therefore, a holistic qualitative phenomenon that cannot be understood by isolating individual characteristics, such as spatial relations, without losing its inherent essence. The concept of genius loci is widely discussed across disciplines such as philosophy, architecture and cultural anthropology. It is broadly understood as a meta-concept encompassing both the physical attributes of a place and the sensory-based perception of its intangible, spiritual qualities. This notion emphasizes the interplay between spatial environments and social processes, providing a framework to explore how places shape and are shaped by human experiences (Vecco, 2020). Genius loci can also be interpreted as a concept rooted in human perception and sensation, influenced by both physical and emotional experiences as well as pre-existing knowledge (ibidem). It highlights the interpretive

process through which individuals engage with and attribute meaning to places, blending lived experiences with cultural and personal contexts.

From an economic perspective, genius loci encompass key characteristics that highlight its value as an intangible asset. It is defined by its uniqueness and authenticity, serving as intangible heritage essential for the creation and preservation of cultural resources (Lokas et al., 2023). It is irreplaceable, intrinsically tied to the specific context of a place, and irreducible, reflecting a complex interplay of social, cultural, political, and historical factors (Tian and Zakaria, 2025). Moreover, genius loci possess a long service life that surpasses typical economic assets and functions as a public good – non-exclusive and accessible for simultaneous use by multiple individuals (ibidem). Figure 1 presents a schematic overview of the key elements of genius loci.

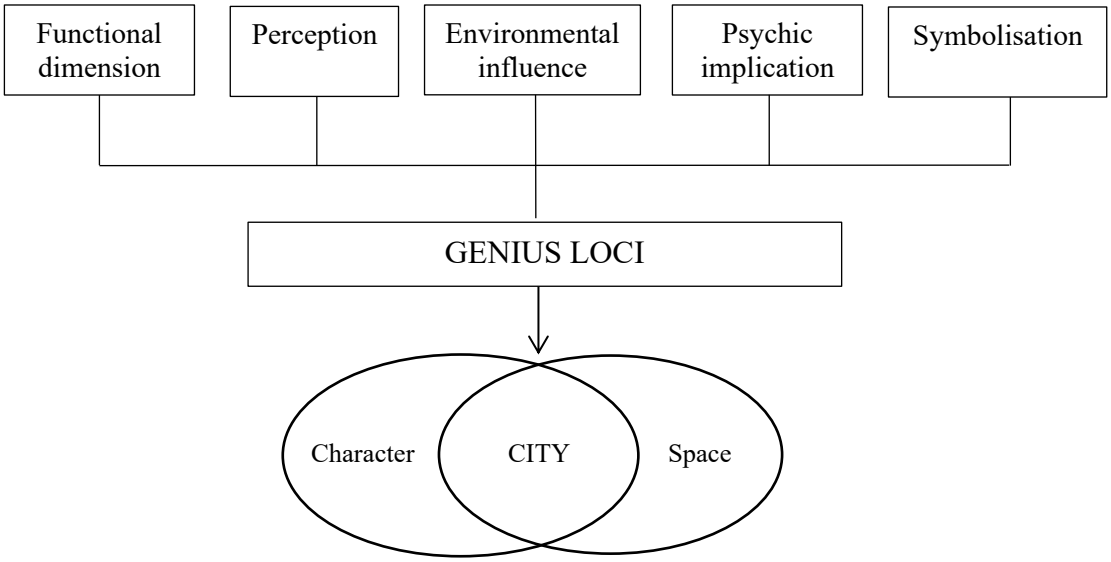

Figure 1. Conceptual diagram of genius loci.

Source: elaboration based on (Badami, 2022).

Analyses using the concept of genius loci emphasize three key elements related to place: material layer, human interaction with nature and intangible experience (Tian, Zakaria, 2025; Vecco, 2020). The first element involves interpreting both natural and man-made features in landscape representations, such as mountains, rivers, trees, and buildings. This analysis helps reveal the geographical and ecological aspects of the depicted site, as well as the symbolic meanings these elements hold within specific cultural and historical contexts. The third element focuses on the emotional and psychological responses evoked by these features, which are crucial for capturing the genius loci of a place. By examining these components together, it becomes possible to uncover not only the physical characteristics of a location but also its deeper cultural and atmospheric significance, contributing to the overall sense of place. The process of identifying and uncovering the genius loci involves numerous elements and requires a holistic understanding of the city's resources, as well as how these resources are utilized and positioned. This is synthetically illustrated in Figure 2.

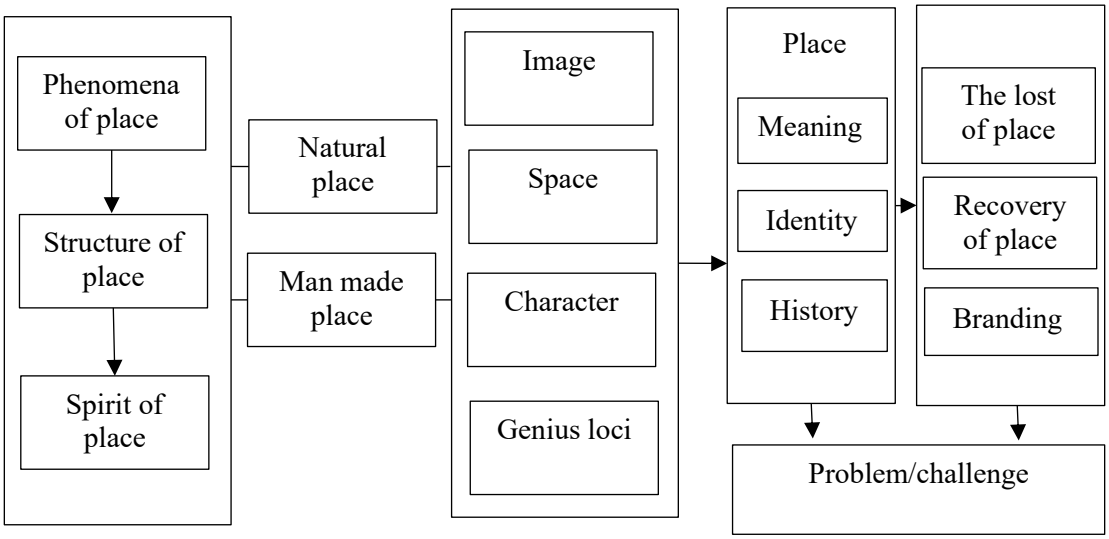

Figure 2. The search process of finding Genius Loci.

Source: own elaboration based on (Norberg-Schulz, 1980; Siregar et al., 2018, p. 2).

The concept of genius loci has been explored in various contexts, emphasizing its role in shaping urban identity. For instance, Asmara's genius loci is integral to its UNESCO World Heritage status, rooted in its historical and cultural-spatial characteristics (Tecle-Misghina, 2022). The study conducted by Rudnicka-Bogusz (2022) identifies features that differentiate military installations from other historic architecture, focusing on which elements must be preserved to maintain the genius loci of barracks complexes, particularly their scholastic potential and sentimental value. A study on Krakow's genius loci (Borkowski et al., 2017) highlights its role in shaping the city's image as a tourist destination. Based on tourist traffic data from 2012-2016, the research demonstrates how genius loci influence tourist satisfaction, loyalty, and perceptions of a destination. These examples highlight the significance of genius loci in defining and shaping urban experiences, which, in turn, influence the perception of a city's image and branding. The presented examples focused on discovering manifestations of genius loci. From this perspective, a key issue is how a place is perceived through the lens of genius loci by its users, and how specific categories or characteristics contribute to the formation of a place's image and its associated genius loci in the public consciousness. The aim of this article is to explore how the genius loci of university cities is perceived, focusing on the elements in the perceptions of different audiences that may be relevant from this perspective.

2.2. Conceptualisation of university city

The concept of the university city has gained increasing attention in the context of socio-economic transformations and the growing importance of knowledge-based economies. Academic centers significantly shape the potential of places – cities, regions, and beyond – by fostering development and enhancing promotion efforts (Boguski, 2008; Domański, 2013; Florida, 2000; Nowak, 2011; Purchla, 2012; Błoński et al., 2016; Sobocińska, 2011). A key feature of university cities is the free exchange of resources and ideas along the science-economy axis,

facilitated by proximity between institutions and industries. This proximity enables access to highly skilled labour, customer markets, and informal knowledge flows, factors increasingly critical for business location decisions (Freidlich, 1929; Nowak, 2011; Sobocińska, 2011). Universities thus contribute to regional or city competitiveness by stimulating creativity and innovation (Florida, 2010; Purchla, 2012).

Definitional approaches to university cities vary (Ćwiklicki, Pilch, 2023). Rewers 2016 describes the university city as a descriptive category within urban typologies, distinguishing it from academic centers/academic cities[10]. While academic cities are metropolitan areas with diverse functions, university cities are smaller towns where the university plays a dominant role in shaping the local economy and social life (ibidem). Quantitative indicators, such as the proportion of students in the population, are insufficient on their own to define university cities (ibidem). In contrast, Gumprecht (2009) defines a university city as one where a university significantly influences the community's character and functioning, proposing a quantitative criterion that at least 20% of the population should be students. Almond, in his research on American college towns, developed a taxonomy outlining the characteristics that define them (Almond, 2020). In Poland, an example of a report aimed at identifying university cities is the study conducted by the Polish Economic Institute (PEI) (Dębkowska et al., 2019). The study aimed to rank Polish university cities based on criteria reflecting their academic attributes (ibidem). This included prestige, assessed through academic staff evaluations and international recognition; graduate employability, measured by employer preferences and the economic outcomes of graduates; and innovation, evaluated through patents, intellectual property rights, and EU funding. Additionally, the ranking considered scientific potential, including parametric evaluations, staff qualifications (doctoral and habilitation degrees), and research infrastructure, as well as scientific effectiveness, which encompassed external research funding, staff development, degrees awarded, publications, citations, and Field-Weighted Citation Impact (FWCI). Study conditions were assessed based on access to highly qualified staff and institutional accreditations, while internationalisation was measured by the availability of foreign-language study programs, the presence of international students and staff, student exchange activities, and the multicultural composition of the student community.

The key concepts in place branding – brand image, brand identity, and brand positioning – are closely interconnected (Florek, 2014; Kapferer, 2008). Brand image reflects audience perception, while brand identity represents how the owner wants the brand to be seen, shaping its positioning and highlighting its advantages over competitors. A city's perceived identity directly influences its image, emphasizing the link between image, identity, and branding. Public perception and attributed meanings often form the foundation for strategic efforts to enhance a city’s appeal. In the case of a university city, the links between the city's identity and its genius

[10] Acknowledging the distinction in the literature between university cities, academic cities and college towns, this study treats the terms as synonymous. This approach was adopted because the respondents in the research did not perceive any significant differences between the two terms.

loci are particularly pronounced because the university often plays a central role in shaping both the tangible and intangible qualities of the place. The aim of this article is to identify the perceptions of the genius loci of a university city among different audiences, considering its role as a territorial product with distinct cultural, spatial, and social characteristics. In doing so, the aim was to determine how Polish cities are perceived in this context.

3. Methods[11]

To achieve the research objective, the study was guided by two questions:

- What characteristics do respondents use to describe the distinguishing features of the genius loci of a university city?
- How is the image of Polish university cities perceived?

A hybrid methodology (Chlipała, 2018; Creswell, 2013; Creswell, Plano Clark, 2018; Tashakkori et al., 2021) was employed to address the stated research questions. Data were collected through in-depth individual interviews, with the interview scenario specifically designed to enable the application of quantitative data reduction techniques during the analysis. The integration of quantitative and qualitative methods within the research procedure occurred at three key stages. During data collection, qualitative and quantitative data were gathered simultaneously, with the intent of nesting and integrating them. In data analysis, an intramethodical approach was employed, where both data types were integrated by following relevant threads aligned with the study's objectives. Finally, during result interpretation, conclusions were drawn by complementing, extending, and confirming findings from both qualitative and quantitative analyses, ensuring a cohesive and comprehensive understanding of the results. Data analysis was conducted using multiple factor analysis (MFA), chosen because it is well-suited for analyzing data derived from small sample sizes (small N).

Multiple Factor Analysis, first introduced by Escofier and Pagès (1994), is an extension of principal component analysis (PCA) that integrates data tables with varying measurement levels to analyze their relationships in a common multidimensional space (Abdi and Valentin, 2007). MFA allows the extraction of latent variables that maximize variance in the data without requiring large datasets. It supports both quantitative and qualitative variables, enabling structural and intra-structural analyses as well as the representation of objects in a shared factor space. MFA relies on singular value decomposition (SVD) and generalized singular value decomposition (GSVD) to identify independent dimensions from normalized data tables. Each table is analysed separately through PCA, with eigenvalues forming the basis for factor

[11] The MFA results described here represent a revised and supplemented version of a broader research project conducted as part of the author's doctoral dissertation, titled 'Hybrid Methods in City Image Identification'.

extraction. The latent factors represent linear combinations of observable variables, with no correlation among them, allowing systematic relationships to be uncovered (Panek, Zwierzchowski, 2013).

A stratified-targeted sampling approach was employed, with strata representing stakeholder groups commonly connected to both the city and the university: officials, academic staff, entrepreneurs, pupils, current students, and NGO representatives. Given the exploratory nature of the study, the sampling was purposive. Participants were selected to ensure that their roles, as relevant to the research objectives, were considered central to their personal or professional identities. To minimize the influence of perceptions shaped by broader experiences in multiple cities, all respondents were chosen from a single location, Kraków. This approach aimed to focus on localized perspectives and avoid biases stemming from exposure to other urban environments.

The fieldwork, conducted between March and May 2022, involved 32 individual in-depth interviews with 4–5 interviews per group. Sampling continued until theoretical saturation was achieved (Glaser and Strauss, 2009), ensuring that the selected respondents adequately reflected the characteristics, opinions, and perceptions of the phenomenon under study. Redundancy was used as a criterion to confirm sample adequacy (Pasikowski, 2015). Each interview lasted an average of 70 minutes.

At the analysis stage, a key representative was selected from each group/ layer for multiple factor analysis. This selection utilized cultural domain analysis (CDA), incorporating consensus analysis (Borgatti, 1994). While not all individuals within a group share identical perceptions, consensus analysis identifies dominant patterns, assesses variation within the sample, and evaluates respondents' knowledge of the cultural domain (Borgatti, 1998; Boster, 1986; Romney et al., 1986). This approach reveals prevailing cultural models and determines the respondent whose answers best reflect group consensus using cultural competence coefficients (Dressler, 2020). Techniques such as sorting (pilesort), free association (freelist), and triadic comparisons were employed to conduct CDA and identify the most representative respondents for further calculations (Borgatti, 1998).

Key university cities were selected based on the cited studies (Dębkowska et al., 2019). Based on the adopted criteria, the authors distinguished four groups of cities: leader, chasing leader, chase group, and peloton. In this paper, the analysis was limited to 11 cities: the leader (Warsaw), the chasing leaders (Kraków, Poznań, Wrocław), and the chase group (Białystok, Gdańsk, Katowice, Lublin, Łódź, Szczecin, Rzeszów). Respondents rated key Polish university cities based on the characteristics they had identified, using a 5-point Likert scale. This allowed them to assess the intensity of each characteristic in the cities they evaluated. In the next step, MFA was used to identify dimensions that describe the ideal type of university city, based on the characteristics distinguished by the respondents, as well as the positioning of the cities under study within the space defined by these dimensions.

4. Results

First, respondents were asked to list all the characteristics (on a free-association basis) that the ideal university city should have. This procedure aimed to capture associations that could be linked to the perceived genius loci of a university city. The responses obtained are presented in Table 1.

Table 1.
Attributes of the Ideal University City According to the Surveyed Groups

Resident	NGO representtative	Pupil	Student	Representative of the academic staff	Representative of the administration	Entrepreneur
Student presence	Plenty of green space	Presence of universities	A well-equipped campus	The presence of prestigious universities	Large number of students	Presence of universities
Presence of the university	The visibility of "student life"	Historic city / city with history	Developed transport infrastructure	Large number of students	Extensive residential infrastructure	Large number of students
Plenty of green space	Developed urban infrastructure	Developed transport infrastructure	Scientific/research infrastructure	The city's prevailing academic culture	Presence of universities	Observed "youth behaviour"
A well-equipped campus	The city's cooperation with foreign centres	Opportunities for young people to develop	Cultural venues	The use of resources	Availability of jobs for students	The presence of a specific language
Many places of entertainment	Cooperation of universities with employers		The presence of universities	Local government awareness	Extensive entertainment facilities	Tolerance
Developed transport infrastructure			Many locations with sports facilities		Student-driven demand	Existence of an ecosystem of universities – business – local authorities
The availability of jobs for students			Numerous restaurants and bars			The university's impact on city life
			Extensive residential infrastructure			
			Convenient location			
			Plenty of green space			

Source: own elaboration.

The MFA identified two primary factors, explaining 66.02% of the total variance (55.56% by the first factor and 10.46% by the second). The first factor reflects the general atmosphere of the city and the influence of the university on urban life, while the second factor relates to

the university and city infrastructure, including campus quality and urban greenery. Factor interpretation was based on loading coefficients, representing correlations between variables and components. The variables contributing to these factors are presented in Figure 3. Their distinction helped address the first research question: What characteristics do respondents use to describe the distinguishing features of the genius loci of a university city?

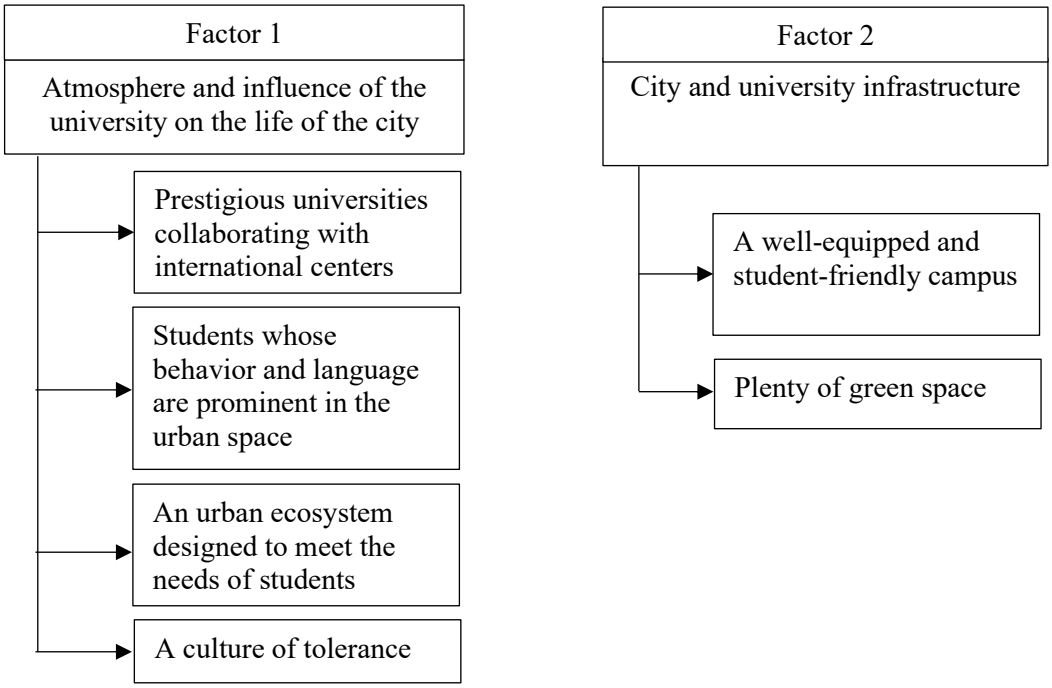

Figure 3. Factors describing a university city.

Source: own elaboration.

The analysis included positioning the cities within the space defined by the identified factors. This approach allowed for the identification of how these cities were perceived in relation to the characteristics associated with the genius loci and the ideal university city (Figure 4). The results of the multiple factor analysis reveal that the first dimension primarily distinguishes Kraków from Białystok. Respondents perceive Kraków as the city where universities play the most significant role in shaping urban life, characterized by a strong academic atmosphere. Warsaw is closely aligned with Kraków along this dimension, suggesting similar perceptions of its university-related influence. On the opposite end, Białystok, followed by Rzeszów, received the lowest scores, indicating weaker associations with university life and atmosphere. Szczecin and Lublin demonstrated the greatest similarity in this dimension. Although neither city was strongly identified as a university hub, their responses placed them in close proximity, reflecting comparable perceptions of limited university influence on urban dynamics.

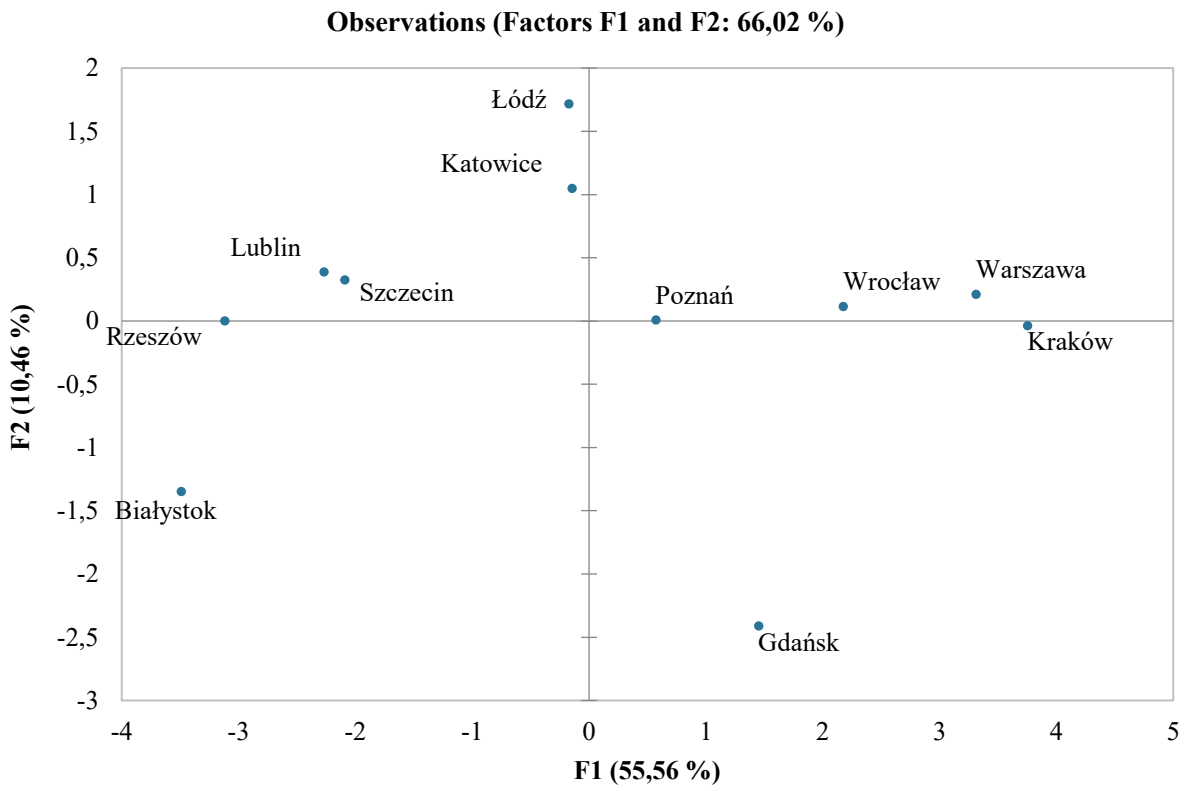

Figure 4. Cities in the global PCA space.

Source: own elaboration.

The second dimension highlights the role of infrastructure, urban greenery, and campus visibility in shaping perceptions. Łódź and Katowice received the lowest ratings, with respondents noting a lack of prestigious universities, underdeveloped campuses, and limited integration of green spaces within these cities. The variables associated with this dimension were negatively correlated in the initial stages of the analysis, and their spatial distribution was determined by the square root of the cosine of the variables. Gdańsk emerged as a positive outlier, receiving high ratings for its well-developed campus infrastructure, clear signage of university-related facilities, and integration of green spaces. Respondents frequently noted Gdańsk's seaside location as a contributing factor to its green and student-friendly image. Białystok also scored highly in this dimension, with respondents emphasizing the prominent role of its campus in the cityscape and attributing the modern infrastructure to effective utilization of European Union funds. Other cities, including Kraków, Wrocław, Poznań, Rzeszów, and Warszawa, were rated similarly, suggesting a more balanced integration of university-related factors and urban attributes. The factor loadings indicate that urban greenery was the most significant variable differentiating cities along this dimension.

The analyses conducted thus answer the second research question posed: How is the image of Polish university cities perceived?

5. Discussion

Complex development challenges and intensifying global competition are compelling cities to adopt marketing strategies that position their unique attributes (Dewalska-Opitek, 2010). Enhancing a city's competitiveness often involves identifying distinctive elements and assets tied to its territorial characteristics, which play a key role in shaping branding and public perception. In this context, a city's unique identity can be conceptualized as its genius loci, a core element for branding. One such asset is the presence of a university, which, when effectively leveraged, can not only drive urban development but also serve as a powerful tool in shaping the city's image. This study aims to explore how the audience of a territorial product, such as a university city, perceives and identifies the characteristics that could define its genius loci. Based on the concepts presented, which highlight the key elements of genius loci, the distinctions made by the respondents can be attributed to each of these elements. This analysis is graphically depicted in Table 2.

Table 2.
Constitutive elements of the genius loci of university city

Elements of genius loci	Characteristics of a university city highlighted by respondents
Material layer	Plenty of green space A well-equipped campus Prestigious universities Students
Human interaction with nature	An urban ecosystem designed to meet the needs of students A student-friendly campus
Intangible experience	Students whose behavior and language are prominent in the urban space A culture of tolerance

Source: own elaboration.

The analyses conducted not only provided insights into the perception of the genius loci of university cities but also enabled the positioning of Polish cities concerning the distinctive features characteristic of this type of city. From this perspective, the results obtained can be referenced and contextualized within the broader framework of the existing rankings of university cities. The ranking of university cities by the Polish Economic Institute (PEI) (Dębkowska et al., 2019) serves as a reference point. This analysis categorized Polish university cities into four groups: leader, chasing leader, chase group, and peloton. The comparison of these rankings with the results of the author's research provides valuable insights into the positioning and characteristics of Polish university cities. Differences are shown in grey in Table 3.

The apparent differences arise from the adopted approach, emphasizing that quantitative measures may not align with the way the city is perceived by its territorial product's target group. Kraków's high score on the dimension of atmosphere and influence of the university on the life of the city aligns with its established reputation as an academic and cultural hub,

reflecting historical prestige and a robust academic presence. This finding is consistent with earlier work by Rewers (2016), who emphasized that university cities possess distinctive traits that enhance their competitive positioning. Similarly, the strong association between academic vibrancy and city identity observed in Kraków supports Florek's (Florek, 2014) model linking brand identity, image, and positioning, underscoring how perceptions of academic excellence contribute to the overall genius loci. However, the study also highlights significant variation among Polish university cities, particularly in the visibility and integration of academic institutions. The lower scores for Białystok and Rzeszów on the dimension of atmosphere and influence of the university on the life of the city suggest challenges in embedding academic identity within the broader urban context. This aligns with findings by Sobocińska (2011), who noted that strengthening the integration of universities into the socio-cultural fabric through partnerships, programs, and community engagement could help address a competitive academic image.

Table 3.
Academic nature of cities - comparison of the PEI index of academic cities and own research results

City	PEI ranking	University character of the city - factor 1	University character of the city - factor 2
Warszawa	1	2	7
Kraków	2	1	3
Wrocław	3	3	6
Poznań	4	5	4
Lublin	5	9	9
Gdańsk	6	4	1
Łódź	7	7	11
Katowice	8	6	10
Szczecin	9	8	8
Białystok	10	11	2
Rzeszów	11	10	5

Source: own elaboration.

The second dimension, emphasizing infrastructure and urban greenery, highlights the impact of physical and environmental attributes on perceptions of university cities. Gdańsk's high ratings for campus visibility, urban greenery, and well-planned infrastructure demonstrate how strategic urban design can enhance the attractiveness of academic centers. In contrast, cities like Łódź and Katowice scored lower on this dimension, indicating underdeveloped infrastructure and limited integration of green spaces. These results suggest a need for targeted investments in sustainable urban development, particularly in enhancing campus infrastructure and integrating green spaces into urban planning. Such initiatives could not only improve perceptions of university cities but also contribute to broader goals of environmental sustainability and livability.

The findings have implications for city branding strategies. For cities like Kraków and Gdańsk, leveraging existing strengths – such as their cultural heritage, academic reputation, and environmental assets – could reinforce their positioning as premier university cities on a global scale. For cities with lower scores, targeted branding strategies could focus on addressing specific weaknesses. These strategies are critical in a competitive global landscape where university cities must differentiate themselves to attract students, researchers, and industries (Boguski, 2008; Burlita and Błoński, 2016).

6. Summary

The analyses presented in this article uncover the genius loci of university cities through the experiences and perceptions of various stakeholder groups. By employing a hybrid methodological approach, the study identifies the characteristics that respondents consider central to their sense of place in the context of a university city, providing valuable insights into the elements that shape its unique identity. In addition, the use of multiple factor analysis (MFA) facilitated the positioning of Polish university cities within the identified dimensions. The conclusions drawn from the study indicate that two dimensions play a crucial role in defining the sence of university city. The first dimension underscores the role of cultural and academic integration in defining the essence of university cities. Kraków's high scores reflect its established reputation as an academic and cultural center, where universities are central to the city's identity. This strong association suggests that historical prestige and a visible academic presence significantly influence perceptions. Conversely, the low ratings for Białystok and Rzeszów may point to less visible or less impactful academic institutions within these cities. Strengthening the integration of universities into the social and cultural fabric of such cities could enhance their academic identity. The second dimension emphasizes the critical role of infrastructure, including campus quality and urban greenery, in shaping perceptions of university cities. Gdańsk's high ratings demonstrate the impact of effective urban planning and well-integrated academic spaces on the city's overall image. Respondents highlighted factors such as clear signage of university facilities and the perceived environmental friendliness of the city, suggesting that accessibility and urban design contribute to a positive university city image.

The case of Białystok illustrates how targeted investments, such as those funded by the European Union, can elevate the perception of smaller cities as university hubs. This finding highlights the importance of leveraging external funding for modernizing campus infrastructure and improving the visibility of academic institutions within urban spaces. In contrast, the low ratings for Łódź and Katowice along this dimension suggest challenges that may stem from insufficient campus infrastructure or a lack of integration with green spaces. These cities could

benefit from strategic urban initiatives aimed at enhancing student-centric facilities and environmental features. For example, the development of green spaces and improved campus design could increase their appeal as university cities.

The results underscore the importance of a multifaceted approach to city branding for university cities. For cities like Kraków and Gdańsk, existing strengths can be leveraged to reinforce their image as premier university cities. This may involve promoting their academic reputation, cultural heritage, and environmental assets. For cities with lower ratings, such as Białystok, Łódź, and Katowice, targeted branding strategies could focus on addressing identified weaknesses, such as improving campus infrastructure, enhancing urban greenery, or better integrating universities into the city's identity. These efforts could align with broader goals of sustainable urban development and regional competitiveness.

The study contributes to the broader literature on city branding by extending the application of the genius loci concept to university cities. By integrating cultural, spatial, and social dimensions, the research provides a holistic framework for understanding how academic institutions shape urban identity. From a practical perspective, the findings offer actionable insights for urban planners and policymakers. Enhancing the integration of universities into the urban fabric, improving infrastructure, and leveraging cultural assets can create more vibrant and competitive university cities. Furthermore, the use of MFA to analyse stakeholder perceptions provides a methodological contribution, demonstrating the utility of combining qualitative and quantitative approaches in urban research.

Building on the findings of this study, several avenues for future research can be pursued to deepen and expand the understanding of genius loci in university cities. Comparative studies could be conducted across other academic centers, both regionally and internationally, to explore how perceptions differ and identify commonalities or unique features. Future research could expand on these findings by exploring longitudinal changes in perceptions of university cities. Additionally, comparative studies involving international university cities could provide a broader context for understanding the interplay between academic institutions and urban identity.

The research procedure employed allowed for statistical analyses but involved purposive sampling, meaning the results cannot be considered statistically representative. Additionally, respondents were selected based on their connection to Krakow through residence, work, or study, aiming to eliminate perceptions influenced by experiences in multiple cities. While this approach provided focused insights, it limits the findings to the perceptions of individuals associated with a single city. Conducting similar studies with groups from other university cities could yield different results, highlighting the need for caution in generalizing these findings.

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THE FINANCIAL CONTEXT OF CORPORATE GREEN INVESTMENTS IN THE POLISH BANKING SECTOR

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Purpose: The primary research objective is to determine the premises of the expansiveness of credit institutions in financing corporate green investments in Poland.
Design approach: The research focuses on updating the positive and negative aspects of the expected increase in the effects of green financing of corporate investments in the European Union. ESG issues have become widely disseminated in broadly understood publications. The areas of the issues studied within their framework are also expanding. There are certainly many reasons for the observed situation. In principle, however, they arise from the ever-increasing financing needs of ESG strategies adopted by business entities. They are also closely tied to the growing public acceptance of counteracting climate change. In economic practice, this means increased competition for means of financing ESG strategies and, as a result, also the emergence of a number of economic barriers to its implementation. The issues related to financing corporate green investments are the main subject of the research since they are the ones that require considerable financial outlays, the use of which is subject to stringent EU regulations frequently exceeding the business capabilities of companies. Green investments also generate a high level of ESG risks, both on the part of recipients and donors of financial capital. In ESG strategies, however, they constitute the most significant factor in climate change determining the scale of innovation of modern companies and their adaptability to the challenges of the global economy. The review of the literature on ESG issues reveals that financing corporate green investments requires extensive research. In this respect, there is no access to reliable empirical data and classical methods of verifying the effects and costs of corporate green investments are unreliable.
Findings: The research results presented in the paper expand the knowledge in the field of implementation of ESG strategies in business entities in Poland. Conducted consecutively for a long period, they make it possible to shape an increasingly objective view of green financing of sustainable development goals with bank credit.
Originality/value: The questionnaire-based research conducted in the first half of 2024 made it possible to assess the motives for financing ESG strategies of companies in the Polish banking sector.
Keywords: green loans, new ESG reporting standards, motives for corporate green financing, ESG strategies
Category of the paper: viewpoint.

1. Introduction

Sustainable development is a concept that has been changing the face of the global economy since the 1950s. Particular interest in sustainability from numerous scientific, business, and political environments is linked to adopting an ESG strategy that explicitly targets climate action. In the European Union, the energy transition has become a significant factor in stimulating its further dynamic economic growth based on the innovative transition of all 27 member states. The document promoting business actions appeared to be the publication of the European Green Deal in 2019, the primary mission of which is to achieve climate neutrality by 2050. Finalising such an ambitious sustainable development goal in the business environment entails specific and rapid measures that alter the existing production profiles requiring the implementation of new techniques and technologies. Therefore, it is mainly associated with financing green investments of companies requiring the accumulation of capital resources significantly exceeding their existing cash income. A growing number of studies and discussions relating to the energy transition in EU member states emphasize the need to finance ESG business strategies using private capital resources. However, the intended allocation of financial capital involves significant ESG risks for all participants in this process. Numerous regulations are therefore implemented in the European Union to direct private financial flows toward green investments. These regulations are related to the development of the market for green and sustainable bonds, fund, and stock market instruments, as well as bank loans. The primary research objective of this paper is to determine the premises of the expansiveness of credit institutions in financing corporate green investments in Poland. A review of the literature on sustainable development and a critical analysis of current studies on the energy transition indicate numerous threats to achieving climate neutrality in the European Union by 2050. (Juszczak, 2024; Krawczyńska-Kaczmarek ,2024; Pisarska,2024; Pyka I, Pyka J, 2023) After all, geopolitical conditions in the global economy are undergoing serious changes. High uncertainty is emerging also at the macroeconomic level of the EU member states, which directly affects the possibility of financing the green transition therein. Meanwhile, the regulatory pressure from EU authorities for rapid financing of the European Green Deal is constantly increasing. The results of the surveys conducted in the banking environment since 2020 verify the thesis that the motives for financing ESG strategies of companies in the Polish banking sector are changing but not hindering the process. On the other hand, changes observed in the external environment of credit institutions increase ESG risks necessitating modifications to bank risk management systems and closer cooperation with banks' business stakeholders.

2. Materials and methods tables

2.1. External conditions for financing ESG strategies

In the observed maze of growing issues related to green financing of ESG strategies, supporters and opponents of process continuation or intensification can be distinguished. The observed climate change, accompanied by unprecedented, catastrophic natural phenomena, is an indisputable argument appealing to all groups of green financing stakeholders. It is also pointed out that the energy transition significantly affects the economy as well. According to the IMF, the medium-term impact multiplier of investments in renewable energy sources on GDP for 2021 amounted to 150%. According to its supporters, the green transition also means a thriving labour market. In the European Union, the energy transition has unexpectedly been driven by the energy crisis caused by the EU's dependence on fossil fuels, highlighted by Russia's aggression against Ukraine. It is therefore indisputable and socially accepted to further decarbonise the EU economy in line with the objectives of the European Green Deal. The group of supporters of the green transition in the European Union also includes countries with a high level of commitment to modern energy technologies that improve their economic innovativeness and international competitiveness. On the other hand, its opponents are the remaining member states whose economies will be impaired in the face of the costs of the green transition. Extensive investment in renewable energy sources, while profitable in the long run, entails a tremendous increase in demand for metals and critical raw materials. This translates into increased prices with all the financial, economic, and social consequences. The situation is encouraging ever greater polarisation of social attitudes in EU member states and generating therein a permanent increase in uncertainty accompanying the implementation of ESG strategies. At the same time, the Estimates of the European Commission of 2023 indicate that additional investments of EUR 620 billion per year are necessary to meet the objectives of the European Green Deal. On the other hand, estimates by the International Energy Agency show that the European Union must increase its annual expenditures on low-emission energy by EUR 200 billion to stay on track for achieving climate neutrality by 2050. Therefore, under the European Commission's plans, most of the investments will need to be financed with private resources. The size of this financing, however, raises far-reaching concerns. The demand for financing environmentally friendly projects is observed to be growing constantly. The European Commission's estimates as of July 2021 show that the European Union will need additional investments of EUR 350 billion per year during the current decade (Zielone finance, 2024). Green investment is also growing globally. In 2023, it reached USD 1.77 trillion, or nearly 2% of the global GDP. However, according to the latest estimates, the gap in financing sustainable development goals globally amounts to USD 11-15 trillion per year, four times the current level of spending to date. (United Nations, 2022). Therefore, there is increasing resistance to the green transition of the modern economy stabilised by

the optimism of its supporters. However, the problem exists and requires a wide-ranging, substantive debate. It seems particularly significant in the context of high geopolitical, economic, and financial uncertainty in the global economy. The issues emerging in its context determine the effectiveness and efficiency of implementing business ESG strategies, which are frequently marginalised from a microeconomic perspective. Regulations that directly aim to channel private financial flows into green investments are a significant determinant of the implementation of ESG strategies in the European Union. Key regulations in this area include the EU Taxonomy, the Non-Financial Reporting Directive (NFRD), the Sustainable Finance Disclosure Regulation (SFDR), the Corporate Sustainability Reporting Directive (CSRD), the Corporate Sustainability Due Diligence Directive (CSDDD), and the European Sustainability Reporting Standards (ESRS) (Pyka, Pyka, 2023) On October 17, 2023, the European Commission adopted Delegated Directive 2023/2775 on adjusting company size criteria for micro, small, medium-sized, and large undertakings or groups. (Commission Delegated Directive—2023/2775) On December 22, 2023, European Sustainability Reporting Standards were released as a delegated regulation of the European Commission. This legal act is directly applicable to all EU member states. The ESRS have their legal basis in Directive 2013/34/EU, as amended by the CSRD. Thus, it does not require additional implementation at the national level. The new ESG reporting standards in Europe, introduced by the ESRS, are expected to increase the transparency and accountability of companies for green investments. Companies subject to reporting under the CSRD must comply with the new requirements, including both general reporting principles and detailed environmental, social policy, and governance guidelines. However, the EU regulatory process has not been closed since the logic of the ESG process is constantly progressing, which requires detailed disclosure of information to assess the desired directions of green transition of business. Since these are constantly changing, ESG reporting under the CRSD provisions and guidelines is being implemented in stages (2024-2027), covering a growing number of entities. The scope of mandatory reporting is also increasing. This is because a green business environment must be transparent about ESG implementation and able to assess ESG risks since any irregularities in this process are subject to sanctions. The changes being introduced should undoubtedly prevent irregularities in the financing of green investments implemented across a significant swath of the European Union. The threat of greenwashing, however, remains significant, which is demonstrated by the greenwashing directive that has been in force in the European Union since 26 March 2024. The new regulations contained in the directive have not been applied by EU member states yet. According to the directive, however, this should happen no later than 27 September 2026. Despite all this, according to estimates and surveys of various entities, financial and non-financial institutions are increasingly interested in ESG strategy implementation. Polish entrepreneurs are also focusing on inspiring change and implementing specific sustainability measures. One in three of the companies studied has a sustainability strategy. Companies employing between 2 to 10 and 11 to 49 employees dominate among them (34% and 41%,

respectively), while sole proprietorships mainly do not have any strategy (58%). At the same time, the vast majority of respondents find it rather important or definitely important to take measures to support sustainable development. However, verification of business activity accepting ESG strategies remains difficult (Marciniak, 2024). Significant reasons for this situation are not only the deficiencies in accounting records but also varied sources of green financing (bank, fund, bond, stock exchange, and public). Bank and credit recipients' disclosures make it possible to claim that this approach is developing dynamically. The first ESG-linked transaction (bank financing) in Poland was conducted in 2019 for Energa (with another tranche in 2020). Another one appeared in 2021 for Raben Group Six. In 2022, six such transactions were completed, and by the end of 2023 another 15. The value of disclosed bank ESG transactions in Poland reached at least PLN 33.717 billion at the end of 2023. Therefore, the volumes of bank green financing are growing rapidly. It is, however, worth noting that nominally high transactions influence the volume of bank ESG financing. In 2023, the transaction for Grupa Polsat Plus alone amounted to PLN 10.6 billion. (Pisarska .2024) Simultaneously, among the 23 companies and groups obtaining financing were industry-diverse companies; 5 representatives of various types of industrial manufacturing, 5 representatives of transport and logistics, 4 representatives of conventional energy and mining, 2 media and telecommunications groups, 2 retail chains, and single representatives of medical services, food production, automotive industry and financial services (Pisarska, 2024). Considering the needs of the climate transition, the results presented are hardly impressive or satisfactory. Therefore, with high probability, it can be assumed that constraints are impeding the increase in the amount of funds for the European Green Deal at the level of business ESG strategies. Their identification requires extensive research, although, with the assumption that the amount of green financing is growing, increased competition for green capital among business entities should be expected, contributing to an increase in the cost of its acquisition. From the perspective of the increased involvement of private financial institutions in sustainable development, the indicated trend will lead to a steady increase in their income and a positive change in their investment portfolio. Under increasing demand for green capital, difficulties in financing the "non-green needs" of business entities, small and medium-sized companies operating in domestic financial markets in particular, will intensify. After all, international and global corporations will obtain green financing through project finance programs, stimulating changes in their existing international business positions. These processes will undoubtedly be accompanied by an increase in the scale of the global economy's financialization, which can be difficult to regard as a positive phenomenon in the context of sustainable development. Therefore, an ESG strategy should be regarded as a serious factor for global change in the operations of companies and financial institutions. Thus, the unequal level of development and social dissatisfaction will intensify in the European Union with a significant difference in the level of preparation of member states for climate transition. After all, the largest financial and opportunity costs of the green transition will be incurred by companies in sectors that are among the largest

emitters of CO2. Obtaining a consensus on this issue seems unlikely. Therefore, sustainable development will eventually slow down regardless of the scale of new climate transition regulations.

2.2. The willingness of banks to finance green investments

Financing green investments with a bank loan currently operating under the Sustainability Linked Loan (SLL) formula is a relatively new solution. The framework for this mechanism has been defined in the Sustainability Linked Loan Principles (SLLP) published in 2019. The experience from the growing application of this instrument in ESG financing has resulted in its further revisions. The latest edition of the SLLP was updated in February 2023, and according to the adopted definition, SLLs are all types of credit and/or contingent instruments (secured lines, guarantee lines, or letters of credit) that meet ESG requirements, the application of which, however, depends on the sustainable development goals achieved by the credit recipients. The structuring of the corporate green lending issue has certainly played a key role in sparking greater interest among banks in directing financial capital toward environmentally sustainable projects. The CSRD has also become a significant document intensifying ESG financing opportunities in the Sustainability Linked Loan formula. According to the adopted regulations, the parties to the agreement and thus the bank (and/or financing banks) together with the credit recipient must agree on sustainable investment indicators (Key Performance Indicators). Within the framework of the defined targets for all criteria – SPTs (Sustainability Performance Targets), the indicators measured year on year should increase guaranteeing the appropriate way to implement the investment financed with a green loan. The interest rate of the loan depends on the structure of the ESG objectives and is agreed upon by the parties to the agreement (the creditor and the credit recipient), taking into consideration potential changes. In the process of financing green investment, the credit recipient is obliged to report to the creditor on the implementation of the tasks financed with the loan while specifying the degree of achievement of each KPI with independent third-party verification confirmation. By this means, the credit recipient controls the achievement of the agreed SPTs and can revise the interest rate terms of the green credit. The Sustainability Linked Loan mechanism based on linking the price of capital (interest rate terms) to the sustainable development goals of the entity, unquestionably serves to motivate the financial sector client (capital recipient) to make progress in sustainability-relevant dimensions. When it comes to credit institutions, the mechanism reduces ESG risk, which undoubtedly encourages them to provide green lending. Estimates indicate that bank green loans are becoming a better sustainability instrument than green bonds, which already appeared on the financial market in 2007. In Poland, bank financing with a margin linked to achieving sustainable development goals (ESG) is becoming more and more common. This is indicated by various estimates. At the end of 2023, bank green loans nominally amounted to more than PLN 33 billion, while the value of green and other sustainable local bond issues of non-financial companies has to date amounted

to an estimated PLN 9.5 billion, whereas investment funds registered in Poland - to PLN 6.5 billion in assets at the end of the first quarter of 2024. These estimates indicate that the strongly formalised process of ESG lending (green investments), where both the credit recipient and the creditor must be guided by strictly specified sustainable development goals, is not a significant obstacle to their mutual green relationship. Moreover, it is worth noting that all the previously indicated regulations generated in the European Union within the framework of supporting ESG processes remain in force, requiring banks and companies to build strong, separate entities for managing the process of sustainable development and ESG risks. Simultaneously, the reporting process has been spread over the years starting from 2024. Criteria have been established according to which, starting with large companies and groups and ending with small and medium-sized enterprises, mandatory ESG reporting is introduced. This fact is usually interpreted as facilitating the preparation of green financing procedures. On the other hand, it emphasises that complex green financing procedures require spectacular personnel preparation for ESG reporting. In small and medium-sized companies this signifies using the services provided by entities that offer relevant support and charge for it. Thus, financial costs and contingency preparation of the green financing process continue to multiply. From what has been seen so far, it is also clear that any loophole in the process of achieving ESG objectives is rapidly becoming the basis for further EU regulations. Thus, the sustainability landscape is shaped by several trends that are uncertain from a green lending perspective. These should include increased regulatory support and increased standardisation of sustainable development, greater integration of ESG factors into mainstream investing, and strong corporate and investor activism forcing companies to adopt more sustainable practices. They point to central control of sustainable development and should in principle limit its market-based financing. Yet this is not so obvious. After all, the whole logic of successive ESG regulations is based on the fact that companies should report in detail on the sustainable development goals they are pursuing. Then the pressure generated by various stakeholders will naturally lead to the desired business transition. Assuming that the administrative management of ESG business strategies will be efficient, increasing demand for capital financing green investments in the European Union should be expected. Meanwhile, the assessment of the course of this process has been so far extremely difficult. ESG data, which are an objective tool and the foundation for analysing sustainability progress, are virtually unavailable. This is because there is no access to aggregated ESG data in the form that would make it easy to compare goals and their implementation by various entities. Meanwhile, the quality of the published ESG estimates and reports increasingly developed by companies leaves a lot to be desired. In this context, the questionnaire-based research conducted over a long period with complete consistency of analysed issues and formulated survey questions is justified. The research conducted successively since 2020 by the research team of the Department of Banking and Financial Markets of the University of Economics in Katowice covers the issues of sustainable development goals focusing on sustainable financing, the process of greening the portfolio

of bank loans, and ESG policy and risk. The current research stage focused on the development and implementation of banks' ESG strategies, their financing of green investments, in-depth aspects of ESG risk in bank risk management, climate risk in banks, and their reporting of ESG measures. The questionnaire-based research was conducted in the first quarter of 2024 among the representatives of the 10 largest commercial banks in Poland. The research sample included the following banks: PKO BP S.A., Bank Pekao S.A., Santander Bank Polska S.A., ING Bank Śląski S.A., mBank S.A., BNP Paribas S.A., Bank Millennium S.A., Alior Bank S.A., Citi Handlowy S.A. and Velo Bank S.A. Acknowledging at the same time that the total value of the assets of these institutions represents 79% of the total value of the assets of the Polish banking sectors, the results obtained from the survey of their representatives are therefore representative of the whole banking sector in Poland. The survey included 100 representatives of commercial banks in Poland occupying managerial positions and related to ESG issues and sustainable development. 77% of respondents had at least 10 years of experience working in a bank. The structure of the respondents makes it possible to conclude that most respondents could observe the changes that have been taking place in banks over the past few years, resulting from the increasing global interest in sustainability issues. The underlying rationale for initiating questionnaire-based research verifying the progress in the implementation of ESG strategies is a research gap in the sustainability assessment. In spite of that, the issue of socialisation of production processes and increasing the chances of the global economy for pro-ecological development has been widely discussed for a long period, constituting the subject of many papers and scientific research. They concentrate, however, mainly on theoretical issues directly leading to the need to increase the scope of research verifying the role and significance of the ESG concept in the global economy. Such an opportunity emerged in the European Union with the launch of the European Green Deal in 2019, a package of policy initiatives, the aim of which was to set EU member states on a path towards environmental transition and eventually the achievement of climate neutrality by 2050. The research by the EU Team began in 2020 and successively analysed ESG strategies. However, the sustainable financing of corporate green initiatives in Poland is an essential research subject that corresponds directly to the interests of its members. The research conducted to date has been questionnaire-based, which results directly from the difficulty in obtaining the required, even short-term empirical data. The collected research material is systematically published, which makes it possible to understand the scale and direction of ESG strategy financing in Poland. Guided by the objective of this paper, a part of the questionnaire-based research was selected, which made it possible to establish the level of interest of banks in financing ESG strategies of companies operating in Poland.

2.3. Limitations of corporate green financing in domestic banks

The questionnaire-based research of 2024 indicates that over 90% of institutions in the Polish banking sector have either implemented or announced the implementation of ESG strategies, which means that real efforts are being made in the Polish banking sector towards green financing for sustainable development. The conducted research indicates that the essential motive for a positive approach to implementing an ESG strategy by banks is an opportunity to improve their image among various groups of stakeholders. This motive was indicated by as many as 95% of respondents. Whereas 24% of respondents claim that the implementation of an ESG strategy is also an opportunity to improve the bank's position in the market. The remaining motives, which in the research included pressure from the parent bank, the geopolitical setup, and an improvement in stock prices, were not significant in the respondents' opinion. With a high degree of probability, it can therefore be assumed that commercial banks in Poland intend to compete for corporate green financing mainly with offers that best meet the formal EU criteria. This conclusion is also confirmed by the results of the research in which 72% of respondents indicated that banks make capital flows for green financing to a minor extent, whereas 17% of respondents think that such financing takes place, however, only in the case of projects that meet the taxonomy criteria. On the other hand, 9% of them declare that there is no capital flow in banks for green investments since credit recipients themselves are not interested in such financing. In contrast, when reviewing the direction of this financing, respondents pointed out that bank green funds are mainly directed at investments related to energy transition, climate change mitigation, and environmental protection. On the other hand, projects that finance investments in the area of social responsibility and corporate governance play a less significant role (Pyka, Nocoń, 2024). They therefore prefer nominally high corporate green financing by shifting investment risk to them. Banks are also guided by specific criteria in financing investments (Figure 1).

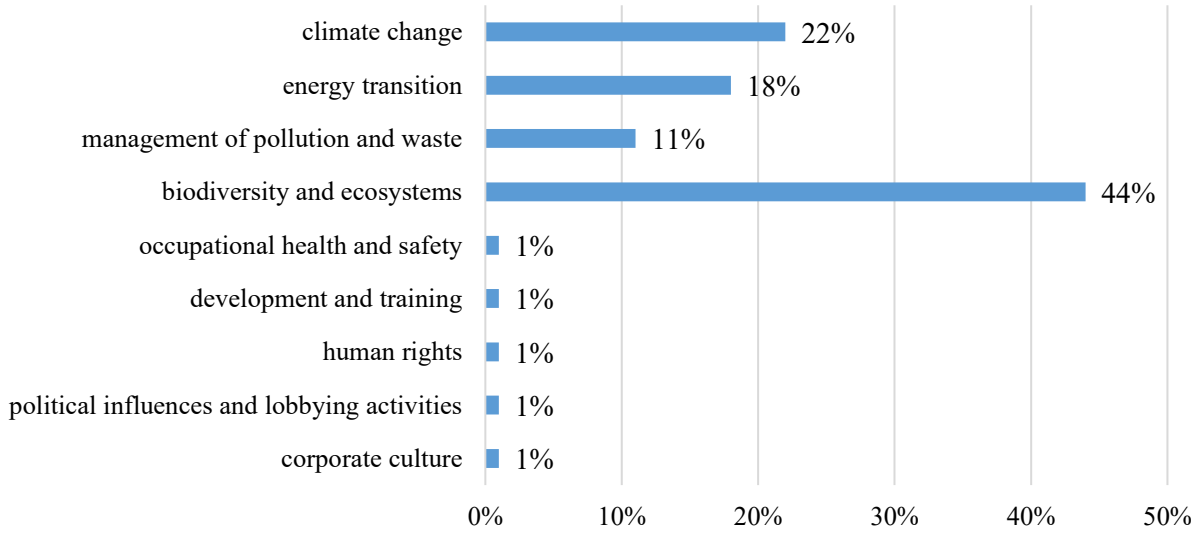

Figure 1.

Source: own elaboration.

They concentrate on loans financing biodiversity and ecosystems (44% of respondents), climate change (22% of respondents), and energy transition (18% of respondents). That is why not all the needs for corporate green financing in the banking sector are evenly distributed. Moreover, it can be assumed that the process will exclude especially small and medium-sized companies. At the same time, it comes as a surprise that 22% of respondents point out the need to allocate bank capital to climate change. Russia's aggression against Ukraine showed that financing energy needs in Poland should be prioritised. At the same time, looking at the survey results, it is difficult to evaluate the preferences for corporate green lending in Poland. In Table 1, respondents expressed the reasons for managing climate change while evaluating this need. 69% of respondents indicated improved energy efficiency in climate change management, logically contradicting the results shown in Figure 1.

Table 1.
Indicate good practices in climate change management in your bank

Name	
Managing climate impact (estimating carbon footprint, identifying reduction objectives, selecting appropriate actions for impact and financial commitment, and adopting an implementation schedule)	56%
Improvement in energy efficiency (concerning transport, lighting, buildings, energy production)	69%
Purchase of green energy (from outside companies or self-produced)	55%
Transport optimisation and eco-driving	26%
Carbon offsetting	2%

Source: own elaboration.

When analysing the willingness of banks to provide green financing to companies, respondents also answered a question about the factors hindering the implementation of ESG strategies (Figure 2). 56% of respondents point to the high cost of transitioning the bank to an ESG strategy. There is also high awareness (49% of respondents) of the low preparation level of the managers for its implementation, which significantly increases the costs of staff training inbanks (49%). There is also a strong awareness of the need for continuous personnel education.

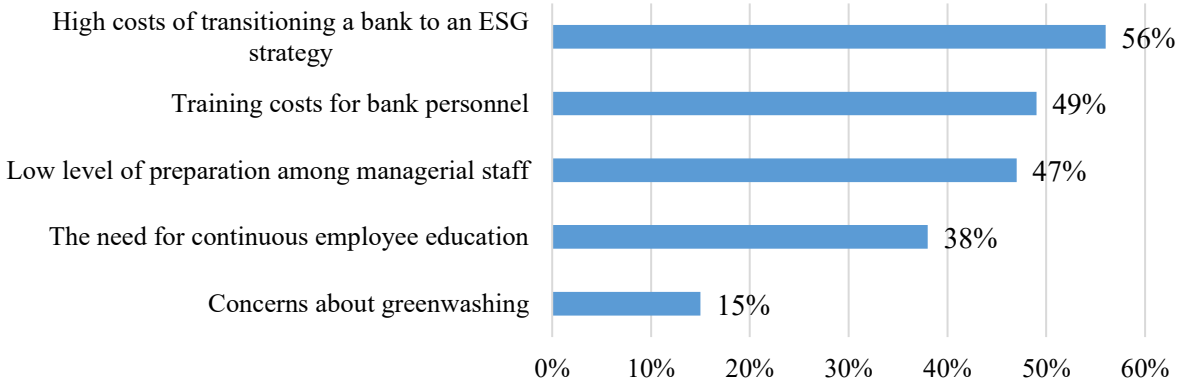

Figure 2. In your opinion, what are the reasons hindering the implementation of ESG strategies?
Source: own elaboration.

By contrast, respondents do not indicate ESG risk among the determinants of green lending. 44% of respondents thought that ESG risk affects corporate green financing only to a small extent. It is also worth noting that respondents do not link ESG risks to the high bank capital required to secure green investment transactions. Only 10% of respondents also link the limitations of corporate green financing to the regulatory need to include ESG risks in bank management (Figure 3).

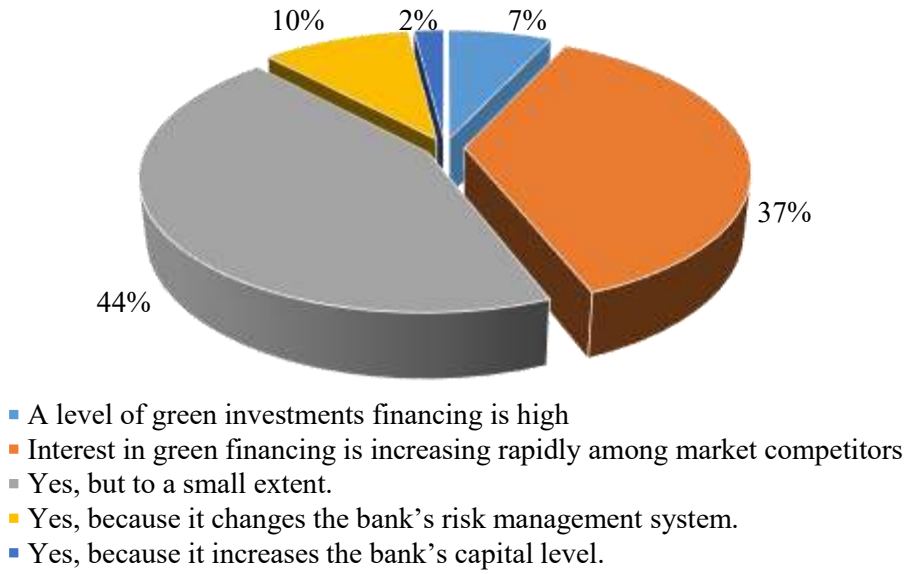

Figure 3. In your opinion, ESG risk affects banking activities because:

Source: own elaboration.

The respondents also indicate that banks apply EU regulations related to the CSRD. 46% of respondents state that they implement the reporting obligation resulting from the CSRD respecting the principle of the so-called double materiality. Similarly, 46% of respondents pay attention to ESG-related indicators and objectives in the reporting process (Figure 4).

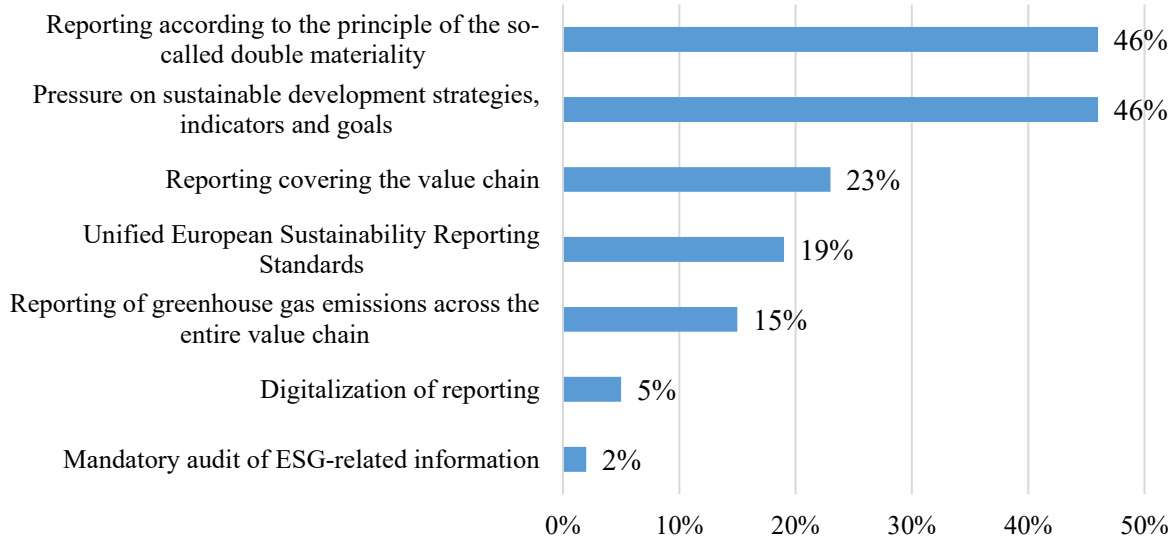

Figure 4. What provisions resulting from the CSRD are already being applied in your bank?

Source: own elaboration.

The significance of reporting is recognised by the respondents in interactions with investors and consumers (51% of respondents). They also indicate other positive aspects of sustainability reporting, which certainly highlights the meeting of banks' expectations to reduce the risk of green lending (Figure 5).

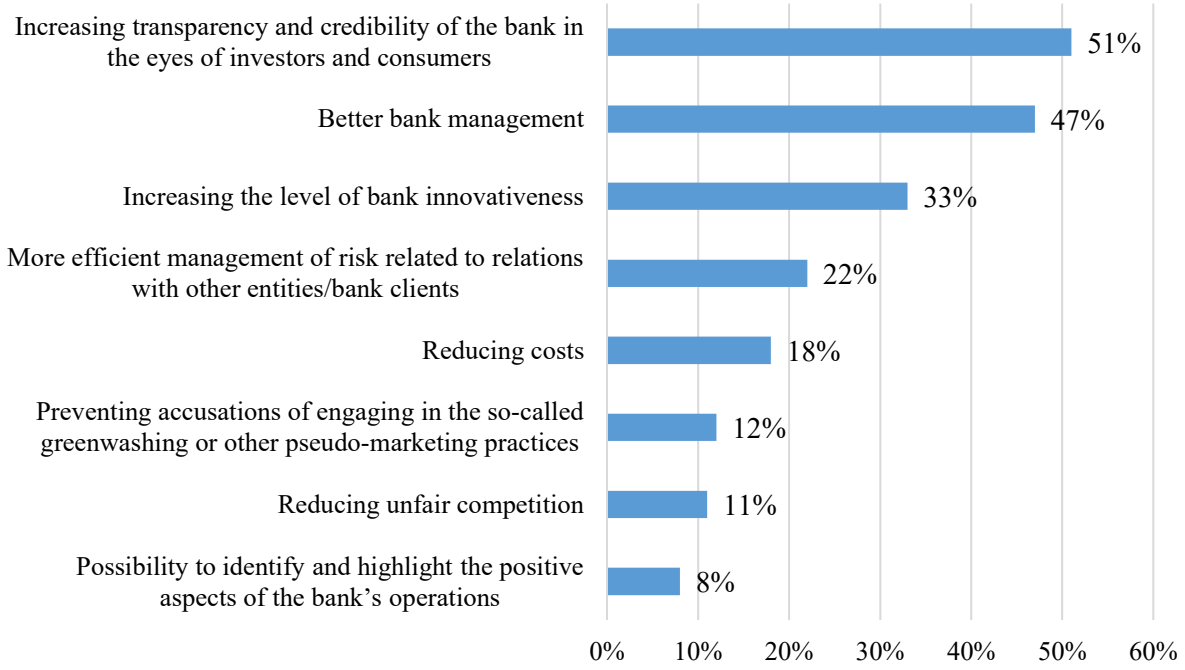

Figure 5. In your opinion, reporting on sustainable development issues is an opportunity for:
Source: own elaboration.

The bank client is frequently confused and does not have sufficient organisational or legal resources to understand the requirements resulting from ESG. That is why banks, addressing the needs of their customers, perceive it as an opportunity to increase their relationship with clients and strengthen the connection between the client and the bank, which facilitates fulfilling their new obligations. They are, therefore developing the right tools and instruments in their relations with clients to help bank clients, mainly companies, meet their ESG reporting obligations. After all, green financing requires interaction with the client.

3. Results

The conducted research broadens the knowledge of ESG strategy implementation. Conducted successively for a long time, it makes it possible to shape an increasingly objective picture of green financing of sustainability objectives with bank credit. However, in the European Union, the ESG strategy implementation is taking place under high uncertainty driven primarily by geopolitical changes in the global economy. They undoubtedly determine the varying course of the process in the member states. However, there are many more factors of external nature

influencing corporate green lending. Maintaining economic prosperity stabilising green financing conditions in the private sphere is essential among them. The economic growth of EU member states since the global financial crisis has consistently failed to achieve the expected momentum. Thus, there is a concern in the business environment about the increasing cost of financing sustainable development. Studies also show that there is a growing demand for ESG financing, which means the need to increase funding for its implementation. According to estimates, it is growing significantly around the world, in the European Union, and in the national economy. Therefore, it should be emphasised that business competition for green capital is growing, which must lead to at least a short-term increase in the cost of financing sustainable development. Another noticeable factor supporting green financing of the entire climate transition is the logic of successive EU ESG regulations based on the fact that companies should report in detail on the pursued sustainable development goals leading naturally to the desired business transition. In the maze of various rapidly growing EU regulations, the market mechanism verifying sustainability is being lost, a serious threat of greenwashing is emerging, and public resistance to green transition is increasing. The lack of data verifying ESG strategy implementation indicated in this paper makes objective evaluation of the formulated opinions and views difficult. A literature review, however, frequently exposed the positive motives for green financing and the advantages of the transition taking place along with the implementation of ESG strategies. The final effect is a growing polarisation of views between supporters and opponents of climate transition that is neutral, however, to the central ESG administration. In this regard, the questionnaire-based research conducted appears to be justified, making it possible to better analyse and assess the course of strategy implementation at the level of financial and non-financial entities. Conclusions from the research on the Polish banking sector show that:

- there are real actions being taken in the Polish banking sector for green financing of sustainable development,
- the main motive for green lending is the opportunity to improve one's image among various groups of stakeholders,
- green banking funds primarily focus on investments related to energy transition, combating climate change, and protecting the natural environment,
- business investments financed with green loans only to a small extent correspond to the energy transition that needs to take place to reduce the level of CO2 emissions in Poland,
- green lending is conducted in close collaboration between banks and businesses and its objective is to meet the reporting criteria and indicators,
- sustainability reporting meets the expectations of banks to reduce ESG risks,
- ESG risks have little impact on corporate green financing,

- the factors hindering the implementation of an ESG strategy are primarily related to the high cost of transitioning banks to ESG strategies, poor preparation of managers for its implementation, and significant costs of staff training in banks,

Thereby, the conducted questionnaire-based research points out that bank ESG risks do not slow down the process of corporate green financing, which results from stringent EU regulations concerning climate change. Banks allocate their capital to corporate green investments guided by meeting formal reporting criteria. That is why business ESG strategies and preparation of industries, as well as companies, should favour dynamic growth and demand for green lending.

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THE RELATIONSHIPS BETWEEN CULTURE AND QUALITY PERCEPTIONS: IMPLICATIONS FOR SERVICE QUALITY MANAGEMENT

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Purpose: The purpose of this study is to examine the influence of Hofstede's culture dimensions on service quality perceptions.
Design/ methodology/approach: Correlation analysis was used to estimate the relationship between culture-dependent consumers' expectations and estimated service quality requirements according to the SERVQUAL scale. In order to test the hypotheses, a questionnaire survey has been carried out to gather empirical data. The online questionnaire set up for this study consists of two parts. The first part is demographic information, while the second part collects the main information required for running the main analyses. Since the objective of this study is to explore the role of cultural differences in perception of service quality, the attitudes towards particular service quality dimensions have been measured by a five-point Likert scale. Each measurement variable varies from 1 to 5, among which 5 means very positive, 4 positive, 3 neutral, 2 negative, and 1 very negative. The completed questionnaires were the basis of the study and have been used in the analysis of data by using correlation coefficient (V-Cramer's coefficient) analysis. The reliability test used was Cronbach's alpha. For all research variables, values were higher than 0.8. Cronbach's alpha showed high internal consistency, which implies that the measures are reliable and the evaluation instrument is appropriate for use in research.
Findings: The influence of cultural values on the fulfilment of consumers' expectations has been analysed with V-Cramer's Correlation Coefficient. The correlation between all investigated culture dimensions and SERVQUAL dimensions is statistically significant because the $\chi 2$-values are higher than the critical value. The characteristic features of service quality typical for a given dimension of culture have been distinguished on the basis of a previous literature review. All research hypotheses are accepted. There is a positive correlation between positive customers' experiences and the SERVQUAL quality dimensions typical for collectivistic values (H1), high power distance (H2), high motivation towards achievement and success (H3), high uncertainty avoidance (H4), and short-term orientation (H5). The research results revealed that consideration of culture-dependent dimensions, connected with service quality management, positively influences consumers' experiences.
Research limitations/implications: The significant influence of cultural values related to Hofstede's culture dimensions on the perception of service quality was confirmed on the example of young Polish customers. There are some limitations of this study related to the limited sample. Moreover, the empirical data were collected only in Poland. A future study should try to validate and generalise the results of this study by using a larger sample and taking into account the expectations of customers from other countries.

Originality/value: Previous studies provide evidence that culture has an impact on service quality. However, there has been no research on the effect of culture on service quality, which is a significant gap in the literature. This study attempts to fill this gap by investigating the relationships between Hofstede's dimensions of culture and service quality requirements according to the SERVQUAL scale.
Keywords: Hofstede's culture dimensions, service quality management, quality perception, service quality requirements, SERVQUAL
Category of the paper: research paper.

1. Introduction

Culture is believed to be one of the most influential factors to shape individual values and to affect behaviour. There were various studies focused on the effect of cultural dimensions on service quality, and the results indicated the effects of cultural dimensions on service quality both positively and negatively depending on dimensions (Laroche et al., 2004; Wen et al., 2009; Kastanakis, Voyer, 2014; Donthu, Yoo, 1998; Furrer et al., 2000; Karami et al., 2016; Djekic et al., 2016; Choi et al., 2021; Shavitt, Barnes, 2020; Hassan, Wood, 2020; Hejaili et al., 2009; Basfirinci, Mitra, 2025; Bouranta et al., 2019; Zhang et al., 2008; Morgeson et al., 2025; Kilbourne et al., 2004; Diallo et al., 2018). Cultural variation results from different cultural values and affects perceptions and experiences that play an important role in consumers‘ attitude behaviours and satisfaction.

Lovelock and Yip (1996) distinguish between three categories of services: a) people-processing services that involve tangible actions to customers in person, b) possession-processing services that involve tangible actions to physical objects, and c) information-based services that depend on collecting, manipulating, interpreting, and transmitting data to create value. People-processing services necessarily involve a high degree of contact with service personnel and facilities. Therefore, there is a need for segmentation to adapt these services to local cultures. On the contrary, possession-processing and information-based services have the potential to be much lower contact in nature, so they can be standardised at the global level. That is, it is when services involve a high degree of interaction between customers and service personnel that cultural elements have the greatest influence.

Previous studies provide evidence that culture has an impact on service quality. However, there is no investigation on the effect of culture on service quality, and thus, significant gaps exist in the literature. This study tries to close this gap by investigating the relationships between dimensions of culture proposed by Hofstede and service quality requirements according to the SERVQUAL scale.

The purpose of this study is to examine the influence of Hofstede's culture dimensions on service quality perceptions.

This study takes into consideration Hofstede's (2010) culture dimensions, including individualism-collectivism, uncertainty avoidance, power distance, motivation towards achievement and success (previously masculinity and femininity dimension), short-term and long-term orientation, and investigates their influence on consumers' attitudes towards service quality according to the SERVQUAL scale (Minkov and Kaasa, 2022).

The study is structured as follows. After this introduction, the theoretical foundations and literature review have been presented. The next section details the methodological procedures, followed by an analysis of data, and defines the dimensions of the proposed framework and its indicators. Then the results of research have been presented and discussed. Finally, conclusions and suggestions for the continuation of the research have been presented, limitations are described, and theoretical and practical implications are explored.

2. Theoretical background

Culture refers to the shared values, beliefs, and norms that shape the behaviours and attitudes of individuals and organisations (Hofstede, 1998). This study is based on the theory of cultural aspects developed by Geert Hofstede (1980), which identifies five cultural aspects that shape the behaviour and values of individuals and organisations of different cultures.

Traditional service quality assessment is based on the famous SERVQUAL model and proposes five dimensions of quality evaluation: Responsiveness, Assurance, Tangibles, Empathy, and Reliability (Parasuraman et al., 1988). The SERVQUAL model has been widely cited as one main mechanism by which to evaluate the level of service quality offered to customers of a service. Reliability is concerned with the dependable and accurate performance of the service. Assurance relates to the knowledge and courteousness of the service provider as well as their ability to inspire trust and confidence in the customer. Tangibles refer to the appearance of the service scape and the physical facilities and materials. Empathy measures the extent to which the service provider offers caring and individualised attention. The final SERVQUAL dimension of responsiveness refers to the willingness of the service provider to provide efficient and prompt service (Parasuraman et al., 1988).

Previous studies across a range of service quality industries have shown that there is a significant link between cultural dimensions and service quality expectations. There is evidence to suggest that the dimensions of culture have a significant influence on a consumer's perception of service quality. Douthu and Yoo (1998) have conducted research to test the effect of culture on bank consumers' expectations of service quality. Hofstede's cultural dimensions and the five dimensions of the SERVQUAL instrument have been applied in their study. Their study results show that customers who are short-term orientated, individualistic, low on power distance, and high on uncertainty avoidance have higher service quality expectations, and low

power distance consumers have higher expectations of reliability and responsiveness while individualistic customers have higher expectations of empathy and assurance. There is a negative correlation between power distance and responsiveness and reliability. This correlation is related to the fact that in cultures with high power distance, the customer tends to suffer poor delivered services because he respects the expertise of the more powerful provider.

Mattila (1999) examined cultural differences between Western and Asian customers in terms of individualism, power distance, and high versus low-context communication in personalised service and pleasant physical environments in luxury hotels. In her study she found out that Western customers rely on the tangible cues of physical environment and value the dimensions of service that are related to pleasure more than those of Asian background. This study finds out that Hofstede's power distance and individualism dimensions are related to the three dimensions mentioned above in evaluating the service quality of luxurious hotels. A managerial finding that could be taken into consideration is that when evaluating the hotel service quality, Western customers are relatively low on power distance, are more individualistic, and focus more on tangible elements of the physical environment than people from Asia, who score higher on power distance and collectivism. Personal interaction with the service provider is more appreciated by Asian people (Mattila 1999).

Furrer, Liu, and Sudharshan (2000) investigated the relationships between Hofstede's cultural dimensions and SERVQUAL dimensions in banking service. They argued that the importance of SERVQUAL dimensions varies across people from different cultural backgrounds and produces correlations between all pairs of dimensions of culture (Hofstede 2010) and of service quality (Parasuraman et al. 1988), substantiating positive or negative relationships. Their study focuses on weak and frequent customers served often by female employees. Their results show that power distance, individualism, uncertain avoidance, and long-term orientation have positive or negative relationships with the SERVQUAL dimensions, and masculinity had no significant effect on service quality. Their research also shows the negative correlations between empathy, assurance, and individualism. Moreover, they also stated that due to the self-identity, individualist customers also expect a distance with the service provider, whereas tangibles are considered a means to decrease the closeness of the interaction. So, tangibles and individualism may have a positive correlation.

Tsoukatos and Rand (2007) conducted a study in retail insurance. They focus on infrequent and weak customers served by female employees. Their study investigates the relationships between Hofstede's culture dimensions and four dimensions of the SERVQUAL, excluding tangible in the SERVQUAL instrument. In their study they find that power distance, masculinity, and uncertainty avoidance are inversely related to reliability, responsiveness, and assurance, and long-term orientation is only significantly related to reliability.

Kueh and Voon (2007) examined the influence of individual-level cultural dimensions on Generation Y consumers' expectations of service quality. They argue that service quality expectations are positively related to uncertainty avoidance and long-term orientation but

negatively related to power distance, with no significant relationships with masculinity and collectivism.

Another study (2013) found that cultural values influenced service quality perceptions. Consequently, cultural dimensions significantly influenced evaluation of service quality. Therefore, using differences in cultural values as a tool for market segmentation could improve understanding of cultural differences among cultures and formulate a better strategy to meet local needs and expectations regarding service quality.

3. Materials and methods

The purpose of this study is to examine the influence of Hofstede's culture dimensions (2010) on service quality perception according to the SERVQUAL scale. The cultural dimensions included in this study are individualism, collectivism, uncertainty avoidance, power distance, motivation towards achievement and success (previously the masculinity and femininity dimension), and long-term or short-term orientation (Minkov, Kaasa, 2022).

Correlation analysis was used to estimate the relationship between culture-dependent consumers' expectations and estimated service quality requirements according to the SERVQUAL scale. One example of Polish customers' experiences is the influence of cultural values connected with Hofstede's culture dimensions on service quality perception, which has been examined.

Poland is considered to be a country with a collectivistic culture (with a score of 47) and a hierarchical society with high power distance (a score of 68). A high score of motivation towards achievement and success (64) indicates that the society will be driven by competition, achievement, and success. Poland scores 93 on the uncertainty avoidance dimension and thus has a very high preference for avoiding uncertainty. Poland's score of 49 in the term orientation dimension indicates that people prefer a short-term orientation focusing on personal stability (https://www.hofstede-insights.com/country-comparison-tool, 2024).

Based on the literature review and the characteristic dimensions of Polish culture, the following hypotheses were proposed for the causal relationship between cultural values and their influence on consumers' service quality requirements:

- **Hypothesis 1 (H1).** Fulfilment of service quality requirements that reflect collectivistic values is more valuable among Polish consumers than fulfilment of service quality expectations typical for individualistic culture.
- **Hypothesis 2 (H2).** Fulfilment of service quality requirements that reflect high power distance is more valuable among Polish consumers than fulfilment of service quality expectations typical for low power distance.
- **Hypothesis 3 (H3).** Fulfilment of service quality requirements that reflect high motivation towards achievement and success is more valuable among Polish consumers

than fulfilment of service quality expectations typical for low motivation towards achievement and success.

- **Hypothesis 4 (H4).** Fulfilment of service quality requirements that reflect high uncertainty avoidance is more valuable among Polish consumers than fulfilment of service quality expectations typical for low uncertainty avoidance.
- **Hypothesis 5 (H5).** Fulfilment of service quality requirements that reflect short time orientation is more valuable among Polish consumers than fulfilment of service quality expectations typical for long time orientation.

In order to test the hypotheses, a questionnaire survey has been carried out to gather empirical data. The online questionnaire set up for this study consists of two parts. The first part is demographic information, while the second part collects the main information required for running the main analyses. The first section of the questionnaire gathers personal information about the respondents, such as age and gender. The second section of the questionnaire gathers information regarding the information related to all independent variables: individualism-collectivism, uncertainty avoidance, power distance, motivation towards achievement and success, and long-term or short-term orientation.

All survey participants were young people, aged under 26. Each participant of the study was asked to answer the survey questions. The research was conducted on a group of 278 students in January, February, May, and June 2024. The data was collected in the form of a survey carried out on the e-learning website. Each participant of the study was asked to answer the survey questions. Respondents included 48.2% males and 51.8% females. 53.2% of the respondents were ages 19-20, 42.8% were ages 21-24, and 4% were over age 24.

In the questionnaire, respondents determined the acceptance level and their attitudes toward the different attributes of service quality, typical for a particular Hofstede culture dimension.

Since the objective of this study is to explore the role of cultural differences in perception of service quality, the attitudes towards particular service quality dimensions have been measured by a five-point Likert scale. Each measurement variable varies from 1 to 5, among which 5 means very positive, 4 positive, 3 neutral, 2 negative, and 1 very negative. Correlation analysis was used to estimate the relationship between culture-dependent consumers' expectations and estimated service quality requirements according to the SERVQUAL scale. The completed questionnaires were the basis of the study and have been used in the analysis of data by using correlation coefficient (V-Cramer’s coefficient) analysis. The reliability test used was Cronbach's alpha. For all research variables, values were higher than 0.8. Cronbach's alpha showed high internal consistency, which implies that the measures are reliable and the evaluation instrument is appropriate for use in research.

4. Results and discussion

The influence of cultural values on the fulfilment of consumers' expectations regarding service quality has been analysed with V-Cramer's Correlation Coefficient. The correlation between all investigated culture dimensions and SERVQUAL dimensions is statistically significant because the $\chi 2$ values are higher than the critical value (7.92). The characteristic features of service quality typical for a given dimension of culture have been distinguished on the basis of a previous literature review. The results have been presented in Table 1.

Table 1.
Expected service quality requirements (based on the SERVQUAL) according to Hofstede's cultural dimensions

SERVQUAL quality requirements (according to Hofstede's culture dimensions)	**$\chi 2$ – value**	**V-Cramer's coefficient**
Individualism - Reliability - Empathy	8.31	V=0.527
Collectivism - Assurance - Responsiveness	8.27	V=0.783
High power distance -Assurance	8.14	V=0.824
Low power distance -Reliability -Empathy -Tangibles	8.21	V=0.429
High motivation towards achievement and success - Assurance - Responsiveness	8.43	V=0.861
Low motivation towards achievement and success -Empathy -Tangibles	8.36	V=0.475
High uncertainty avoidance - Reliability - Responsiveness - Assurance - Empathy	8.62	V=0.986
Low uncertainty avoidance -Tangibles	7.98	V=0.471
Short-term orientation - Assurance - Responsiveness	8.12	V=0.759
Long-term orientation - Reliability	8.17	V=0.412

Source: own study.

Regarding the first analysed cultural dimension (individualism-collectivism), service quality requirements that put emphasis on elements connected with the expression of collectivistic values are more accepted among surveyed consumers (V=0.783) than service attributes, which

emphasise characteristics related to individualistic values (V=0.527). Additionally, for surveyed consumers, more valuable are services that have features connected with high power distance (V=0.824) than services that highlight quality assessment elements reflected in low power distance (V=0.429).

The results also confirm that service quality attributes connected with high motivation towards achievement and success are more attractive for consumers (V=0.861) than service quality attributes that have features related to low motivation towards achievement and success (V=0.475).

Essential for customers' expectation fulfilment is consideration of service quality assessment characteristics, which reflect high uncertainty avoidance (V=0.986). Such services are more attractive for surveyed consumers than services that contain elements reflected in values typical for low uncertainty avoidance cultures (V=0.471). The obtained results indicate that Polish consumers prefer the fulfilment of service quality requirements that reflect values connected with short-term orientation (V=0.759) over the fulfilment of service quality requirements that contain elements typical for long-term orientation (V=0.412).

According to the conducted analysis, service quality management, which takes into consideration cultural values and reflects culture dimensions typical for a particular cultural group, has a positive influence on consumers' experiences. The difference in quality acceptance level and consumers' positive attitudes is especially considerable in the case of uncertainty avoidance. Poland is a country with a very high level of uncertainty avoidance, and this fact has its manifestation in research results. The highest acceptance level among surveyed consumers has service quality attributes that emphasise values connected with strong uncertainty avoidance. Therefore, the lowest correlation coefficient reflects a small acceptance level in the case of service quality characteristics that emphasise values connected with low uncertainty avoidance. Also, the results related to high power distance and high motivation towards achievement and success confirm that specific service quality requirements, which reflect cultural values, have a significant influence on service quality assessment and positive service experiences.

Based on the analysis that was conducted, all considered cultural dimensions typical for Polish culture have a positive influence on service quality assessment. Therefore, all research hypotheses are accepted. There is a positive correlation between positive customers' experiences and SERVQUAL quality dimensions typical for collectivistic values (H1), high power distance (H2), high motivation towards achievement and success (H3), high uncertainty avoidance (H4), and short-term orientation (H5). The research results revealed that consideration of culture-dependent dimensions, connected with service quality management, positively influences consumers' experiences.

5. Conclusions

Findings of this research revealed that cultural dimensions had a direct influence on service quality perception. This research investigated the impact of Hofstede's cultural dimensions on consumers' attitudes towards service quality. One example of Polish consumers' experiences is the significant influence of cultural values on service quality assessment has been confirmed. The high level of acceptance of service quality requirements typical for collectivistic values, high uncertainty avoidance, high motivation towards achievement and success, high power distance, and short-term orientation is the consequence of shaped-in cultural context consumers' expectations.

The evaluation of service quality was significantly influenced by cultural dimensions due to the influence of cultural values on service quality perceptions. By utilising cultural value differences as a means of market segmentation, it could enhance comprehension of cultural differences in culture and create a better plan to meet service quality requirements that are dependent on culture.

There are some limitations of this study related to the limited sample. Moreover, the empirical data were collected only in Poland. A future study should try to validate and generalise the results of this study by using a larger sample and taking into account the expectations of customers from other countries.

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BUDGET PLANNING FOR PRODUCT INNOVATION PROJECTS BY SMALL AND MEDIUM-SIZED ENTERPRISES

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Objective: This work aimed to establish the relationships between individual types of costs related to the planned budget of an innovative project and their impact on the values of future net cash flows and budget amounts.
Design/methodology/approach: Based on literature research, the following hypotheses were formulated: The product innovation budget depends on the amount of equity; The planned amounts of cost types are interrelated and dependent on the total value of future net cash flows from the product innovation. They were then verified using the Pearson correlation matrix, where lateral data were supplemented by SMEs.
Findings: Based on the study, NPV was found to be significantly positively correlated with the planned costs associated with "Intangible assets". Technically and technologically advanced projects force incurring higher costs, which translates into higher net cash flows in the future. Meanwhile, there was no relationship between the planned budget and equity of SMEs.
Research limitations/implications: The limitation of the relatively small research group was noted, which does not allow generalizing the results. However, it gives inspiration to expand the research.
Practical implications: Our findings allow for matching the financial needs of the project with the economic sustainability and security of the entity planning the product innovation.
Social implications: Innovation projects ensure the economic and financial stability of SMEs, which directly translates into employment and social efficiency in regions.
Originality/value: The article presents the relationships between the individual types of costs associated with the product innovation project and their impact on the NPV indicator.
Keywords: budget planning, product innovation, SMEs
Category of the paper: research paper.

1. Introduction

Innovations have been widely discussed in the literature, but are still of interest to many researchers. Their development and the impact on the economy of the country where they originate, as well as to which they are transferred, pose a challenge to modern researchers. Hence

the notion of innovation economics as a field where openness, creativity, entrepreneurship combine to form the innovation system of countries and regions. Basic research of business entities and public institutions involved in innovation processes, studying and describing their characteristics, changes and resulting barriers, require systematic observations. The triple helix model: universities, companies and governments as the main players in the innovation system (Leydesdorff, Fritsch, 2006; Zhuang et al., 2021), with their knowledge and expertise, it is extended and supplemented by social resources and economic structures that support the creation of new industries and markets for economic growth (Cooke, 2005; Kauffeld-Monz, Fritsch, 2013).

For this purpose, ontological papers are necessary that identify the main actors and their typical behavior, decisions made both in the tangible and the intangible sphere. The object of observation becomes not only the processes, but the impacts of economic policy instruments under the conditions formed within the framework of different types of regional innovation systems (Re Lee et al., 2022; Kim, Lee, 2022; Reshid et al., 2024) and their importance for the competitiveness of the economy (McKenzie, 2024), the formation of new structures of relations within the system of countries and regions themselves (Bai et al., 2024; Yoon et al., 2015). At this point, it is important to emphasize the special role of small and medium-sized enterprises (SMEs) in creating and strengthening the region's innovation system. Lee et al. (2022) notes that "from the government's perspective, it is necessary to change the direction of the system in a form that can form various start-ups by expanding the range of support for start-up support, away from the public relations method of nurturing start-ups that fit the theme set by the government".

Given that the government is one of the key actors in the innovation ecosystem (Tripathi et al., 2019; Ziakis et al., 2022), it should understand the mechanisms for the creation and dissemination of innovations, and the participation of SMEs in their creation and absorption to strengthen the economy of the country in which they operate.

The economic importance and peculiarities of SMEs, associated with different organizational requirements and the dynamic interaction of formal and informal systems, make these organizations an ideal context for exploring fundamental issues in measuring the relationship between different types of costs in the planned budget of a product innovation project. This study, therefore, seeks to understand how SMEs plan costs to successfully incorporate product innovation into the production and sales system of their existing business.

2. Literature review

Based on data from the Central Statistical Office of Poland (GUS, 2024), there were 2,307,100 non-financial enterprises in Poland in 2023. Most of them were SMEs. The most numerous group (97.1% i.e. 2.3m) in the structure of Polish enterprises are microenterprises,

the share of small companies is 2.1% (48.200), and medium-sized companies – 0.6% (14.300), and large companies are only 0.2% (3.800).

Recent research (McGuinness, 2018) has provided evidence demonstrating (e. g. Beck et al. 2008) that SMEs act as a major driving force in increasing the country's growth. SMEs create employment opportunities, open markets and stabilize the economy by developing trade liberalization, among others. Due to the financial and economic crisis, many SMEs are facing various challenges that do not necessarily affect their financial and economic prowess. Several studies (e.g. Bas et al., 2018; Okpara, 2011), have revealed that SMEs are particularly vulnerable to bankruptcy during any type of crisis. According to the latest research conducted by the Central Statistical Office of Poland (GUS, 2023) into the innovative activity of enterprises (excluding construction), in 2020-2022 (the research period includes almost 3 years of the Covid-19 pandemic and the first year of the war in Ukraine), the total value of SMEs operating in Poland that introduced product innovations is: 35.6% (industrial SMEs) and 20.1% (service-providing SMEs).

It was also noted that the level of knowledge of SMEs is low, susceptible to economic fluctuations, less independent of the domains in which they operate, etc. In addition, several studies (McGuinness, 2018) have noted that SMEs are facing a number of challenges associated with their liabilities, i.e. repaying credits to financial institutions, identifying shortfalls in inventory and operating capital. Although SMEs have developed their own methods and ways to survive, the results achieved are diverse, both in positive and negative ways.

The literature strongly confirms that companies with higher levels of innovation are more resistant to crises (Fagerberg et al., 2010) and increasing their economic efficiency (e.g. Dooley et al., 2017), they grow faster than non-innovative ones. Innovation is associated with an increase in the competitiveness of the company, provides it with the ability to secure and imitate activities by other entities (Slater et al., 2014), optimizes inputs to increase the results, makes costs dependent on quality and quantity, strengthens creativity and control as a market leader (Pešalj et al., 2018; Rosösig et al., 2024).

However, one important aspect of management has not received sufficient attention in the relevant academic literature. For example, we currently lack a thorough understanding of how budget adjustments and planning will strengthen the financial needs of innovative ventures and the security of the entire company with potential consequences later in the project implementation. This shortcoming is significant because management research does not consider the financial risk approach of project managers.

Typically, business owners worry about investing in innovation, among others through budgetary activities, especially those related to financial disruption, which directly affects the balance and security of the planned overall initiative, while maintaining balance in the existing business. Hence the conclusion that

H1. The product innovation budget depends on the amount of equity.

The dynamic nature of the business environment requires a strategic approach to investment planning that goes beyond traditional financial management. Business leaders are tasked with promoting initiatives that not only yield immediate returns, but also contribute to creation of long-term value for SMEs. This includes a delicate balance between launching innovative products, expanding into new markets, increasing channel sales and intensifying efforts on existing offerings to maintain market leadership and prioritize speed in marketing new products (Mittal, 2024).

Collaboration in the process of planning financial resources is becoming a key factor, uniting stakeholders in a joint effort to identify and prioritize initiatives that promise the most favorable results in terms of return on investment, profit margins and alignment with the company's future vision. The process promotes a culture of strategic alignment, ensuring that financial allocations are meticulously aligned with strategic goals and support a shared commitment to achieving those goals. Budget planning and management should be focused on achieving strategic goals in the long term, so the comprehensive costs of the project should be taken into account.

According to the Certified Institute of Management Accountants (CIMA, 2005), a budget is "a quantitative expression of a plan for a specific period of time. It can include planned sales volumes and revenues, resource quantities, costs and expenses, assets, liabilities and cash flows". Therefore, in order to call a plan a budget, it must include quantities of economic resources to be allocated and used, it must be made for a specific period of time, it must be expressed in monetary terms, and managers must act in a way that shows the intention to implement the plan. Budgeting is the process of expressing quantitative resource requirements (amount of capital, amount of materials, number of people) in targets and milestones, divided into stages (Budget, 2015, p.3).

Project management textbooks distinguish five basic methods of project cost planning (Institute, 2017):

- Zero-based budgeting, in which each item is set to zero at the beginning of the period before reallocation;
- Static budgeting or incremental budgeting, which uses historical data to add or subtract a percentage from the previous period to create a budget for the upcoming period;
- Performance-based budgeting, which emphasizes cash flow per unit of product or service
- Activity-based budgeting, which starts from the company's goals and allows to determine the cost already incurred for the purpose of achieving them
- Value proposition budgeting, which assumes that no budget item should be included unless it directly provides value to the organization.

According to the presented methods of budget planning related to investments in product innovations, SMEs should propose a solution that depends on future revenues from innovation. Hence the following hypothesis:

H2: The planned amounts of cost types are interrelated and dependent on the total value of future net cash flows from the product innovation.

The proposed hypothesis is consistent with the direction of research and the conducted analysis of the literature. Making the budget of an innovation project dependent on future revenues from innovation, should reduce the risk related to the uncertainty of the environment. Therefore, it seems justified to formally plan and standardize the procedures for monitoring and evaluating the entire project (Sihag and Rijsdijk, 2019).

3. Methodology

The analysis in this study was conducted through secondary literature and primary analysis. The research was compiled from analysis and review of secondary literature. The formulated hypotheses are tested using a structured questionnaire in which financial data for the planned budget of a product innovation project is entered. The lateral data includes: current assets, tangible assets, intangible assets, subcontracts, staff, indirect costs, civil works and lands, equity and project budget, and the net present value (NPV) reported by the respondents, at a discount rate of r = 4%. NPV allows to assess whether a single investment will bring the expected financial benefits for uniformity of cash flow assessment. The values for the year 2033 were requested. Twenty-six entrepreneurs participated in the survey, including small (21 entities) and medium-sized (5 enterprises), who were planning to introduce product innovations in 2024-2026. The total amount of planned budgets for all the surveyed entrepreneurs was PLN 411,260,000.

Data analysis consisted in estimating the correlations between lateral data.

A correlation matrix was analyzed, assuming a correlation significance level of p=0.1 as the cut-off, due to the exploratory nature of the study. A correlation coefficient was applied to lateral variables as a measure of the relationship between two variables. In order to test Pearson's linear correlation of two quantitative features X and Y for n values of these characteristics (x_t and y_t, t=1,2...n, respectively), the coefficient will be denoted as r(X, Y) and calculated according to the formula (Śleszyńska, 2020):

$$r(X,Y) = \frac{\sum_{t=1}^{n}(x_t - \bar{x})(y_t - \bar{y})}{\sqrt{\sum_{t=1}^{n}(x_t - \bar{x})^2 \sum_{t=1}^{n}(y_t - \bar{y})^2}} \quad (1)$$

where x and y – the arithmetic mean values of feature X and Y, respectively.

The linear correlation coefficient is symmetrical and takes values in the range of [-1, 1], its absolute value indicates the strength of the linear relationship, and the sign – the direction of the relationship. Correlation matrices were generated using the Statistica statistical software.

4. Results

Based on the lateral data provided by the respondents, Table 1 shows the correlation matrix between the entrepreneur's equity, NPV and planned budget of the product innovation project.

Table 1.
Correlation matrix – project budget

Variable	Correlations (Budget) Marked correlation coefficients are significant with p < .10 N=26 (Missing data were removed by case)				
	Mean (PLN)	Std deviation	Equity	NPV	Project budget
Equity	58704,8	191698	1,000000	0,018247	-0,081521
NPV	29582,4	54956	0,018247	1,000000	0,075552
Project budget	991359,0	2060892	-0,081521	0,075552	1,000000

Source: Own research using the Statistica software.

In view of all of the given variables, the significance condition was not met. The correlation coefficient shows no correlation between lateral data, indicating that there is no statistically significant relationship between equity and the planned amount of the project budget. Based on the data in Table 1, the following hypothesis should be rejected:

The product innovation budget depends on the amount of equity.

It is interesting to note that the lower the entrepreneur's equity was, the higher the project budget was planned. This may indicate that respondents are optimistic about the economic efficiency of launching a new innovative product on the market.

Table 2 shows the correlation between the amount of the types of costs budgeted for a product innovation project. Based on it, it is possible to analyze the relationship between the different types and their impact on NPV.

Not all of the lateral data met the significance condition. Indirect costs did not significantly affect any of the examined expense values.

The amount of NPV is positively correlated with the cost of “Intangible assets”. In their projects, respondents planned spending on intangible assets which significantly affects the NPV and the amount of planned spending on tangible assets. Such correlations are indicative of highly capital-intensive investments in product innovation. Both the tangible assets that respondents intend to purchase within the project and the intangible assets, generate high costs, as the project product itself should be innovative, and thus more technologically advanced equipment with software is needed, as entrepreneurs are aware.

Planned expenses related to “Subcontracting” are significantly, positively correlated with expenses for “Current Assets”. Meanwhile, “Staff” costs were significantly coordinated by respondents to expenditures on civil works and lands. This cost projection demonstrates the direct relationship between the expansion of the company associated with the planned investment in an innovative product and the increase in employment, and is reasonable.

Table 2.
Correlation matrix – the relationship between the types of project costs with the value of future income

Variable	Correlations (Budget) Marked correlation coefficients are significant with p < .10 N=26 (Missing data were removed by case)									
	Mean (PLN)	Std deviation	Current assets	Tangible assets	Intangible assets	Subcontracts	Staff	Indirect costs	Civil works and lands	NPV
Current assets	778753	2026898	1,0000	-0,0629	-0,0578	0,5599	0,2382	0,2513	0,0315	0,0205
Tangible assets	202069	498054	-0,0629	1,0000	0,5256	-0,0694	0,0773	-0,0795	-0,1474	0,2297
Intangible assets	409	1412	-0,0578	0,5256	1,0000	0,0628	0,2520	0,1093	0,0205	0,6663
Subcontracts	1726	3216	0,5599	-0,0694	0,0628	1,0000	0,0685	0,1212	0,0574	-0,0483
Staff	3479	4956	0,2382	0,0773	0,2520	0,0685	1,0000	-0,0763	0,5492	-0,0064
Indirect costs	2469	5595	0,2513	-0,0795	0,1093	0,1212	-0,0763	1,0000	0,0521	0,0084
Civil works and lands	2451	7007	0,0315	-0,1474	0,0205	0,0574	0,5492	0,0521	1,0000	-0,1531
NPV	29582	54956	0,0205	0,2297	0,6663	-0,0483	-0,0064	0,0084	-0,1531	1,0000

Source: Own research using the Statistica software.

According to hypothesis 2, the values of individual investment costs are related to each other. Meanwhile, only expenses related to "Intangible assets" significantly affect the net present value.

5. Conclusion

The available literature on innovation is extensive. Many scholars study the systems, models, methods, regions, or causes and effects of how economic, financial or social actors manage innovations. Many researchers also highlight the dependencies and links between stakeholders and the economic and political ecosystems in which SMEs operate. However, a certain research gap has emerged when considering budgeting for innovation projects. SMEs have lower financial resources and are more vulnerable to risks associated with all kinds of social as well as economic crises. Meanwhile, innovative companies are better able to cope with a turbulent environment. The present article was designed to study the impact of types of costs on the budget of innovation projects, and to analyze the relationship between equity and the amount of budget planned by SMEs. This approach allows to better match the financial needs of a product innovation project with the economic balance of running an existing business.

Based on the study, NPV was found to be significantly positively correlated with the planned costs associated with "Intangible assets". Technically and technologically advanced projects force incurring higher costs, which translates into higher net cash flows in the future. This approach also proves that capital-intensive non-current assets will generate higher revenues, i.e. investment in a company's intellectual capital is more profitable.

At a significance level of p=0.1, there was no relationship between the planned budget and equity of SMEs. Hence the conclusion that the company's financial surplus does not affect the planned innovation project budget. Moreover, project budgets are negatively correlated with the entrepreneurs' equity (but there is no significance of correlation between that lateral data).

The present study is exploratory in nature and presents only a small part of the economic life of SMEs. The relatively small sample size does not allow us to generalize the results, but it does allow us to pay special attention to product innovation budget planning by the largest group of entrepreneurs in Poland, i.e. SMEs.

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DIGITAL TRANSFORMATION AND ESG PERFORMANCE – LITERATURE REVIEW

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Purpose: The purpose of this study is to investigate the relationship between digital transformation (DT) and environmental, social, and governance (ESG) performance with main focus on how DT influences the ESG.
Design/methodology/approach: The study utilises a rapid literature review (RLR) to identify important current research papers on DT and ESG performance relation. RLR offers a transparent yet time-efficient approach similar to systematic literature reviews. Two major databases, Scopus and Web of Science, were used to select publications, supplemented by Google Scholar for additional relevant works.
Findings: Current research highlights the positive and significant relationship between DT and ESG performance and also pointing out factors that support it. Among others there are factors like information transparency, reduction of managerial myopia and mediator roles of dynamic capabilities, innovation capabilities, and servitization level.
Research limitations/implications: The source of research limitations is mainly the dependence on RLR methodology. This approach simplifies the literature review process, allows for analysis of current topics, but limits the final number of articles in the review. However, the results enable the purposes of the study to be realized. They identify the current investigated factors that influenced the relationship between DT and ESG performance and present future research directions.
Originality/value: The study presents the latest research findings on DT and ESG performance relation. Taking into account the ESG reporting obligation, which will be extended to SMEs in the coming years, DT appears to be a catalyst for a controlled and smooth transition to the increased disclosure obligation.
Keywords: digital transformation, ESG, ESG performance
Category of the paper: literature review.

1. Introduction

One of the main business goals is to create value. Value has traditionally been viewed through the prism of financial performance. It leads to its measurement through indicators such as ROA, ROE, focussing interest on the shareholder of the company (Tombolesi, 2023).

In recent years this has begun to move its focus from shareholder towards stakeholders and for meeting their expectations as well. Environmental, social, and governance (ESG) factors are becoming increasingly important in assessing the value of companies. This is not only due to increased environmental awareness (Cicirko, 2022), but also due to ESG reporting obligations under the Corporate Sustainability Reporting Directive (CSRD). Companies, especially SMEs, could find it as an another "burden" of new disclosures to report. However, research indicates that there is a positive correlation between ESG results and financial performance that is not exclusive only for large entities (Danila, 2023). It is highlighted that this connection does attract the interest of investors and lenders. Therefore, the integration of ESG in operations can become an important factor in creating a competitive advantage in obtaining external financing (Tombolesi, 2023). Furthermore, reporting of ESG-related activities is sought not only by investors but also by customers. According to the data presented by PwC, more than 60% of customers are guided by sustainability criteria when making purchases, and consumers and regulators are increasingly sensitive to false ESG claims (PwC, 2023). This is just a short list of possible reasons why ESG issues have attracted the researchers around the globe (Arvidsson, Dumay, 2022) with particular interest in assessing its impact on corporate results (Alareeni, Hamdan, 2020; Kim, Li, 2021; Velte, 2017). Current research has also focused on looking for factors that can improve ESG performance, which will subsequently translate into corporate performance. A factor gaining popularity in research is a digital transformation (DT) (D. Chen, Wang, 2024; Kwilinski et al., 2023; Peng et al., 2023; Zhong et al., 2023). Companies in almost all industries explore ways to take advantage of the benefits of the new IT technology. Both global and European enterprises are set for substantial increases in IT spending. Worldwide IT spending is projected to increase by 9,3% in 2025 reaching about $5.74 trillion. In Europe specifically, IT spending is expected to reach total $1.28 trillion in 2025, marking an 8.7% increase from an anticipated $1.18 trillion in 2024 (Carter, 2024; Graham, 2024). The size of the expenditures is not only something that can impress, but so is a suggestion from past studies that only about 20% initiatives in that field succeed, so a great part of the expenditures are left without an impact or benefits (X. Zhang et al., 2023). The increase in IT spending, both for global and European enterprises, is visible mainly because of investment in a new generation of technology represented by artificial intelligence, block chain, cloud computing, big data and the Internet of Things (X. Zhang et al., 2023). This innovation presents challenges to the organisational structure of business processes and models, as well as comparative advantage. Palfreyman, Morton (2022) points out that digitalisation is a process that profoundly changes the operational characteristics of the enterprise through the integration of information and communication technologies. A significant aspect of the DT process is the development of a company's dynamic capabilities to respond effectively to unpredictable events, such as the Covid-19 pandemic (Guo et al., 2020). Several studies, particularly those focused on Chinese firms, have demonstrated that DT has a positive impact on ESG performance (X. Chen et al., 2024; Peng et al., 2023; Yang et al., 2024). A brief review of the literature shows that some of the results

are mixed, emphasising that the correlation of DT and ESG performance does not imply causation (Y.Chen et al., 2024; Kwilinski et al., 2023).

As companies increasingly invest its resources into DT, with AI technology leading the change, understanding its broader implication has become a critical issue. Taking into account the focus of the European Union on sustainable development, DT appears to be an important facilitator for businesses to realise sustainable value while enhancing ESG performance (Kwilinski et al., 2023). Consequently, this study seeks to examine the present research topics regarding DT and ESG performance and asks the following research question How does digital transformation (DT) influence the environmental, social, and governance (ESG) performance of companies? The answer to this question may provide a unique insight and contribute to understanding of DT both from the managers and policymakers' perspective and lead to the decisions about the scale of support for DT initiatives.

2. Methods

Taking into account that the relationship between digital transformation and ESG performance gains importance, there is a need for timely and contextually relevant evidence to understand how it impacts ESG performance. To address this need and for the purpose of this study, a decision was made to utilise a Rapid Literature Review (RLR) focused on identification of current research areas. The RLR is designed to complete reviews in shorter timeframes while maintaining a level of transparency similar to that of systematic literature reviews (Smela et al., 2023; Tsang et al., 2023).

The data source was decided to be two popular scientific databases i.e. Scopus and Web of Science, enabling the retrieval of research published by major journals. The search terms used consisted of a combination of 'digital transformation' and 'ESG performance' as two key words to understand the given topic. Giving into consideration the fact that most of the works are published in recent years, the eligibility criteria was limited to English language papers, topics related to business and management, and open access possibility. At the stage before the removal of duplicates, the articles in the database were published between 2021 and 2024. Given the small number of results obtained in the review, it was decided to include six more articles using other methods. The addition was based on authors review of quality and cited publication using Google Scholar. The set of works that qualify for inclusion in this review consists of 19 papers. The publications selected for analysis were published over the last four years, with a significant predominance of publications in 2024, highlighting the popularity of the topic (2021: 1; 2022: 2; 2023: 5; 2024: 11). The publications appeared in 11 journals, with recurring ones being Humanities and Social Sciences Communications (5), International

Journal of Technology (4), and Sustainability (2). The summary and subsequent steps are presented in the figure below.

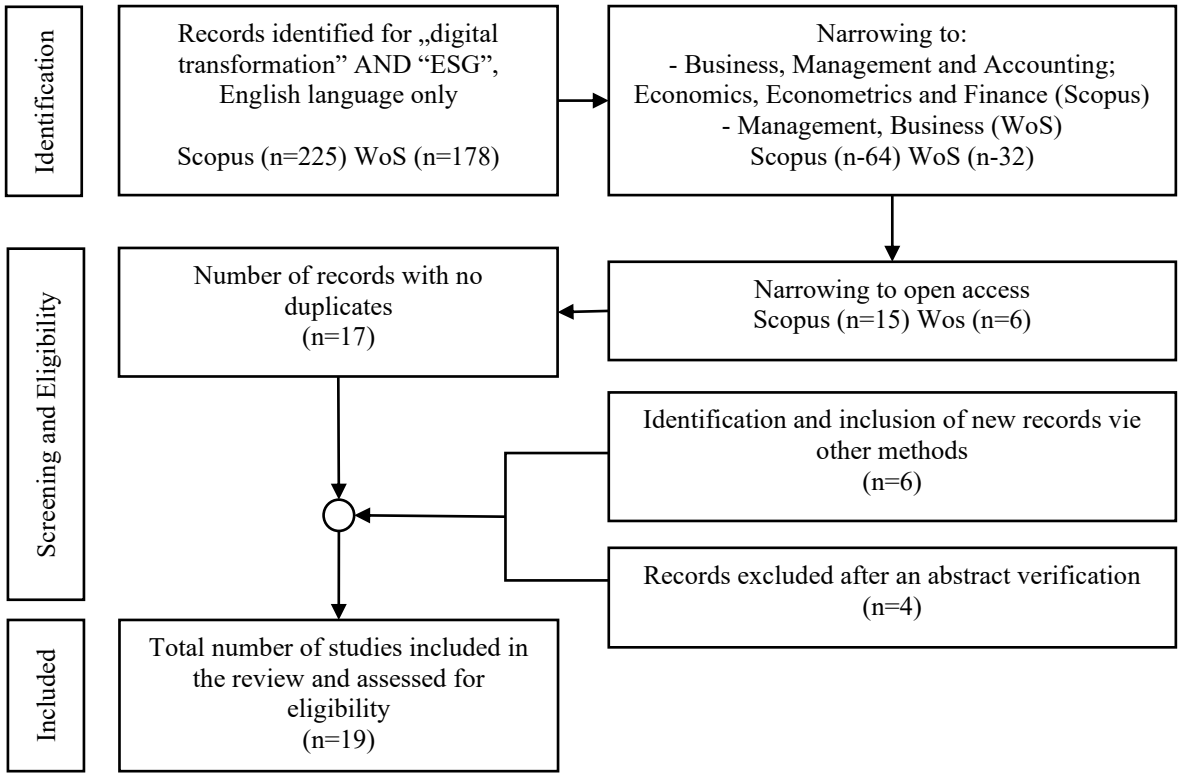

Figure 1. PRISMA-like flow chart of the subsequent steps of article selection.
Source: own work.

3. Results of the literature review

3.1. Causal relationship factors between DT and ESG performance

Most of the studies seem to make it clear that it is not only DT that makes ESG performance improve, but that there is also something "inbetween", some elements that play a mediating role in improving performance (Kwilinski et al., 2023; Zhong et al., 2023a). This perspective on the correlation between DT and ESG performance is clearly illustrated in the work of Kwiliniski et al. (2023). Their study examines the issue from a broad perspective at the country level, offering insight into this complex relationship. The evidence indicates a significant, positive and direct impact within individual countries. Moreover, it underlines spillover effects that positively influence neighbouring countries as well. It highlights the interconnections and possible effects for the realization of the Sustainable Development Goals on a global scale. The authors also emphasise that "correlation does not imply causation," suggesting that other

factors may contribute to these outcomes. This observation encourages further research to expand the list of variables that could influence this relationship.

The first examined study in this group tests the analysed relationship from the perspective of resource allocation, while showing that DT can significantly improve ESG performance (Zhong et al., 2023). It enhances it by, among other factors, restraining management myopia. Managers, as planners and active participants in the implementation of new concepts, benefit from the clarity of information provided by DT. It promotes also employee's autonomy, delegation of decision-making responsibilities to lower levels in the organizational structure while reducing managerial overload. Additionally, DT increases investments in factors related to information transparency as well drives investments in innovation, especially in green initiatives, enabling better practices for environmental responsibility. The authors also noticed that the application of DT enhances information which enriches management ability to make proper decisions.

The second analysed study refers mainly to a mediating role of green innovation from the perspective of large manufacturing companies (Zhao et al., 2023). DT, as a part of the company strategy, can help to reduce the carbon emission footprint. It extends the prior result that DT drives investment with particular emphasis on green innovation (Zhong et al., 2023). Zhao et al. (2023) highlight the critical role of business digitalisation in promoting both green process innovation and green product innovation. Additionally, digital platforms, which are becoming a dominant organisational model in the industry, align closely with the theory of dynamic capabilities. These platforms enable enterprises to quickly adjust to changing needs while successfully reaching their ESG objectives.

The work of Xie et al. (2024) shows that DT improves the search for innovative and green technology. The findings reveal that DT enhances ESG performance through three mediating mechanisms: improving information transparency, fostering green innovation, and strengthening internal control processes. Additionally, common institutional ownership (CIO) amplifies the positive effects of DT on ESG performance. CIO is also known as a horizontal shareholding ad it refers to individual investors that hold shares in multiple companies from the same industry. They serve as sources of external finance, work as external monitors that ensure enterprises meet the requirements of stakeholders. The study of Xie et al. (2024) also shows that subjective perceptions of economic policy uncertainty diminish its impact. This negative impact results from the example of liquidity preference theory, while ESG costs do not yield instant outcomes, and the company engages in other projects.

L. Zhang et al. (2024) provides empirical evidence for the improvement of ESG performance through DT. It highlights the mediating role of dynamic capabilities (DC) in this process, showing that DT impacts ESG performance both directly and indirectly by bolstering DC. DT has also impact on ESG performance by, among others, leveraging digital technologies, optimisation of resource utilisation, which can be considered as a key to sustainable management.

The study of W. Chen et al. (2024) slightly reverses the dependency and focusses on the positive influence of ESG performance on innovation novelty. This relation is significantly heightened in DT enterprises. The key factors driving this improvement include reduced communication costs, fostering collaboration, better utilisation of innovative resources, and expanding the scope of innovation. It strengthens firms' capacity to seek, obtain, and combine various types of knowledge.

The last study examined in this group, D. Chen, Wang (2024), investigates this relationship in the context of SMEs. Using Resource Orchestration Theory, the authors examine not only the direct impact of digital transformation on ESG performance, but also the mediating role of innovation capabilities and the level of servitization in the process, with particular focus on their importance as key factors in the SME context.

3.2. Balancing DT for optimal ESG performance

Among selected studies some of them highlight that excessive DT can affect the relationship between DT and ESG performance. For instance, Y. Chen et al. (2024) identifies a nonlinear relationship between DT and environmental information disclosure (EID), revealing an inverted U-shaped dynamic. At moderate levels of DT introduced into company, it experienced an enhanced performance of EID due to improved data processing, analysis, and dissemination capabilities, supporting stakeholders in evaluating environmental performance. Nonetheless, past a certain point, the advantages of DT decline. Excess digitalization can overwhelm organisational systems reducing efficiency. As DT progresses, managerial adaptability becomes essential for aligning organizational processes with increasingly complex digital systems, ensuring EID effectiveness. This additionally underscores the importance of DCs in the DT process. A similar U-shaped effect of DT on ESG performance is acknowledged in another study, that is, Kwilinski et al. (2023). Nguyen (2024) provides another example via research on ASEAN-6 commercial banks, where DT acts as a driver for ESG integration, improving the ability to implement sustainable practices efficiently. However, excessive investment in DT may weaken the profitability advantages of ESG. These findings reinforce the dual-pathway model: DT improves the execution and influences financial results, but controlling DT intensity is essential to optimise its value.

An analysis of this negative corelation can be found in a study of Wang, Hou (2024) as they observe that DT can significantly reduce ESG performance. This applies to companies that are currently investing in DT. The entry level has a negative impact on traditionally run operations, while the uncertainty of the results of introducing DT remains high and represents a kind of hidden cost for the company.

3.3. ESG decoupling

ESG decoupling is a term that describes the inconsistencies between the actual ESG performance and the more optimistic style of ESG report disclosures (X. Chen et al., 2024). The term

has gained importance in the context of a growing number of ESG reports that do not always reflect the actual actions of companies. DT is shown to be a factor that reduces the risk of ESG decoupling. It plays a role within a governance as an ability enhancer to monitor what is happening within a company (X. Chen et al., 2024). A similar effect has been obtained in research on digital finance (DF), which reduces the presence of ESG decoupling. DF is seen to increase the quality of disclosures and to reduce managers' myopia. The effect is more noticeable in high-tech and heavy polluting companies (Liu et al., 2024). Of course, the impact depends on firm characteristics such as ownership structure, technological capabilities, and pollution levels, while investors attentiveness reinforces the effectiveness of digital finance in reducing ESG decoupling. Notwithstanding, given the prevalence of mandatory ESG performance disclosures, the topic needs further investigation and may be the subject of further research.

3.4. Other studies

Amongst the papers analysed in this review, there is also a group of papers whose findings are difficult to precisely categorise; their link to DT is not so direct, although they are still relevant to the objective of the paper. One of the studies investigates the relation of ESG performance and earnings quality in Asia's digital industry. It experiences a very rapid transformation and unpredictable growth, which also forces ESG performance on them (Tohang et al., 2024). The study of Hasan et al. (2024) explores and shows that ESG positively influence customer behaviour toward brands, with DT amplifying the effects of the environmental dimension by enhancing trust and loyalty. The study highlights the importance of incorporating DT into ESG strategies, particularly in environmental initiatives, to improve communication, participation, and alignment with consumer values. Similarly, Sarpong et al. (2023) reveal how rural banks can leverage digitalisation to adopt ESG practices. When it becomes part of strategy, it can improve brand equity and financial performance through enhanced stakeholder engagement and customer loyalty.

Further analysed studies such as Babkin et al. (2021) research extend this view by integrating ESG into digital maturity assessments of industrial ecosystems, showing that higher maturity correlates with better global competitiveness and sustainability. DT can also act as a catalyst for achieving higher ESG standards, fostering long-term industrial resilience and sustainable development. In the telecommunications industry, Grishunin et al. (2022) find that ESG disclosures positively influence market value, with governance playing a pivotal role, and highlight the synergistic role of DT in enhancing ESG transparency. Another study by the authors (Grishunin et al., 2023) shows the impact of environmental innovations, enhancements in the workforce. Moreover, product development practices have a positive impact on total shareholder return. The impact was evaluated on the example of companies that follow the DT strategy.

Finally, Pishchalkina et al. (2022) underscore the importance of standardized ESG rating methodologies in the mining sector, facilitating comparative analyses and identifying sustainability leaders. Together, these findings underline the critical role of DT in maximizing ESG initiatives across industries.

3.5. Summary

On the basis of the above studies a positive relationship between DT and ESG performance can be observed both on country economy level and passing through all the levels down to the SMEs. The studies revealed some key factors enabling the positive influence of DT of ESG performance which start from the reduction of managerial myopia as a enabler of long-term strategic planning and sustainable decision-making (Liu et al., 2024; Zhong et al., 2023). This is closely linked to increased investments in information transparency (Xie et al., 2024; Zhong et al., 2023) which enhances accountability and trust, as well as drives innovation, particularly in green technologies (Xie et al., 2024; Zhao et al., 2023). Strengthened internal control processes, amplified by CIO that foster collaborative oversight, enhance ESG performance by improving governance structures and aligning with ESG objectives (Xie et al., 2024). Beyond external factors, the mediating roles of DCs, innovation capabilities, and servitization levels are pivotal in maximising DT's impact (Zhang et al., 2024; Chen, Wang, 2024).

However, these benefits require careful management of the intensity of DT. Excessive investment can overwhelm organisational systems, reduce efficiency and the financial and sustainable benefits of ESG integration. (Chen et al., 2024; Kwilinski et al., 2023; Nguyen, 2024) Lastly, while improved ESG performance is a desirable outcome, it may paradoxically lead to opportunistic behaviours, such as higher discretionary accruals, underscoring the importance of balancing ESG advancements with strong governance measures (Tohang et al., 2024).

4. Future research areas on DT and ESG performance relation

An analysis of the highlighted texts shows that quite numerous papers are optimistic about the results of the DT and ESG performance relationship. Future research on the relationship offers a rich and diverse array of possibilities. One promising area is the exploration of the U-shaped relationship between DT and ESG performance (Kwilinski et al., 2023). Also, there is a need, addressed in almost every study done on the Eastern market, to expand research so that it includes enterprises from various countries and cultural contexts. It could provide deeper insights into how regional dynamics shape the outcomes (Xie et al., 2024; Zhao et al., 2023). It also corresponds to a set of other cultural dimensions and stakeholder engagement. For example, customer behaviours and loyalty towards ESG issues are influenced by more factors, which, in turn, can impact the final results (Hasan et al., 2024; Sarpong et al., 2023).

This highlights the necessity for customized strategies and a broader range of external adjustment variables, including marketization degrees and preferential tax policies (Zhong et al., 2023). Another significant research avenue involves leveraging AI-driven ESG ratings, which could refine performance assessments and improve comparability across industries and regions (Zhong et al., 2023). Furthermore, the determinants of ESG decoupling, including impression management strategies and industry-specific variations, could provide valuable insights into aligning corporate practices with sustainability goals (Chen et al., 2024; Liu et al., 2024; Papa et al., 2024).

Finally, the development of company-specific dictionaries to measure digital operations and national comparative studies could help refine the methodology and discover the unique effects of DT on ESG performance (Chen et al., 2024). Collectively, the research directions underscore the importance of nuanced, interdisciplinary approaches in advancing the knowledge on DT-ESG performance interface.

5. Discussion and summary

The review revealed numerous relationships between digital transformation (DT) and ESG performance, a topic of growing interest in recent years. Most studies indicate a positive relationship (Chen, Wang, 2024; Xie et al., 2024; Zhang et al., 2024), with several highlighting its significance (Kwilinski et al., 2023; Zhao et al., 2023; Zhong et al., 2023). This consistent evidence underscores the importance of DT as a driver of ESG improvements across various contexts.

The analysis employed a RLR approach, which is designed to rush the systematic literature review process. While the RLR method allows for quick insights into especially new topics, it comes with limitations, including, of course, the lack of consensus on its formal definition and best practices (Smela et al., 2023). This review aimed to include key contributions in the field, but the constraints of RLR suggest that broader and more comprehensive analyses could uncover additional relevant aspects. Consequently, the findings should be interpreted with caution, as they are based on a carefully selected selection of studies. Notwithstanding, it allows to identify a number of linkages and mediators of DT's impact on ESG that allow a broad view of this field of knowledge. Several research directions attractive to the researchers have been identified. It currently appears to be important to validate research conducted in Asia in the context of the Western world. Furthermore, a significant portion of the reviewed studies relies on data collected in periods preceding Covid-19, with some post-pandemic analyses beginning to emerge. The pandemic seems to be a pivotal point in IT expenditures, which may have transformed the dynamics between DT and ESG performance. For instance, studies in this review cover periods such as for example 2008–2020 in the EU (Smela et al., 2023)., 2010–

2020 in Shanghai and Shenzhen (Zhong et al., 2023), and only a few recent analyses from 2023 in China (Zhao et al., 2023). This combination of the need for research in other contexts and with the use of more recent data additionally highlights the evolving nature of DT's impact on ESG performance, particularly at a time of significant growth in IT spending.

DT poses challenges for traditional management paradigms while simultaneously reducing the cost of ESG implementation. It improves the accessibility and transparency of information (Zhong et al., 2023). This dual role of DT, both disrupting and enabling, requires adaptive management strategies to maximise its benefits. For policymakers, the findings highlight the need to increase support for DT initiatives while ensuring that ESG performance discrepancies are effectively addressed.

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MANAGER-JOB FIT ON INDIVIDUAL AND GROUP JOB PERFORMANCE

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Purpose: Matching the employee's skills and abilities to the job position plays a significant role. Many studies show such connections in the case of employees, but there is insufficient research on managers. This paper explores the impact of aligning managers' skills, competencies, and preferences with job demands (manager-job fit) on individual and group performance.
Design/methodology/approach: Using data from 200 managers collected through an online survey, the study employs PLS-SEM to test hypotheses.
Findings: The findings reveal a strong positive relationship between manager-job fit and both individual and team performance. Notably, older and more experienced managers tend to report a better job fit, while higher education levels do not necessarily correlate with improved fit.
Practical implications: The study highlights the importance of considering manager-job fit in organizational success, as it affects not only managers' effectiveness but also the performance of their teams.
Originality/value: The paper contributes to management literature by introducing the concept of manager-job fit and emphasizes the need for further research with larger and more diverse samples, perhaps focused on a sector of activity.
Keywords: person-job fit, job performance, group performance, manager
Category of the paper: research paper.

1. Introduction

Work is one of the most important areas of human activity, absorbing a significant part of time, and involving physical, intellectual, and emotional resources. Until recently, work was considered in terms of earning a salary, today it is more often sought for a place to satisfy many other needs. Work supports the development of competencies, provides satisfaction, and gives meaning to many people’s lives. The need for a sense of meaning, and the expectations about the work have been increasing (Ağralı-Ermiş, Şahin, 2019). Initially, the relationship between

the employee and the organization was perceived as a one-sided process of adapting the employee to the position. Currently, HR activities focus more on finding the right job for the right person than the right person for the job. Most organizations are people-oriented today.

The concept of fit to the work environment is widely studied. In theory, there is a distinction between person-job fit and person-organization fit. This article focuses on person-job fit (P-J fit). P-J fit occurs when the employee's knowledge, experience, competencies, attitudes, and motivation meet the job requirements, the scope of tasks, and the responsibilities of the job position. Many studies indicate the importance of P-J fit for employees' attitudes and behaviors.

P-J fit supports employee engagement and encourages innovation behavior (Cable, DeRue, 2002) and task performance behavior (Li, Hung, 2010). It also provides organizational citizenship and job satisfaction (Chuang et al; 2016), facilitates quick adaptation (Langgeng, 2021), and reduces occupational turnover intentions (Ahlenius, M. et al., 2024). Moreover P-J fit supports positive employee attitudes and behaviors such as job satisfaction, organizational commitment, work engagement, and organization turnover (Kim et al., 2020; Rayton et al., 2019) positively impacting job performance (Sengupta et al., 2015). Employees who like the job's key characteristics usually find an intrinsic motivation for working (Ahlenius et al., 2024).

However, most of these studies focus on employees in various positions. There is insufficient research on person-job fit among managers, who play a significant role in an organization's success. Managers have a crucial and decisive role in all management processes. They create an organizational vision, plan and organize the activities, lead people, and inspire them to achieve goals. Therefore, it is important to determine whether congruence between what the job demands and managers' abilities matters. The research aim is to identify the impact of manager-job fit (M-J fit) on their and their employee's job performance.

The originality of the research introduces the concept of manager-job fit. Much research undertakes the topic of person-job fit, however, the role of manager matching the manager to the job is missing, although it is crucial. If the manager's knowledge, experience and competencies are not matched to the job position, it seems that it will be impossible to match people to the job as well. The first section presents theoretical issues related to person-job fit and proposes a hypothesis. Then, the research methodology is presented. The next section presents the research results, followed by a discussion. The article ends with conclusions, contributions in the field of management, and research limitations.

2. Literature review

Person-job fit (P-J fit) can be simply explained as the consistency between the employee's characteristics and the job requirements. While the job requirements are obvious, because they

are related to the job tasks and responsibilities and suitable competencies, the employee's characteristics contain many components. Ilmia et al. (2024) claim that the employee's personality is basic for a P-J fit. Suwanti et al. (2018) suggest that P-J fit is when an organization can meet the objectives and values of workers' demands. The employees want to perceive their jobs as compatible with their expectations (Boon, Biron, 2016). Rajper et al. (2019) described P-J fit as a match between the requirements of the job and the KSA (knowledge, skills, abilities) of the employee to perform the task or work. According to Wu et al. (2011), there are two different forms of P-J fit: compatibility of values (wants, goals, interests and preferences) and compatibility of abilities (knowledge, skills, and other abilities of employees to meet job demands). Person-job fit involves meeting employees' expectations regarding good working conditions and remuneration packages, i.e. needs-supplies (Zhu et al., 2018), and matching employees' skills and abilities to the job, i.e. demands-abilities (Sylva et al., 2019).

Moreover, two approaches to P-J fit can be distinguished - objective and subjective (Andysz, 2011). Objective fit is a state independent of the perception of the person. It can be inferred based on external criteria, such as the amount of earnings, the quality of work, the pace of performing tasks, or the achievement of organizational goals. This is usually described as the right person in the right place. Subjective fit is an individual perception of working conditions based on internal criteria, such as job satisfaction or a sense of calling. It determines the unique relationships between the employee and the work environment.

Various research studies have found that employees perform better in jobs that fit their skills and abilities. P-J fit as an antecedent of job performance (Bhat, Rainayee, 2017). Achieving better or worse results depends on employees' perception of the level of fit with the job requirements (Lappalainen et al., 2019; Andela and van der Doef, 2018). Job performance is one of the most important outcomes of employee management. This is usually measured in some aspects - the abilities and skills (natural or acquired) of employees and their motivation to use their skills and abilities to perform their jobs better (Sarmiento, Beale, 2007). Moreover, high-performance employees support the organization's achievement (Akhtar et al, 2021).

Some research findings have shown the significance of P-J fit on group performance. Team-job fit impacts team performance through personality and job satisfaction (Lin et al. 2022). When team members are aligned with their jobs, they work harder to achieve job satisfaction and performance. A person-group fit is also important. Zhang, Seong, and Hong (2022) found the relationships between person–group fit and continuous improvement.

However, there is insufficient research on manager-job fit. Many studies have presented the effect of leadership styles on follower outcomes (Hancock et al., 2021). While much has been written about individual leadership styles, little is known about whether matching a leader to a job is important. A leader needs slightly different competencies to manage employees and the organization. In addition to the competencies necessary to perform tasks in the job position, a manager also needs, among other things, the ability to motivate and inspire employees to achieve organizational goals.

Therefore, the hypotheses are as follows:

H1: Manager-job fit has a positive relation with individual performance.

H2: Manager-job fit has a positive relation with group performance.

H3: There is a positive relation between individual performance and group performance.

3. Methods

The study covered 200 managers. The respondents were full-time employees of various sectors from Polish companies. The study used convenience sampling. It is a non-random sampling method, which involves selecting participants based on their convenient availability and proximity. A web-based questionnaire with a Google Form link was sent to respondents in October-December 2023. The invitation letter described the purpose of the study and voluntary consent to participate in a survey. Table 1 presents the participant's characteristics.

Table 1.
Participants' characteristics

Items	Category	Sample (N=200)	Percentage
Gender	male female	89 111	44,5% 55,5%
Age	less than 25 25-35 36-50 more than 50	10 70 108 12	5,0% 35,0% 54,0% 6,0%
Education	middle school vocational secondary higher	2 5 51 142	1,0% 2,5% 25,5% 71,0%
Managerial experience	less than 1 year 1-5 years 6-10 years 11-15 years 16-20 years more than 20 years	20 65 62 38 9 6	10,0% 32,5% 31,0% 19,0% 4,5% 3,0%
Company size	micro (1-9 employees) small (10-49) medium (50-249) large (more than 250)	19 67 56 58	9,5% 33,5% 28,0% 29,0%
Sector	services manufacturing trade	31 44 125	15,5% 22% 62,5%

Source: own study.

The constructs were measured with extensively used scales. Person-job fit was measured using Speier and Venkatesh's (2002) scales with three statements:

(a) My skills and abilities perfectly match what my job demands;

(b) My personal likes and dislikes match perfectly what my job demands;
(c) There is a good fit between my job and me.

Job performance was adopted from Yilmaz (2015) with four statements of individual job performance:
(a) I complete my tasks on time;
(b) I meet/exceed my goals;
(c) I make sure that services meet/exceed quality standards;
(d) I respond quickly when problems come up.

The group performance was measured according to Lin et al. (2008) with three statements:
(a) My group worked efficiently;
(b) My group met our objectives;
(c) My group generally completed work on schedule.

The statements were measured using a 5-point scale.

4. Results and discussion

Descriptive statistics were measured: means, standard deviations and correlations of the variables in this study (Table 2). As expected, manager-job fit is positively correlated with individual performance ($r = 747$, $p < 0.05$) and group performance ($r = 0.692$, $p < 0.05$). An average score above 4.0 for all variables indicates that the constructs studied were rated quite well. However, manager-job fit was rated the lowest.

Table 2.
Descriptive statistics and correlations between variables

Variables	Mean	S.D.	1	2	3
Manager-Job fit	4.15	0.86	1	0.747*	0.692*
Individual performance	4.21	0.79		1	0.659*
Group performance	4.18	0.85			1

Notes: N=200, *p < 0.05.

Source: own research.

Next, M-J fit was analyzed in terms of the respondents' characteristics with ANOVA. Female managers assess the consistency of job requirements with their needs slightly better than male managers. In the case of age, the differences are significant. The older the manager, the better the fit for the position. The youngest managers rate the fit at 3.4, while managers over 50 years of age rate it at 4.6. These results are not surprising, because young people are not sure about their managerial competencies, they are learning new skills, and are still looking for their place of work.

Surprisingly, the research results indicate that the level of education is not very important. The respondents assess the fit of their skills and abilities to job demands very similarly, although it is the highest for managers with a middle school. The higher rating of M-J fit in this group is most likely related to the fact that this is a low level of education and it is rare to become a manager with that level of education. In fact, only 1% of managers have a middle (lower secondary) school. Next, the M-J fit and managerial experience were analyzed. It can be noticed that M-J fit is low in the case of little managerial experience (less than 1 year) - the average is only 3.7, and the highest among the most experienced managers - over 4.8.

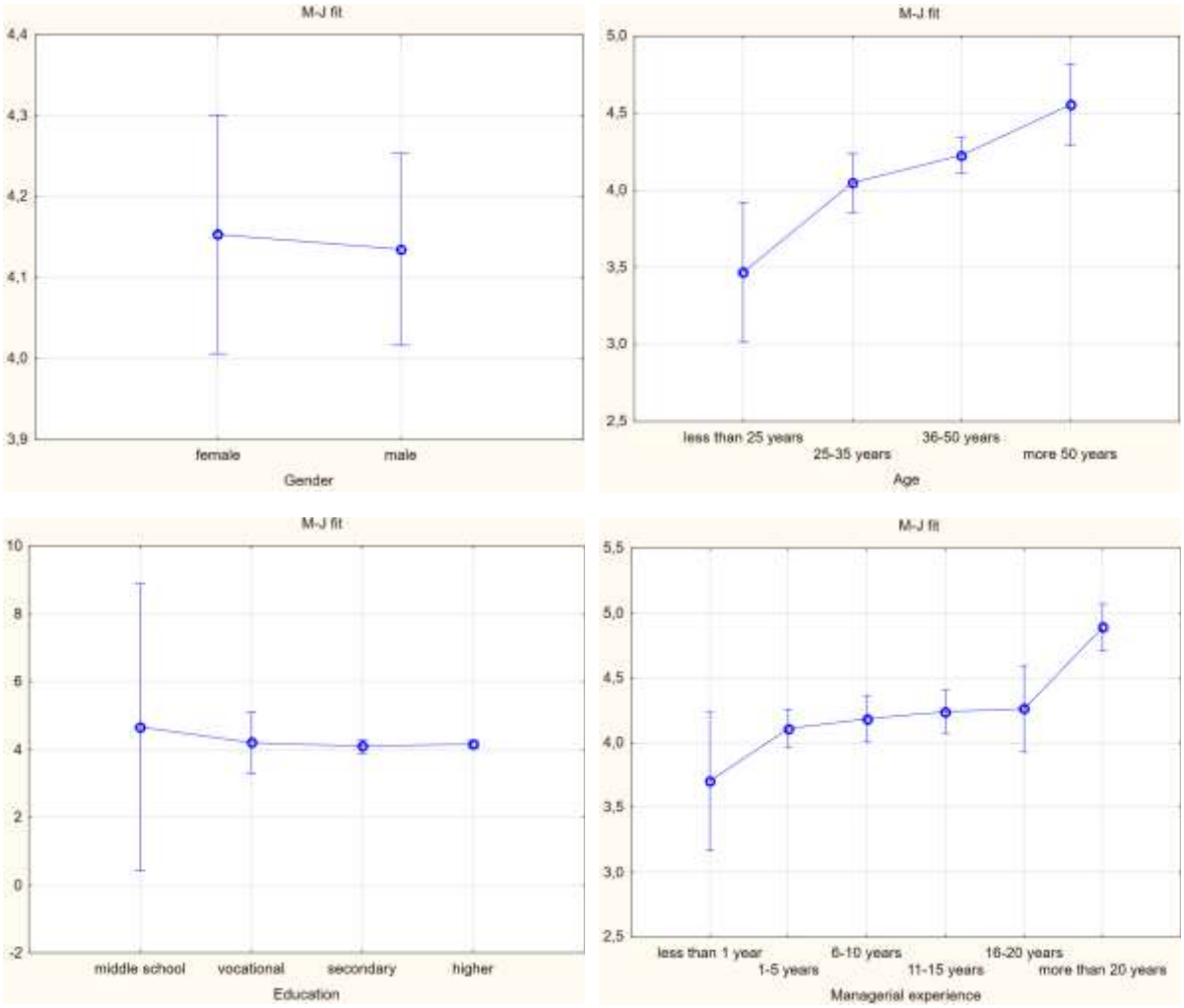

Figure 1. Manager-job fit and gender, age, education, and managerial experience.
Source: own study.

Confirmatory Factor Analysis (CFA) was employed to test the instrument's validity and reliability (Table 3). In this testing model, each statement must have a loading factor greater than 0.40 (Bloom, Reenen, 2010). Validity was assessed using AVE (average variance extracted). The reliability of the measurement was determined using Cronbach's alpha coefficients,

which must be above 0.7. CR (composite reliability) should be above 0.7 (Hair, Ringle, Sarstedt, 2013). AVE coefficients must be higher than required, i.e. 0.5 (Na-Nan, 2020). This means that the tested model is reliable and valid.

Table 3.
Validity Test and Reliability Test

Variables	Composite Reliability	Cronbach's Alpha	AVE
Manager-Job fit	0.962	0.79	0.896
Individual performance	0.908	0.81	0.832
Group performance	0.995	0.85	0.989

Source: own study.

The last step was to use SEM. Figure 2 presents the results of the structural model of M-J fit and individual and group performance. The model fit indices are as follows: chi2 = 2.595, NFI = 0.960, RFI = 0.924, IFI = 0.975, TLI = 0.952, CFI = 0.975. This means that the estimated model fits the data well. Positive relationships between manager-job fit and individual performance ($\beta = 0.93$, $p < 0.01$) confirm H1. Manager-Job fit also strongly correlates with group performance ($\beta = 0.71$, $p < 0.01$), which confirms hypothesis H2. Individual performance impacts group performance ($\beta = 0.18$, $p < 0.01$), confirming H3.

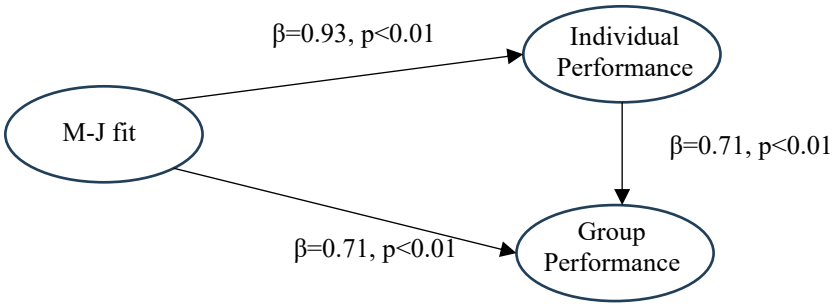

Figure 2. Structural model
Source: own study.

5. Conclusions

M-J fit plays a key role in a leader's success. The research shows that a good fit between manager and job affects individual results, as well as the results of the entire group of employees. However, it is worth noting that a perfect fit is an unattainable state. It could even probably lead to boredom and stagnation in the employee's development (Edwards, Shipp. 2007). Therefore, the P-J fit is optimal when it contains an element of a small mismatch, which can be both a deficit in certain resources and requirements, as well as their excess (Edwards, 2008).

A small deficit can be easily overcome and even become a challenge and a force for development.

The study contributes to the literature on P-J fit in two important ways. First, we proposed the new concept of manager-job fit (M-J fit). Although this term is included in the person-work concept, it focuses on a somewhat specific group of employees, namely managers. Leaders not only perform their tasks and responsibilities but also manage employees in the organization. Managers have an impact on their work, the work of their subordinates and the entire organization. Therefore, a lack of M-J fit can have negative consequences for the success of the organization. Second, we confirmed the relationship between manager-job fit and their performance and group performance. This study suggests that companies should not only pay attention to employees' skills but also understand the fit between them and their jobs.

The study has some limitations. The study used a self-reported questionnaire, which may result in bias in the data collection process. Therefore, future studies should use a different method of data collection. Adding interviews or open-ended questions could provide deeper insights into managers' perceptions of job fit, offering a richer, more nuanced understanding beyond the quantitative results. Conducting a longitudinal study would allow for the analysis of how manager-job fit evolves over time and its long-term effects on performance. In addition, the study sample is not large, so the results cannot be generalized, although it is sufficient to conduct analyses and draw conclusions about the studied population. It seems that investigating how manager-job fit varies across different industries or organizational cultures could provide more targeted recommendations for improving managerial performance in various sectors.

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LOGISTICS IN THE ERA OF CLIMATE CHANGE: A REVIEW OF CHALLENGES AND DEVELOPMENT OPPORTUNITIES

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Purpose: The aim of the article is to analyze the impact of climate change on the logistics sector and to identify key challenges and opportunities for development in the context of sustainable development. It also discusses the actions being taken by the logistics industry to adapt to new climate conditions, technological innovations, and legal regulations that necessitate the transformation of this sector.
Design/methodology/approach: The article is based on a literature review and current data regarding the impact of climate change on logistics. An overview was conducted of global supply chains, adaptive measures, investments in sustainable infrastructure, and technological innovations. Particular attention was paid to legal regulations related to CO_2 emissions and sustainable development policies that shape logistics strategies.
Findings: Climate change significantly impacts logistics, causing disruptions in supply chains and damage to infrastructure. The logistics sector responds to these challenges through investments in low-emission technologies, the implementation of innovations such as artificial intelligence and warehouse automation, and adaptation to new legal regulations. The analysis indicates that a key element for the industry's survival is flexibility and sustainable development, which enable more effective resource management and adaptation to global trends.
Originality/value: The article provides a comprehensive overview of the latest challenges and innovations in logistics in the context of climate change. In addition to analyzing the impact of these changes on supply chains, it presents innovative technological solutions and legal regulations that are fundamental to the future of the industry. The article emphasizes the importance of international collaboration and adaptation to new market realities, which represents a unique contribution to the discussion on sustainable logistics development.
Keywords: climate change, green logistics, global supply chains, sustainable development.
Category of the paper: literature review.

1. Introduction

In the face of rapid climate change, logistics is confronted with challenges that have not been part of its daily operations until now. With rising global temperatures and increasingly

frequent extreme weather events, the logistics sector finds itself on the front lines, facing the necessity of adapting to a new reality. Floods, droughts, hurricanes, rising sea levels, and other weather phenomena disrupt the functioning of international supply chains, and the impact of these changes is increasingly felt by both companies and consumers. Global climate change is beginning to affect every aspect of logistics operations, from transportation to warehousing, which requires new, more sustainable approaches (Luthra et al., 2018).

Logistics, as a key component of the global economy, plays a crucial role in ensuring the smooth flow of goods and services worldwide. It operates within a complex, multi-layered ecosystem that includes transportation, warehousing, distribution, and resource management (Rebs et al., 2017). The interconnections between these processes mean that any disruptions caused by climatic events can lead to global economic consequences. Phenomena such as blockades of shipping channels, damage to roads, or power supply interruptions can result in delays and increased operational costs. Consequently, climate change directly affects the efficiency of supply chains, and its impact is expected to grow in the coming years (Bhalaji et al., 2024).

In Poland, as well as in other Central European countries, climate change is becoming increasingly evident, particularly in the form of floods, storms, and other weather anomalies. The flood of 2024, currently affecting regions such as Silesian, Opole, and Lower Silesian Voivodeships, is a dramatic example of the scale of destruction that these phenomena can cause. While the full effects of this natural disaster are still being assessed, it is anticipated that the damage will be substantial, impacting transportation and industrial infrastructure that is critical for logistics and economic activity. Floods can lead to supply chain disruptions, damage to roads and bridges, and paralysis of entire regions, necessitating long-term recovery and adaptation to new climate conditions (Achebe et al., 2021).

As the world faces increasingly unpredictable climatic conditions, it is essential for the logistics sector to adopt a proactive approach (Adger et al., 2005). Adapting to climate change, technological innovations, and sustainable development are becoming priorities for companies that aim not only to survive but also to thrive in this new reality. Implementing sustainable solutions, such as low-emission transportation, eco-friendly warehouses, and more flexible supply chains, is no longer merely a matter of improving corporate image but a necessity arising from the new global situation (Dong et al., 2017).

This article presents an overview of the key challenges facing the logistics sector in the era of climate change, as well as possible pathways for development and adaptation. The following sections will discuss important issues such as the impact of climate change on global supply chains, the need for adaptation and sustainable development in logistics, technological innovations that support the resilience of logistics to climate change, and the influence of legal regulations on logistics in the context of climate change. The aim of the article is to demonstrate that despite the serious threats posed by global warming, the logistics sector also has immense opportunities for growth through innovations and sustainable approaches that can ensure greater resilience to future climate challenges.

2. The impact of climate change on global supply chains

Climate change is increasingly impacting global supply chains, disrupting their fluidity and stability. The intensification of extreme weather events, such as hurricanes, droughts, floods, and wildfires, leads to significant delays in the delivery of raw materials, semi-finished products, and finished goods. For many companies, especially those operating on a global scale, the unpredictability of climatic conditions poses a serious threat to the stability and efficiency of their supply chains (Nchofoung, Asongu, 2022).

One of the most direct consequences of climate change is the damage to transportation infrastructure. Extreme weather conditions, such as heavy rainfall, floods, and severe storms, lead to the destruction of roads, bridges, railways, and seaports. In 2017, Hurricane Harvey halted operations at ports in Texas for several weeks, causing global delays in the delivery of oil and chemical raw materials, which are crucial for many industries. Such events demonstrate how vital transportation infrastructure can be severely damaged, impacting supply chains in various parts of the world (Karaduman et al., 2020).

Climate change also affects the availability and prices of raw materials. The increased frequency of droughts and unpredictable weather events impacts agricultural production and the extraction of mineral resources. For example, droughts in agricultural regions of North America or Australia can lead to a drastic decrease in yields, affecting the prices of food products and agricultural goods (Mndawe et al., 2015). Disruptions in production can also trigger a domino effect in global supply chains, increasing production costs and leading to delays in the delivery of finished products (Mitić et al., 2023).

Another significant factor is the threat to ports and shipping routes. Climate warming leads to rising sea levels, which endanger low-lying ports and transportation hubs. Many of the world's largest ports, such as Shanghai, Rotterdam, and New York, are located in areas vulnerable to flooding due to rising water levels. Floods, storms, and other extreme weather events can result in port closures, delays in loading and unloading, and issues with cargo handling. The blockage of these critical points affects the entire global supply system, leading to disrupttions in international trade (de Abreu et al., 2022).

One of the most challenging aspects of climate change is its unpredictability. Even the best risk management systems in logistics become inadequate in the face of rapidly changing climatic conditions. Events such as sudden floods, wildfires, or severe storms, which were once rare, are now occurring more frequently. For logistics companies and supply chain managers, this poses a significant challenge, requiring a more flexible approach to operational planning. Resources must be available in greater quantities and more widely distributed, which increases operational costs and complicates the management of goods flows (Evans et al., 2009).

However, while climate change presents challenges, it also offers opportunities for innovation and structural changes. Companies that invest in sustainable logistics solutions can not only

reduce their carbon footprint but also protect themselves against future disruptions. Innovations such as electric transport fleets, more eco-friendly storage methods, and the development of climate risk management technologies are becoming crucial for building the resilience of supply chains. In the face of climatic uncertainty, more flexible and sustainable logistics systems can provide a competitive advantage in the global market (Dawson, 2014).

In summary, climate change has a multidimensional impact on global supply chains. Disruptions in transportation, issues with access to raw materials, threats to infrastructure, and rising operational costs are becoming everyday challenges that businesses around the world must confront. At the same time, technological advancements and the development of sustainability strategies can present opportunities for companies that are ready to adapt and innovate. In an era of unpredictable climate changes, the only certainty is the need for rapid responses to challenges and the utilization of available opportunities to build more resilient and flexible supply chains.

3. Adaptation and sustainable development in logistics

In the face of rapid climate change, the logistics sector must take action to adapt to new conditions while simultaneously reducing its negative impact on the environment. This industry plays a crucial role in the global economy, and its efficiency and reliability are essential for maintaining the fluidity of supply chains. One of the main challenges thus becomes implementing sustainability strategies that will enable logistics companies not only to survive but also to thrive in an increasingly unpredictable world. Key investments include modern infrastructure, the use of renewable energy, and the implementation of innovative technologies that will aid in adapting to changing climatic conditions (Souza, Santos et al., 2020).

3.1. Investments in climate-resilient infrastructure

Climate change is bringing increasingly frequent and intense weather events that damage traditional transportation infrastructure, such as roads, bridges, ports, and airports. In response to these challenges, the logistics sector must invest in infrastructure resilient to the impacts of climate change (Mallick et al., 2014). Examples include bridges designed to withstand greater flooding or roads with enhanced durability that are resistant to extreme temperature changes (República Federativa de Brasil, 2016).

Modern infrastructure projects must take into account forecasts for future climate threats. An example of such measures is the construction of drainage systems capable of quickly removing excess water from roads and bridges during heavy rainfall. Additionally, ports and airports, which are crucial for international freight transport, must be adequately secured against rising sea levels and intensifying storms. Such investments can help minimize disruptions in the flow

of goods and maintain the stability of supply chains even in the face of natural disasters (Quinn et al., 2018).

3.2. Implementing sustainable solutions

In the face of growing consumer expectations and regulatory requirements, logistics companies are increasingly implementing sustainable solutions. Reducing CO_2 emissions has become a priority from both an environmental and operational cost perspective. One of the key components of sustainable logistics is low-emission transportation. More and more companies are investing in electric vehicle fleets, which emit significantly less carbon dioxide than traditional vehicles powered by fossil fuels. The development of technology related to autonomous vehicles also opens up new possibilities for energy efficiency and the reduction of greenhouse gas emissions (Jens et al., 2021).

Another important step towards sustainable development in logistics is the use of renewable energy. Increasingly, warehouses and logistics centers are being equipped with solar panels or utilizing wind energy, which allows for a reduction in energy consumption from fossil fuels. Sustainable logistics buildings, which are energy-efficient and optimized to minimize energy loss, are becoming the standard in modern supply chain management. Companies implementing such solutions can not only reduce operational costs but also enhance their image in the eyes of consumers and business partners (Sun et al., 2022).

3.3. Technology for adaptation: improved forecasting and route planning

Modern technologies play a crucial role in adapting the logistics sector to climate change. One of the most important tools that can help companies minimize risks associated with natural disasters is the use of advanced weather forecasting systems and data analysis. These technologies enable the prediction of upcoming threats, such as floods, storms, or droughts, allowing for early preparation for these challenges and avoiding the most affected areas (Rowan et al., 2013).

Advanced GPS technologies and fleet management systems enable logistics companies to dynamically plan routes that avoid areas affected by natural disasters. Real-time monitoring of changes in weather conditions and infrastructure status allows for quick responses and adjustments to delivery plans. The development of artificial intelligence and predictive analytics also enhances risk management in supply chains, anticipating not only weather-related threats but also other potential disruptions, such as interruptions in raw material supplies or shifts in international markets (Tanamal et al., 2023).

Technology also plays a crucial role in optimizing internal processes within logistics companies. Through automation and digitization of operations, it is possible to manage resources more efficiently, leading to reduced waste and increased energy efficiency. Smart warehouses,

where processes such as sorting, packing, and inventory management are automated, help companies minimize energy and material consumption while simultaneously enhancing operational efficiency.

4. Technological innovations supporting logistics resilience to climate change

Ongoing climate change compels the logistics sector to adapt and implement modern technologies that not only help reduce the negative environmental impact of economic activities but also enhance the operational resilience of companies. Technological innovations play a key role in creating more flexible and adaptive logistical solutions capable of handling increasingly unpredictable and extreme climate conditions. In this context, artificial intelligence, automation, and modern transportation methods become essential tools in building a future resilient to climate change.

4.1. Artificial intelligence and data analysis in route optimization and resource management

Artificial intelligence (AI) and advanced data analysis systems are becoming invaluable support in managing logistics in the face of dynamic and unpredictable climatic conditions. By applying AI, it is possible to optimize delivery routes in real-time, allowing for the avoidance of regions threatened by natural disasters such as floods, storms, or fires. Intelligent algorithms, by analyzing weather data, traffic intensity, and the state of infrastructure, can dynamically adjust routes, minimizing the risk of delays and reducing fuel consumption, which contributes to lower CO_2 emissions (Aslam et al., 2023).

Resource management systems supported by AI allow logistics companies to better allocate their resources, such as transport fleets, warehouses, and personnel, in response to changing conditions. Automated analysis of large data sets enables the identification of potential threats, such as supply disruptions, changes in resource availability, or sudden shifts in demand for transportation services. As a result, companies can make quick and precise decisions that minimize the risk of losses and downtime. Furthermore, predictive models analyzed by AI allow for forecasting future issues, giving companies time to prepare alternative action plans (Delanoë et al., 2023).

4.2. Automated warehouses and logistics centers resilient to climate change

Automation of warehouses and logistics centers is another key area where technology helps increase the sector's resilience to climate change. Automated warehouse systems, where robots and machines handle most processes such as sorting, packing, and transporting goods, allow

for greater operational efficiency while also reducing energy and resource consumption. In times when climate change can cause unforeseen disruptions, automation ensures continuity of operations, decreasing dependence on external factors such as labor availability and weather-related issues (Alim, Kesen, 2020).

However, it's not just the automation of processes that plays an important role; the design of warehouses and logistics centers with resilience to extreme climatic conditions is also crucial. Modern logistics facilities are built with consideration for risks such as flooding, rising temperatures, and severe storms. Examples of such solutions include buildings with elevated foundations, flood-resistant drainage systems, and photovoltaic installations that provide renewable energy and reduce reliance on the power grid. These investments in infrastructure enable companies to minimize downtime and losses during crisis situations (Bianchi et al., 2023).

4.3. The use of drones and modern transportation technologies

In the face of natural disasters such as floods, landslides, or fires, traditional methods of transporting goods may prove insufficient. In such situations, modern technologies like drones become a key tool in emergency logistics. Drones enable the rapid and efficient transport of small loads to areas affected by disasters that are difficult to reach with conventional vehicles. They can deliver essential products such as medicines, food, or rescue equipment to locations cut off from traditional transport routes, allowing for quick responses in crisis situations (Mishra et al., 2020).

In addition to drones, other innovative technologies, such as autonomous vehicles and aerial transport systems, open up new possibilities for transporting goods in challenging climatic conditions. Autonomous trucks, guided by advanced navigation systems, can travel routes more efficiently and safely, reducing the risk associated with human errors and improving the flow of deliveries. Meanwhile, the development of aerial transport systems, such as Hyperloop, although still in its early stages, represents a potentially groundbreaking solution that could revolutionize freight transport by minimizing the impact of weather phenomena on shipments (Mitropoulos et al., 2021).

5. The impact of legal regulations on logistics in the context of climate change

In response to the growing threats posed by climate change, governments worldwide are implementing increasingly stringent legal regulations aimed at reducing greenhouse gas emissions and promoting sustainable development. For the logistics sector, which plays a key

role in global trade, these new regulations present both challenges and opportunities for innovation. Logistics companies must adapt their strategies to meet evolving requirements, which impacts transportation technologies, resource management, and operational practices.

5.1. CO_2 emission standards and their impact on transportation

One of the most important aspects of regulations related to climate change is the increasingly stringent standards for carbon dioxide (CO_2) emissions and other greenhouse gases. In the European Union (EU), the "Fit for 55" policy aims to reduce greenhouse gas emissions by 55% by 2030 compared to 1990 levels (Ovaere, Proost, 2022). For the logistics sector, this means the necessity to implement modern transportation technologies and transform vehicle fleets to be more environmentally friendly. Many countries have also introduced emission limits for trucks and other delivery vehicles, compelling logistics operators to invest in electric or hybrid vehicles (Brożyna et al., 2023).

In the United States, new emission standards for trucks and buses were introduced in 2022, reducing nitrogen oxide emissions by 90% compared to previous regulations (Singh et al., 2023). These measures aim not only to limit greenhouse gas emissions but also to improve air quality in cities, which are key logistics hubs.

Transportation and logistics companies must now make strategic decisions regarding fleet modernization (Bollinger et al., 2014). The introduction of electric or hydrogen-powered vehicles requires investment in charging infrastructure and appropriate refueling logistics. Although the initial costs of such transformation may be high, the long-term benefits, such as fuel savings and emission reductions, become a key competitive factor in the market.

5.2. Sustainable development policies and the logistics sector

Legal regulations regarding sustainable development go beyond emission standards alone. Increasingly, governments are implementing policies that require companies to report and reduce their carbon footprint. An example of this is the regulations concerning "Green Public Procurement" (GPP) in Europe, which promote ecological criteria when purchasing logistics services. Companies that provide their services to the government must now meet specific environmental standards, which stimulates the development of more sustainable practices (Cheng et al., 2018).

According to European Union regulations, companies are also required to prepare ESG (Environmental, Social, Governance) reports that consider the impact of their operations on the environment. This exerts pressure on logistics companies to adopt more eco-friendly operational strategies, such as minimizing resource and energy consumption and reducing waste. The requirement for transparency in environmental activities serves as an incentive for innovation, and companies that fail to meet these standards may face difficulties in maintaining a competitive position in the market (Berniak-Woźny et al., 2024).

5.3. Examples of regulations in different countries

Countries around the world are adopting various approaches to environmental regulations; however, the trend towards sustainable development is becoming a global standard. In Germany, through the "Climate Protection Program 2030," the government has introduced regulations aimed at reducing emissions from the transport sector by 40–42% by 2030. This includes promoting intermodal transport, which combines different modes of transportation, thereby reducing emissions associated with long-distance freight transport (The Federal Government, 2024).

Meanwhile, China, as the largest emitter of CO_2 in the world (Chen et al., 2024), has implemented ambitious plans to achieve carbon neutrality by 2060. Chinese authorities have introduced regulations promoting the development of electric vehicles and the construction of green transport corridors to reduce emissions from the logistics sector, which heavily relies on road and maritime transport (Rahaman et al., 2022).

In the United States, one of the key legislative actions is the Inflation Reduction Act of 2022, which includes a comprehensive package of tax incentives and grants for investments in low-emission technologies, including freight transportation. This law provides logistics companies with support for modernizing their fleets and implementing renewable energy systems (Bistline et al., 2023).

5.4. International cooperation and global initiatives

Climate change is a global challenge, which is why international cooperation on legal regulations and sustainable development in logistics is becoming increasingly important. A key role in this is played by the Paris Agreement of 2015, which aims to keep the global temperature rise well below 2°C, and preferably to 1.5°C above pre-industrial levels. To achieve these goals, it is necessary to reduce emissions from the transport sector, which is one of the main sources of greenhouse gas emissions (Meinshausen et al., 2022).

For the logistics industry, this means the necessity of collaborating at the international level to standardize technologies and procedures related to eco-friendly transport. The International Maritime Organization (IMO) and the International Air Transport Association (IATA) have introduced regulations aimed at reducing emissions in the maritime and aviation sectors. An example is the so-called IMO 2050 strategy, which aims to reduce CO_2 emissions from maritime transport by at least 50% by 2050 (Lindstad et al., 2023).

Global regulations and initiatives, such as the "Zero Emission Roadmap," require collaboration not only from transport companies but also from manufacturers, logistics operators, and governments to effectively reduce emissions and adapt economic sectors to future challenges.

Legal regulations related to climate change present an increasing challenge for the logistics sector; however, they can also stimulate the development of innovations and eco-friendly technologies. CO_2 emission standards, sustainable development policies, and global initiatives to mitigate climate change compel logistics companies to transform. International cooperation

and investments in modern technologies will be crucial for the future of the industry, which must not only adapt to new realities but also contribute to combating climate change.

6. Conclusion

In the face of increasing challenges related to climate change, the logistics sector is at a turning point. This article presents a range of challenges and development opportunities arising from the dynamically changing environmental and regulatory conditions that directly impact global supply chains. Climate change, such as extreme weather events, causes significant disruptions in logistics, threatening the stability of goods supply at both national and international levels. The example of Poland, where the effects of floods in 2024 are expected to have a long-term impact on infrastructure and logistics operations, illustrates the substantial significance of climate change for the entire industry.

The impact of climate change on global supply chains, particularly in the context of disruptions caused by extreme weather events, highlights the need for more resilient and flexible solutions. Delays in deliveries, infrastructure destruction, and increasing risks in regions critical to global trade prompt companies to invest in sustainable and innovative solutions. As a result, companies must adapt their operational strategies, which not only forces change but also creates new development opportunities.

The adaptation of the logistics sector, including investments in climate-resilient infrastructure, is becoming a key element of survival strategies. Sustainable development, based on low-emission transport technologies, electric vehicles, and renewable energy sources, is not only a response to new regulations but also a necessity that contributes to the long-term profitability and competitiveness of logistics companies. Concurrently, the implementation of advanced technologies such as artificial intelligence, automated warehouses, drones, and monitoring systems helps anticipate and mitigate the effects of extreme weather events, enabling flexible and effective resource management.

However, a key element shaping the logistics sector in the era of climate change is legal regulation. Both CO_2 emission standards and sustainable development requirements force companies to reorganize their supply chains and adapt to more stringent legal requirements. Governments are setting increasingly ambitious emission reduction targets, compelling the logistics sector to undergo technological transformation. Regulations and international agreements, such as the Paris Agreement, encourage companies to invest in environmentally friendly technologies and collaborate at the global level to meet future demands.

In conclusion, the logistics sector faces serious challenges but also unique opportunities in the context of climate change. The implementation of innovative technologies, adaptation

to sustainable operational strategies, and compliance with new legal regulations are crucial elements that will enable logistics companies to survive and grow in the coming decades. Logistics must not only confront the direct impacts of climate change but also become a driver of innovation that will aid in the global fight for a sustainable future.

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MANAGEMENT OF RESIDENTIAL DEVELOPMENT PROJECTS IN POLAND IN THE CONTEXT OF INNOVATION IMPLICATIONS

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Purpose: To identify the level of innovation implementation in the context of management of residential development projects in Poland. The main research problem of the submitted paper is the result of taking into account the changes that the residential real estate market will have to face primarily in the context of the introduced EU regulations.
Design/methodology/approach: Based on an introduction to the research problem at hand, the paper presents the state of the housing market in Poland, highlighting the existence of a large housing gap and the impact of the war in Ukraine. A desk research method was used, i.e. the study of available secondary sources such as publications, reports and statistical data relating to the housing market. The Author's own survey studies among developers of residential projects involving the construction of multi-storey multifamily buildings were conducted using CATI methodology in November 2022 and August 2020 to determine the level of innovation introduced by this category of developers in Poland and to assess them in terms of their preparedness to introduce innovations, the types of innovations they introduce, their management of innovations and the development of their own innovations.
Findings: The conducted study made it possible to determine the level of innovation of Polish development companies implementing multifamily residential construction projects. In addition, the structure of innovating and non-innovating companies was presented by the spatial extent of their activities. Respondents also clearly indicated that the management of innovative housing projects causes additional difficulties even if the company has implemented such projects before, which is why they introduce innovations to their projects gradually and mostly adapt available solutions instead of creating their own innovations. Lack of support from external entities, especially public bodies, was identified as the most significant problem posing a barrier to innovation by developers.
Research limitations/implications: The study concludes by pointing out the most pressing need which is to support and prepare developers to implement innovative projects. Moreover, this should meet the requirements of sustainable development, as a continuation of more detailed research in this area, especially due to EU legislation necessitating innovation within housing.
Originality/value: The paper describes the progress of innovation within the residential real estate market in Poland, identifying the types of innovation most commonly opted for by developers. Furthermore, it points to the lack of skills and knowledge of tools for assessing the risk of introducing innovations in the real estate market. The most important variable determining the dynamics of innovation implementation in the housing market, as indicated by developers, is the possibility of cooperation and support for this process by external public institutions.

Keywords: innovation, housing market, housing developer, renewable energy sources RES
Category of the paper: research paper.

1. Introduction

Back in the 1980s, Central and Eastern European countries had different economic systems: a market economy and a socialist economy. In both systems, the availability of houses as a basic good depended on different factors: in the market economy – on the financial possibilities of the buyer, in the socialist economy – on the administrative decisions of the authorities. In Poland in the post-war period, the satisfaction of housing needs was based on administrative allocation of housing and egalitarianism. Housing was treated only as a social good. It was not until after 1989 that, as a result of economic and political changes, housing also became a market good subject to the laws of the market.

Over the past thirty-two years, market economy mechanisms have replaced Poland's inefficient, centrally controlled economy. It became necessary to move away from nationalist-statist projects (Heydel, 1981) and to limit the state's shareholding in companies and banks, as further nationalisation was a major threat to the efficient market-based mechanism of economic development. Regardless of the market or socialist economy, housing markets, especially in Central and Eastern European countries, faced a substantial housing deficit. The number of dwellings per 1,000 inhabitants best reflects the extent to which housing needs are met in a given country (Smosarek, Cichocki, 2023; Smosarek et al., 2021).

According to the National Housing Programme (Ministry of Development and Technology, 2016) adopted by the Polish Government in 2016, the value of this indicator is expected to reach 415 by 2030. For Poland, the value of this indicator was 363 in 2014, in 2019 it was already 380.7 (EU average 480), while in 2020 this indicator reached 393 (Wielgo, 2021), while for the EU it reached 496 (Nowak, 2023). An analysis of the most recent data (NBP, 2023; Wielgo, 2023) shows that in 2023 Poland reached 420 dwellings per 1,000 inhabitants which fulfils the plans of the 2016 Housing Programme. This was caused, among other things, by numerous housing support programmes and the continued high demand for real estate at relatively high prices.

Despite the increasing number of dwellings in Poland compared to the EU average, there still is a housing gap which will continue in the coming years. This is indicated not only by the cited number of dwellings per 1,000 inhabitants but also by indicators such as (Sobolewski, Zatryb, 2024):

- Type of construction – in Poland, there is a higher percentage of single-family houses than flats: in the EU on average 52% of people live in houses, in Poland 58.2%, while in the case of flats, the EU average is about 47.5% and in Poland 41.7%.

- Overpopulation – the EU average is 16.8%, while Poland has a rate of 35.8%, making us one of the worst EU countries in this category.
- Surface area of dwellings per capita – the EU average is 33m2 per capita, while in Poland it is 24.3m2.
- Average number of rooms per person – the EU average is 1.6 rooms per person, in Poland the ratio is 1.1. This is another statistic that puts Poland in one of the last places in Europe.
- Number of inhabitants per household – the EU average is 2.3 persons per household, while in Poland it is 2.9 persons.

This indicates that Poland still has a long way to go to catch up with the European average. The housing gap is defined in various ways by authors of publications and specialists; however, one may follow the calculations by K. Sobolewski and G. Zatryb who, taking into account many aspects, including migration or demographic aspects, estimated the deficit at approximately 1.8 million dwellings. It is also worth noting that the structure of the housing market will also have to change in favour of flats. Due to the trend of major cities developing as economic centres and the decreasing importance of smaller urban centres, the structure of the housing market must also change. At present, there is a shortage of flats in large cities, which are often overcrowded, while smaller cities have a surplus of residential properties, often with houses of large size, occupied by two people.

The real estate market and also the housing market play a decisive role in fulfilling the EU's plans to, among other things, achieve zero carbon emissions by 2050 and the sustainable development goals. According to information from the Council of the European Union (European Council, Council of the European Union, 2019–2024), buildings are responsible for 40% of energy consumption in the EU and for 36% of energy-related direct and indirect greenhouse gas emissions. In addition, it is noteworthy that the above figures present an average for the EU, while in the case of Poland these indicators, as shown in Figure 1, are clearly worse.

Thus, to meet the ambitious EU guidelines, it becomes necessary to innovate in the property market, both in new developments and the existing stock. In the situation of such a large housing deficit, especially in Poland, the further dynamic development of Poland and the European Union becomes possible thanks to the introduction of innovation (Hult et al., 2004; Jin et al., 2004). Within the EU, innovation is seen as a priority for EU development and competitiveness in global markets.

In view of the immense importance of innovation not only in terms of competitiveness but also in terms of sustainable and thus ecological development in the future, the implementation of innovation is becoming a critical element. EU countries have committed to achieving climate neutrality by 2050 and thus fulfil their obligations under the Paris Agreement (2015), which is a legally binding international treaty on climate change (COM, 2021). The EU's green transition comprises a package of initiatives in a number of closely related areas, such as climate, environment, energy, transport, industry, agriculture and sustainable finance.

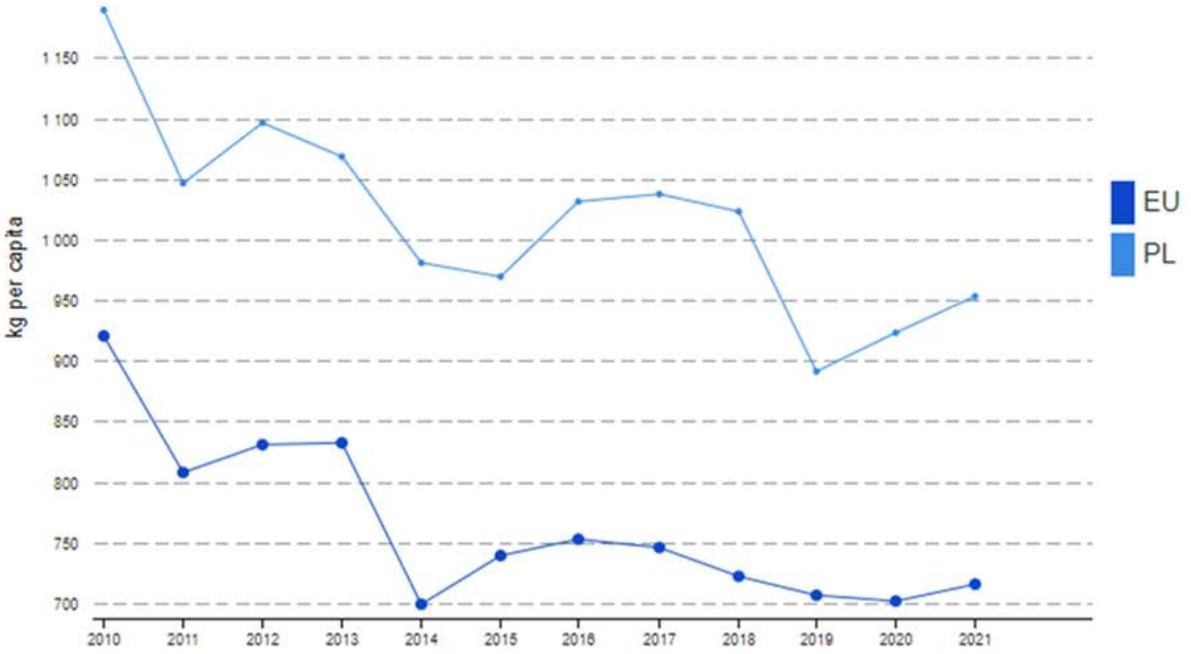


Figure 1. Greenhouse gas emissions by households for heating and cooling (in kg per capita). 2 countries selected.

Source: Eurostat (2020-2021).

These are selected packages of initiatives that are particularly applicable to the real estate sector:

- Green Deal (2022). Supports the transformation of the EU into a just and prosperous society with a modern and competitive economy. Strengthens the Union's position as a leader in the global fight against climate change;
- the Fit for 55 package (2023) as a set of proposals to revise climate, energy and transport legislation and introduce new legislation to bring Union law in line with its climate goals. Thus, by 2030 new zero-emission buildings, solar energy in buildings, existing buildings zero-emission by 2050, average energy consumption decreasing by 16% by 2030, 20–22% in 2035, and phasing out fossil fuels;
- European Climate Pact (2021). The EU and its Member States have committed to reduce net greenhouse gas emissions in the EU by at least 55% by 2030, compared to their 1990 levels (European Commission, 2016; COM 2020);
- European Industrial Strategy, including a circular economy. Actions are to address sectors such as IT, electronics, construction, buildings, among others;
- the Just Transition Mechanism, i.e. sustainable financing (Parliament Regulation..., 2021).

The geopolitical situation, namely the armed conflict in Ukraine, is also a driver for innovation in the real estate market. Russia's invasion of Ukraine, which took the form of a full-scale war that started on 24 February 2022, has caused serious consequences across the global economy, in the economies of EU countries and especially in countries in the immediate vicinity of the conflict, such as Poland. As a direct consequence of Russia's invasion of Ukraine, the price of raw materials, particularly energy commodities such as oil, natural gas and coal,

of which Russia is a strategic exporter, rose dynamically and by leaps and bounds. This was a factor in the increasing importance of innovation, in this case particularly concerning renewable energy sources ensuring climate neutrality and energy security (Karlinski, 2022; Polish Economic Institute, 2023).

The economic consequences of the war in Ukraine for Poland (Kolany, 2022) are a depreciation of the Polish złoty, a significant increase in raw material and grain prices, higher inflation and higher loan instalments, an increase in the cost of assisting the wave of refugees from Ukraine, i.e. also providing them with housing, and a significant increase in military expenditure in Poland as a frontline country.

The greatest risks from the perspective of the real estate market caused by the conflict between Russia and Ukraine are high inflation and thus interest rates, which increase the cost of loans, including mortgages, and limit creditworthiness, the increase in the price of raw materials for construction, such as steel or wood, but also energy, which affects the operating costs of buildings, and energy security, which further demonstrates the importance of innovations within the framework of RES (ZBP, 2022),

The above indicates the importance and topicality of the undertaken issues relating to the implementation of innovations in the residential real estate market. The housing gap in Poland determines the further dynamic development of the housing market, the EU strategy and regulations necessitate that this development be sustainable, based on innovation and pro-ecological. The conflict in Ukraine exposes the importance of innovations related to energy efficiency in connection with energy security.

In the paper, the research topic of the study is:

- management of residential development projects in Poland in the context of innovation implications,

while the main research problem is:

- to identify the level of innovation implementation in the context of management of residential development projects in Poland.

2. Material and methods

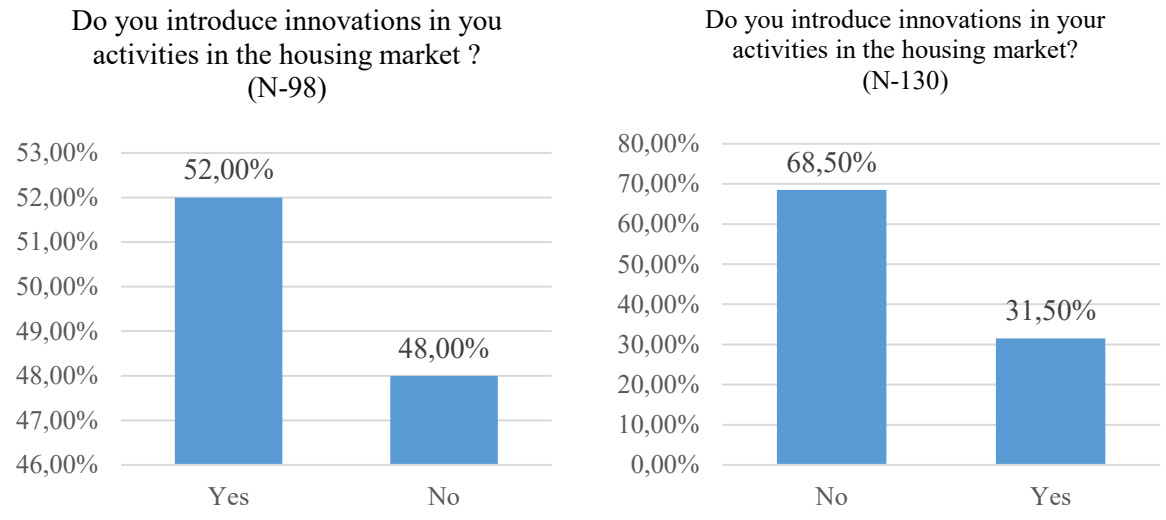
The study on the management of innovative residential projects was carried out in November 2022 using the CATI methodology. The survey was conducted on a sample of 98 entities – housing market developers implementing investments in multi-storey multi-family construction. The research sample was selected from 230 (+/-5%) entities of the general population operating in the market at the time of the survey.

A similar survey was carried out at the end of August and beginning of September 2020, with a survey sample of 130 entities out of 324 (+/-5%) entities of the general population.

The survey focused on developers implementing residential projects on the real estate market in Poland, with the criterion narrowing down the general population, analogous to the later survey, being the selection of only those developers who implement projects for the construction of multi-storey multi-family residential properties. Therefore, the survey was not narrowed down to one group of developers, e.g. medium-sized companies, but small, medium-sized and large companies were surveyed, as the selection criterion was the capital strength of the companies, i.e. the possibility to implement large residential projects. It was decided to carry out such a survey because even developers classified as small enterprises carry out large investment projects in Poland, involving subcontractors in their projects.

3. Results and Discussion

The survey presented has made it possible to determine, approximately, the proportion of residential developers who innovate in their activities on the real estate market in Poland (Figure 2). As can be seen, the survey revealed an increase in the number of developers declaring that they introduce innovations to their projects over the two years. When analysing the above result, it is necessary to take into account the conditions in which the research was conducted. After all, it cannot be said that this clear increase in the number of developers is only determined by the growth of the number of companies introducing innovations, as the identified general population in 2022 was lower than in 2020.



a) survey 2020 b) survey 2022

Figure 2. Percentage of developers introducing innovations (2020 and 2022 survey).

Source: the Author's own elaboration.

The implication is that a number of companies disappeared from the market during the period under review, which, due to conditions prevailing at the time such as the Covid-19 pandemic, high interest rates severely limiting lending and thus the demand for housing, rising prices for raw materials and construction materials, among others, due to the war in Ukraine, was difficult for business. Therefore, the hypothesis that most of the companies that disappeared from the market did not innovate seems plausible, in line with the fact that innovative companies are more competitive and therefore more resistant to bankruptcy, but confirmation of this hypothesis would require appropriate research.

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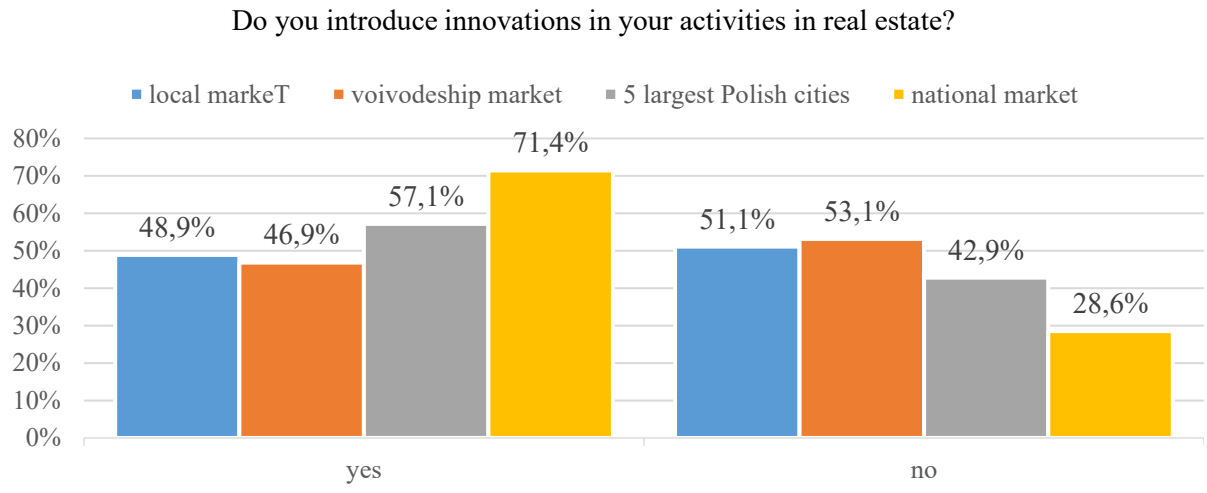

Figure 3. Developers' propensity to innovate according to the territorial scope of operations.
Source: the Author's own elaboration.

Analysing the structure of developers declaring innovations according to the territorial scope of their activity, it can be noticed that developers operating on the largest scale are the most willing to introduce innovations, then those operating on the market of the five largest cities, while developers operating on the local and voivodeship markets show the lowest propensity to introduce innovations (Figure 3). The results seem to confirm that developers operating on

a larger scale and thus in a more competitive environment are more willing to innovate. This is in line with the trend described in the global literature, where research in England by G. Killip and A. Owen (2020) indicates that companies operating locally are less likely to innovate than those operating on a broader scale.

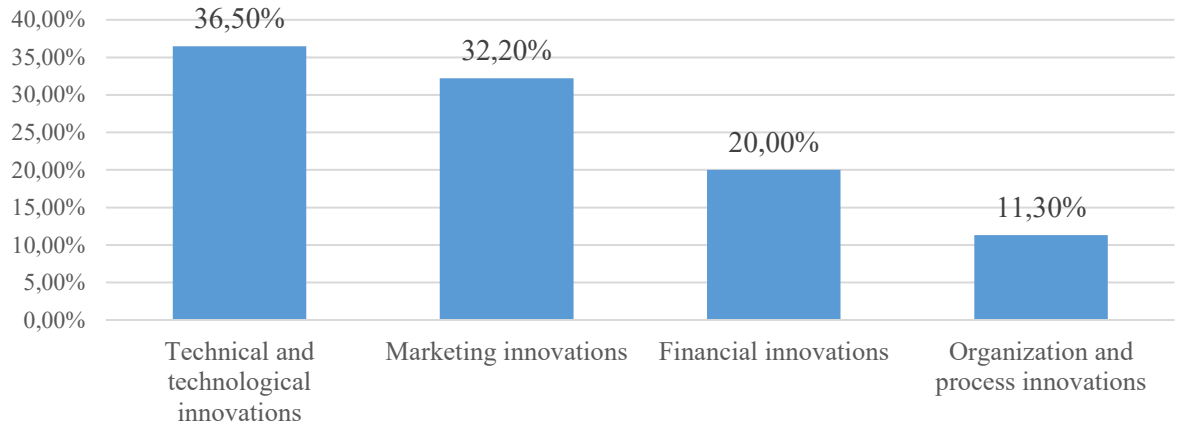

Figure 4. What type of innovation does developers use?

Source: the Author's own elaboration.

The most common innovations used by developers include technical and technological innovations (Figure 4), such as RES or specific building materials, which have an impact on building operating costs, but are associated with high implementation costs, which makes errors in managing such projects very costly. Technical and technological innovations are classified according to the Oslo Manual (OECD, 2018) as product innovations. The division of innovations proposed in the study differs from the division presented by the Oslo Manual, however, it has been adopted as more pertinent in the case of the real estate market as other authors also point out (Bac, 2014). Innovations from the marketing innovations group are also often used because their implementation costs are not high and the process of introducing them is therefore not risky.

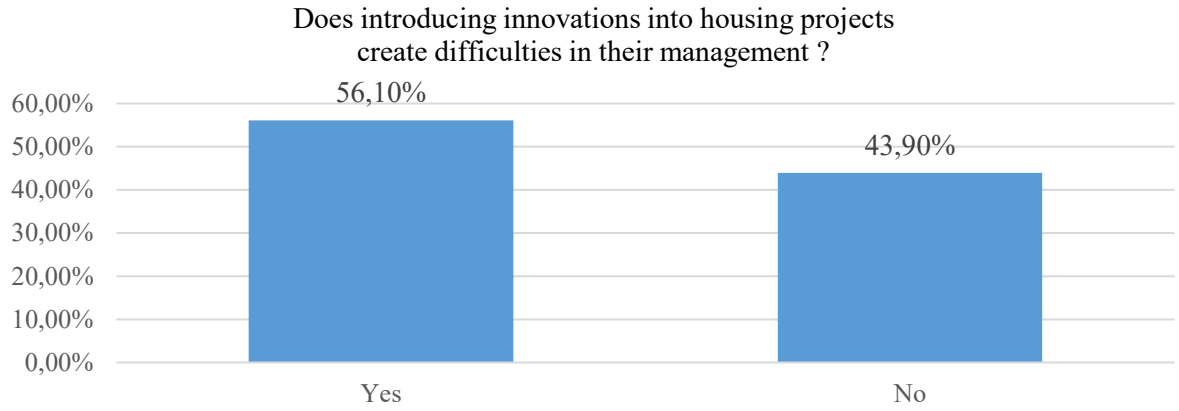

Figure 5. Are projects involving innovations difficult to manage?

Source: the Author's own elaboration.

As can be seen from the responses of developers, the management of innovative projects in the residential market in Poland clearly causes difficulties for them (Figure 5). This seems understandable from the point of view of the essence of innovation as something new and unique, however, developers, even those who have previously introduced innovations in their projects, declare that each time an innovative project shows a higher level of difficulty in managing it. The above answers by respondents regarding the difficulty of managing innovation projects are determined by the above mentioned, most frequently used type of innovation, i.e. costly technical and technological innovations, or the lack of knowledge and appropriate tools for assessing the risk of innovation, which is also indicated by the survey results. Forty-nine percent of respondents admitted that they do not measure risk as part of their innovation activities, 39.2% declared that they measure risk intuitively based on market experience and only 11.8% used specialised tools to do so. There are various risk measurement methods presented in the literature on the subject. These include, among others, scenario analysis, the SWIFT method or, FMEA analysis - Failure Mode & Effect Analysis - analysis of the causes of failures and criticality of failures (Heuresis, 2020). In the case of measuring the risk of introducing innovations in the housing market, the Dematel method can be considered, which has already been pointed out in previous works (Sitek 2022). In addition, developers indicated a clear need for external, especially public, support for the management of innovative projects (Figure 6).

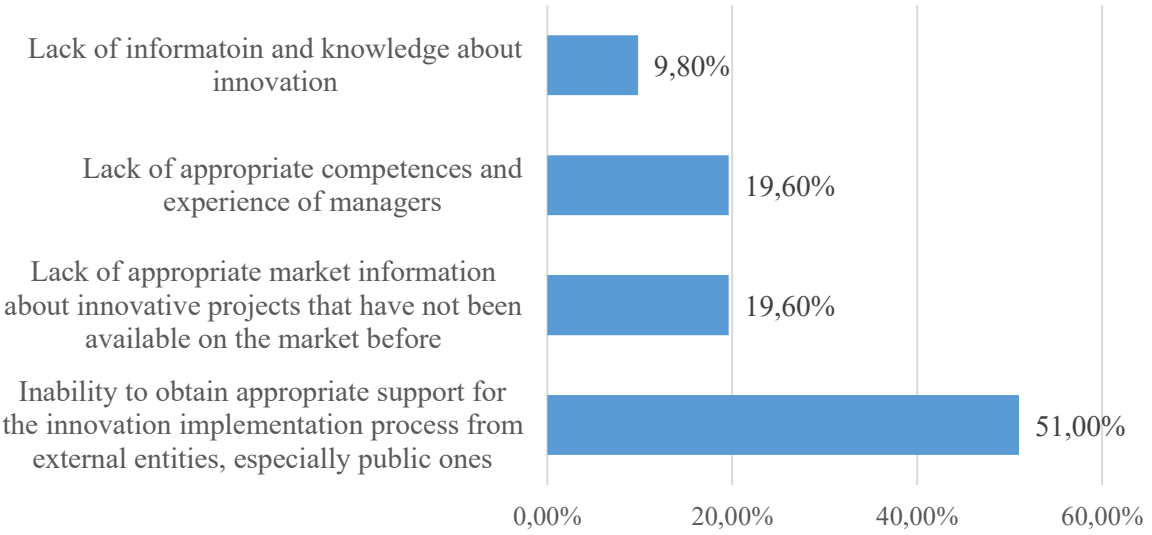

Figure 6. If introducing innovation into housing projects creates difficulties in managing them, it happens primarily through.

Source: the Author's own elaboration.

Since in response to the question 'If introducing innovation into housing projects creates difficulties in managing them, it happens primarily through...' 51% of the respondents cited the inability to obtain adequate support from external actors, especially public ones, for the implementation of innovations. This could mean that they need comprehensive support for the management process and knowledge about innovation. Lack of information on innovations that are

possible to introduce, but not yet implemented on the market in Poland was mentioned as the second reason – 19% of responses, as well as lack of assistance in creating own innovations. In the last-mentioned case, this was confirmed by answers to another question concerning the source of innovations introduced. Namely, 76.5% of respondents admitted that they adapt innovations already introduced earlier, 21.5% declare that they conduct research on their own and obtain licences and patents for their own innovations, and only 2% confirm work on innovations in cooperation with external entities.

Developers point to the inability to obtain adequate support for the process of innovation implementation from external entities, especially public ones, as the main factor influencing the evident difficulties in managing innovative projects. Additionally, respondents indicated that the main barriers contributing to the abandonment of innovation implementation are the difficulty of carrying out the process and overly complicated regulations. It should be emphasised here that future tasks aimed at specifying the needs of developers in terms of the desired support from external entities to increase the growth dynamics of innovation implementation in the housing market in Poland seem justified. Also, future research could be extended to include not only the group of developers but also other companies in the construction sector, which in the near future will face the necessity of applying advanced solutions to reduce energy intensity and emissions of the existing stock in connection with the need to meet the conditions of zero emission by 2050, to reduce energy consumption, also by buildings, as early as by 2030 or to increase the acquisition of energy from renewable sources including photovoltaic installations on buildings, where possible, according to EU regulations (European Council, Council of the European Union, 2019–2024).

4. Conclusion

In conclusion, it is important to realise that the share of innovations implemented in the real estate market in Poland, including the housing market, is low. This article touches only marginally on the possible reasons for this situation, as it was not aimed to identify its reasons but to assess the level of innovation in the housing market in Poland and how this level is affected by the difficulties in managing such projects. Of course, as indicated earlier, further research aimed at describing in more detail and better understanding these causes and understanding the needs of developers in terms of introducing innovations is highly justified, especially in the situation of achieving zero-emission or energy-efficient buildings and building an innovative economy, which is a priority of the EU required by the introduced regulations. According to the European Commission's State of the Energy Union Report 2024 (European Commission, 2024), in 2022, energy consumption by residential buildings fell by 6.7 per cent year-on-year, but this was due to savings made and a mild winter rather than improvements in the energy

efficiency of buildings. The report emphasises that to meet the targets, efforts need to be stepped up regarding the energy efficiency of new buildings and the renovation of the existing stock. Therefore, the relevance of this topic seems high.

The following conclusions can be drawn from studies concerning the introduction of innovations in housing projects by developers in Poland:

- the research showed a reduction (by 44 entities) in the number of innovating developers in 2022 compared to 2020. The reasons could be attributed to the difficult market situation after the Covid-19 pandemic, high inflation and interest rates and the outbreak of war in Ukraine and its further consequences;
- despite the decrease in the number of entities in the general population, an increase in the number of developers declaring innovation was observed, illustrating a positive trend which may, however, have been reinforced by the disappearance of non-innovating developers from the market;
- a higher number of innovating developers was observed in the group operating on a geographically broader market than in those operating locally. This may reflect the greater importance of innovation in a situation when there is a need to compete in the market;
- the high proportion of non-innovating developers is a result of a lack of demand/need for innovation. In the context of the changes described in relation to the "Fit for 55" package and the directives introduced, it can be concluded that the main determining factor described as a lack of the need to innovate, has changed 180 degrees;
- invariably, the most important and most frequently used innovations are those in the technical and technological category. This group includes renewable energy sources, specific materials and construction techniques;
- respondents declare that innovation creates problems in the management of development projects. Therefore, the development of knowledge and support and the transfer of know-how of the management process in innovation projects seems to be very important;
- respondents clearly indicate the need for adequate support in the innovation implementation process from external and especially public entities. Although the EU is seeking to create tools to support innovation, it is apparent that a systemic change is needed at the level of the state, namely Poland;
- it was indicated that despite the awareness of the existence of innovation risk and the difficulties implementing innovative development projects, developers do not use identification and measurement of this risk, and even if such identification is carried out, it is intuitive. There are many methods of measuring risk, however, the Dematel method can be proposed to measure innovation risk in the residential real estate market (Sitek, 2022). It should be emphasized that this is only a proposal, and confirmation

of the possibility of its implementation in innovative housing projects requires additional research;

- respondents indicate that a lack of innovation increases the risk of bankruptcy, which is why they include elements of innovation in their strategies. Gaining a competitive advantage, and thus a leading position in the market, was identified as the main factor for incorporating innovation into strategies;
- it should be emphasised that the most important action to be taken in this situation is to identify the needs of developers in the process of implementing innovation in the context of providing them with adequate support and preparation for the implementation of innovation projects that can meet current and future sustainability requirements, which can be adopted as a follow-up to further, more detailed research.

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PROCESS OF KNOWLEDGE MANAGEMENT IN INNOVATIVE PROJECTS OF EDUCATIONAL ORGANIZATIONS IN THE SILESIAN VOIVODOSHIP

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Purpose: This article provides an overview of the changes that have taken place, focusing on innovation in project management in educational organizations, The aim of the article is to present the problem of knowledge management in projects of educational organizations, co-financed from European Union funds. The article presents selected issues of improving students' knowledge on the basis of selected projects in the Silesian Voivodeship.
Design/methodology/approach: The research problem in the field of knowledge management in the form of projects in the financial perspective 2014-2020 was defined on the basis of the literature studies carried out. The empirical research used data from the Regional Programme of the Silesian Voivodeship concerning the improvement of teaching processes in schools through the implementation of projects. Statistical methods were also used to determine the impact of project financing on the quality of student education in the Silesian Voivodeship.
Findings: The proposed framework focuses on assessing knowledge management and innovative projects that will offer leaders in educational organizations both balanced insights and valuable information. The research shows that the level of financing from innovative projects is directly related to the scope of change of schools using the EU funds of educational organisations' projects.
Originality/value: The practical and scientific value of this paper is that is describes an integrated approach to contextual knowledge management and project management.
Keywords: co-financing of projects of knowledge management, knowledge management, projects of educational organizations
Category of the paper: research paper.

1. Introduction

The increasing importance of knowledge in the development of society, the economy and organisations is an issue that is being addressed more and more in the relevant literature. The importance of knowledge on a macroeconomic scale makes the knowledge-based economy

stand out. (Skrzypek, 2011) This type of economy points to the need for knowledge management as an important area of management science and quality (Turek, 2018). The fragmentation of the discipline 20highlights the validity of improving knowledge management processes to improve effectiveness and decision-making efficiency. One of the more recognised methods of improving the effectiveness of knowledge management is through projects, where innovative projects are identified along with their intended outcomes.

The results of projects are a derivative of their type, nature and intensity of relationship with knowledge management. A particular relational intensity in the analysed area is shown by projects in educational organisations predisposed by their key functions to absorb knowledge. An element strengthening the processes of knowledge absorption through projects is their co-financing by European Union funds. The potential for co-financing especially in the 2014-2020 perspective has influenced a large increase in projects in educational organisations in Poland. A specific illustration of the processes of knowledge management in projects of educational organisations is presented on the example of the Silesian Voivodeship.

The article was developed on the basis of the latest foreign and national literature on knowledge management. The problem of knowledge management was also referred to the projects of educational organisations, in which there are particular reasons for absorbing modern solutions.

Knowledge management in educational organisations is an integrated problem of the concept of management science and the tasks carried out in education. The integrative nature of relationships is due to the increasing role of knowledge management in an economy in which educational organisations are of fundamental importance. These organisations, with their considerable intellectual capital resources, undertake a wide variety of activities to absorb knowledge. The activities are dominated by projects that make it possible to determine the potential of the intellectual capital of educational organisations by influencing the effectiveness of the organisation, and they are based on knowledge management processes in projects. Projects in educational organisations are implemented on many levels. These include projects aimed at modernising the teaching base together with improving the knowledge of participants in educational processes. Achieving a higher level of knowledge management in projects of educational organisations is to a large extent the result of co-financing the processes of knowledge absorption.

2. Processes of knowledge management

The increasing importance of knowledge in the development of society, the economy and organisations is an issue that is being addressed more and more in the relevant literature.

The dynamically expanding number of publications indicates the importance and scope of issues that have been identified on a macroeconomic scale for many years with the economy, and especially with its part referred to as the knowledge-based economy (Jemielniak, 2012),

This fragmentation is a derivative of the importance of knowledge for socio-economic development, in which management and quality sciences set substantive priorities. (Mohapatra, 2016), Issues of knowledge management are located in their area. (Knop, 2008).

The multidimensionality of the knowledge management issue makes it possible to cite the basic principles of codified knowledge. These principles include:

- the decision-making processes that knowledge will serve,
- methods of identifying knowledge, determining the achievement of the strategic and operational goal of the organisation. Many organisations that take on different challenges seek the basis for their decision choices in different forms, such as projects,
- assessment of the knowledge acquired in the context of usefulness and codification,
- identification of the appropriate means of disclosure with a wide dissemination of knowledge, in particular by structuring it. In this area, the processing of knowledge that increases the efficiency of the organisation is particularly justified.

The above principles provide the basis for defining the problem of knowledge management. Knowledge management is the decision-making process of an organisation's knowledge resources in order to create value and take account of strategic and tactical requirements. This process includes initiatives, activities, strategies and systems to support improved retention, engagement along with systematic improvement of the process of knowledge creation (Krupski, 2012).

The knowledge management increases the information exchange among organization participants, boosting the generation of innovations. (Martins, 2019). Employee participation not only enables the managers to investigate problems from different perspectives, but also supports in proposing innovative solutions. (Abbas, 2019).

Considering the multifaceted nature of the problem, we can quote a definition according to which knowledge management is identified with the purposeful design of processes, methods and structures to increase, renew, share or improve the use of knowledge corresponding to intellectual capital (Hamid, 2021)

Issues of knowledge management are analysed in the context of assessing knowledge resources in creating and achieving the organisation's goals (Olko, 2015).

The achievement of objectives is determined by the transfer of knowledge in organisations of a different nature. It is especially important to establish, strengthen and build relationships aimed at the success of the organisation. Its source is the processes of knowledge management affecting the effectiveness of the organisation and creating value. (Imran, 2021).

The view that knowledge in organisations constitutes the most valuable intellectual capital resource requiring effective management should be considered fully justified. (Swierczek, 2019) The above approach stems from the proliferation of knowledge in management initiatives concerning the capture and sharing of knowledge accumulated by an organisation's intellectual

capital Wiktor J.W. (2020). Furthermore, it is accepted that knowledge management should primarily concern knowledge in the form of a resource enhanced or shared by social interactions. (Hamid, et al, 2021) The social perspective refers to the knowledge transfer relationships among the employees (Hock-Doepgen, 2021). They are responsible for the transfer of their knowledge to projects. Knowledge sharing allows employees to access both: knowledge and information, which has an significant influence on employees' own innovation. (Zhao, 2021).

The resource approach in knowledge management justifies the preparation and implementation of projects in virtually every form of social and economic activity.

3. Innovative projects of educational organisations in processes of knowledge management

The diversity of issues of knowledge management causes the search for methods of improving intellectual capital resources in organisations. Projects should be considered as a significant method. Their nature and nature require knowledge management to be adapted to the needs of the organisation (Karbownik, 2021) Such needs are particularly important in educational institutions which, due to their purpose and functions in society, are obliged to systematically improve and transfer knowledge. Improving knowledge in educational organisations is characterised by considerable complexity. It is then required to answer the question of who and where gathers knowledge as a sum of experiences from the process of planning, preparation and implementation of new solutions in educational organisations. (Trocki, 2020).

Educational organisations, when preparing projects on knowledge management, set the strategic objectives of public education as a central point. Education professionals and school projects are an exceptional tool to start improvements in the educational systems. (Gairín, 2012). Managing projects in educational organisations in a systematic way enables achieving the strategy of knowledge development. The areas of knowledge identified in the projects by creating a problem-solving plane, together with the assignment of appropriate techniques, enable a proper selection of decision-making options. (Dyduch, 2019) Variantiveness is created on the basis of knowledge – standards of improvement – social challenges. (Poznańska, 2018) Relativity determines the basis of knowledge management in the organisation's projects. Project management was increasing its effort to point at a strategic business perspective with the impact of the development of innovation. (Allahar, 2019).

Management processes primarily take into account knowledge, intellectual capital and strategic conditions for socio-economic development. Their relationships occur in the organisation's projects, creating the organisation's resource potential as a result of proper project management.

4. Structural analysis of projects of educational organisations in the Silesian Voivodeship

The 2014-2020 financial perspective has set new goals for the European Union's development strategy. The objectives included economic growth determined by more effective investment in education, research and innovation, and sustainable development. Improvement of the education process was undertaken by implementing various development projects. Planned activities developed in the form of projects can be considered particularly relevant. To illustrate the problem, data on EU projects implemented in educational units in the 2014-2020 financial perspective in the Silesian Voivodeship are presented. The assessment concerned projects implemented during the period considered. The total number of 52 projects in educational institutions can be divided into four groups.

The first group includes 28 projects in the scope of undertakings consisting in the creation of modern didactic base, mainly through the purchase of new infrastructure, modernisation of existing laboratories and workshops.

In the second group, there were projects whose basic assumptions concerned the process of improving the quality of education. 10 projects were included in this group.

The third group consists of 9 projects integrating the modernisation of the teaching base with practical vocational training. The projects are dominated by the problems of synchronizing the activities of educational institutions with the needs of the local labour market.

The fourth group – 5 projects - includes educational projects aimed at practical vocational training for students with disabilities. The objectives of projects of this type emphasise the strengthening of educational infrastructure, teaching facilities for pupils with disabilities in order to equalise opportunities and improve their start in the labour market.

All evaluated groups of projects required adapting knowledge management to the needs of the organisation. They are particularly important in educational organisations, which, due to their functions in society, are obliged to systematically improve and transfer knowledge. Projects in the area of knowledge management, co-financed by European Union funds, have proved to be very useful in this process.

5. Assessment of projects of educational organisations within improving students' knowledge in the Silesian Voivodeship

Educational organisations of the Silesian Voivodeship in the 2014-2020 financial perspective implemented projects in the area of improving the knowledge of students sent to internships with employers. The assessment of the projects concerned the amount of European Union

funding, the number of placements and the level of improvement in students' knowledge after the internship (Table 1).

Table 1.
Summary of the number of students' internships and evaluation of their effects in terms of subsidized projects of educational organisations with EU funds delegated to employers in the Silesian Voivodeship in 2020

Range of Union funding for projects/internships	Number of internships with employers in the projects of educational organisations of the Silesian Voivodeship	Increase in the level of knowledge improvement of students after internships in projects
Less than and equal to PLN 2 million	12	62%
More than PLN 2 million less than and equal to PLN 4 million	17	84%
Over PLN 4 million	7	81%

Source: own study based on project analyses in the Silesian Voivodeship.

A preliminary analysis of the data on the funding of student placement projects within educational organisations shows that the largest number of placements was carried out within the second group of financing, i.e. more than PLN 2 million to PLN 4 million. Within this funding range, 17 internships with employers were financed and the knowledge of students in this range improved the most in relation to the other financing ranges. On the other hand, self-governments which received the lowest (including up to 2 million PLN) or the highest (above 4 million PLN) co-financing, registered a lower number of internships at employers and lower marks for the level of knowledge improvement among students than TSUs which received medium co-financing.

At the same time, the funds from the internship project spent by self-government units dedicated to schools are used not only to organise internships at employers, but also to equip the schools themselves and their workshops and to purchase teaching materials. These activities are aimed at increasing students' knowledge. Hence, it can be assumed that the level of financing received affects not only the number of student placements, but also indirectly other aspects concerning the organisation of schools. This in turn determines better access to practical and theoretical knowledge of students who participate in the studied projects.

It can therefore be hypothesised that the funding range influences the development of educational organisations that take part in internship projects and send a certain number of students on internship, equip schools and laboratories and purchase teaching materials.

In order to verify the research hypothesis, a multifactorial analysis of variance with a single ANOVA classification was used to compare several dependent groups. Its essence is to break down the variability into components and compare individual variances resulting from the influence of a given factor on the test results. The comparison of variance with the F test allows to assess whether the group averages of the considered effect differ significantly.

The level of co-financing under internship projects (Y) was adopted as a factor. This is an order variable that takes three values. It is important to consider whether the level of funding has a significant effect on the independent variables (i.e. the test variables) expressed on a numerical scale, i.e.: the number of students (X1) who completed the internship, the number of retrofitted schools (X2) and their laboratories (X3) and the value of purchased teaching materials (X4). As a result of the test, statistics of the test were obtained from the use of statistical software (Table 2).

Table 2.
ANOVA Test Statistics

Effect	Total Sum of Effect Squares	Degrees of Freedom	Average Sum of Effect Squares	Value of F test	Significance p
Absolute term	231.2	1	231.2	832.1	0.045
Financing level (PF)	66.12	2	128.34	4.212	0.023
Number of students_PF	22.00	2	42.34	2.241	0.001
Number of schools equipped_PF	432.01	2	723.11	5.242	0.021
Number of studios equipped _PF	341.22	2	653.34	3.245	0.002
Value of purchased didactic materials_PF	12.3	2	25.65	2.132	0.032
Error	192.23	23	8.004		

Source: own study.

Analysing the results obtained, it can be noted that the level of funding significantly differentiates the number of student placements completed (for p = 0.001); the number of schools retrofitted (p=0.021) and their laboratories (p=0.002) and the value of teaching materials purchased (0.032). Testing has confirmed that the level of financing influences the effects of project spending in schools. The surveyed schools can therefore be divided into three groups. The first group with financing of up to PLN 2 million included schools with the lowest number of internships and completed retrofits and the lowest value of purchased teaching materials. The second group of schools that benefited from more than 2 million to 4 million in funding included those with the highest number of students who participated in the placement, the highest number of retrofits completed and the value of materials purchased. The last-third group includes schools that have benefited from the highest funding and are significantly different from the previous two groups in that they send an average number of pupils on internship, are on average equipped and have purchased teaching materials of average value.

The results allow the conclusion to be drawn that the level of funding significantly influences the level of development of schools that use the funds of projects of educational organisations in the Silesian Voivodeship. This is also confirmed by the assessment of the level of im-

provement of students' knowledge after the internship. The statistical analysis conducted provides information on the accuracy of applications by educational organisations for EU co-financing in the Silesian Voivodeship.

The selection of the subject and scope of projects of educational organisations illustrates the problems of effective and efficient knowledge management in educational activities.

6. Conclusions

The literature review and empirical research confirmed the importance of knowledge management in the projects of educational organisations. The importance of the problem of knowledge management in society, the economy and organisations is the starting point for searching for more and more excellent methods of absorbing knowledge. It was assumed that fundamental importance in the processes of knowledge assimilation is played by the projects of educational organisations, which by virtue of their educational functions enable the improvement of the material base. The aim of modernising the teaching infrastructure of schools is to improve the level of teaching and the acquisition of new skills by students. Opportunities in this regard were exploited by educational organisations through the submission of relevant projects in the 2014-2020 financial perspective.

Empirical research on projects of educational organisations co-financed by the European Union was carried out in the Silesian Voivodeship. The results of the research confirmed the usefulness of the projects, which mainly concerned:

- creation of modern teaching facilities, modernisation of equipment in classrooms and laboratories;
- the process of improving the education quality;
- creation and modernization of a teaching base with practical vocational training for the needs of the local labour market;
- construction and modernisation of educational infrastructure for students with disabilities in order to equalise their opportunities and improve their start in the labour market.

In addition, the research shows that the level of financing is directly related to the scope of development of schools using the funds of educational organisations' projects. The higher the financing, the more beneficial the results of knowledge absorption in educational organisations.

It can be concluded that the projects of educational organisations have a positive impact on the knowledge management of the educational sphere.

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ARTIFICAL INTELIGENCE IN HR PROCESSES

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Purpose: The purpose of the publication was to identify and assess the potential and actual state of artificial intelligence (AI) tools used in HR processes within large and medium-sized enterprises

Design/methodology/approach: The research problems were formulated as the following questions: 1) In which HR processes do enterprises utilize artificial intelligence? 2) What are the primary barriers associated with the use (or lack thereof) of artificial intelligence in HR processes within enterprises? The research employed a qualitative method—individual in-depth interviews (IDIs). The sample was purposefully selected and included employees, managers, and HR department directors. Data collection was conducted using a custom-designed interview guide.

Findings: The study revealed that AI is applied in processes such as recruitment, report generation, administrative task automation, and content creation. The benefits of AI implementation primarily include time savings and improved quality of analyses. However, a significant portion of respondents does not use AI due to barriers such as high implementation costs, lack of competencies, and concerns regarding data security. Employee resistance to change and automation also represents a significant challenge.

Research limitations/implications: The study covers large and medium-sized enterprises. Future research should involve quantitative analyses and examine industry- and sector-specific differences in AI implementation within HR processes.

Practical implications: The article can serve as a source of knowledge for managers and HR department staff, helping them identify processes where AI can deliver the greatest benefits. The research findings can support the planning of AI implementation strategies and the mitigation of technological and organizational barriers.

Social implications: The implementation of AI in HR processes can influence employees' quality of life by automating repetitive tasks, thereby allowing a focus on more valuable and creative activities. At the same time, concerns related to data privacy and the risk of job displacement due to automation should be considered.

Originality/value: The article presents original research on the application of artificial intelligence in HR processes. It addresses critical issues related to the benefits, barriers, and future directions for AI implementation in human resource management.

Keywords: artificial intelligence, human resource management, HR processes

Category of the paper: research paper.

1. Introduction

Artificial Intelligence (AI) forms the cornerstone of the Fourth Industrial Revolution, redefining how organizations operate within dynamic environments (Poisat et al., 2024). AI encompasses diverse technologies such as machine learning algorithms, natural language processing, and predictive analytics, which enable automation and optimization of decision-making processes (Grover, 2022). The rapid development of these technologies, including AI-driven tools, significantly transforms enterprise operations. These changes affect various organizational domains, including human resource management (HRM) (Tiwari et al., 2022).

AI in HR processes refers to the application of advanced computer technologies that mimic human intelligence to support, automate, and optimize various HR functions and tasks (Chandratreya, 2024). Initially, AI tools in HR were applied to basic operations such as payroll processing and benefits administration (Shivaraj, 2021). However, contemporary AI solutions are now implemented in more sophisticated processes, such as recruitment and candidate selection, onboarding, training, and development (Figure 1). Enterprises increasingly adopt AI solutions in systems like Applicant Tracking Systems (ATS) and chatbots that support employees, analyze their sentiment, or measure engagement levels. The literature indicates that AI accelerates candidate assessment and matching during recruitment processes (Shettigar, 2024). AI also enhances feedback delivery and streamlines HR reporting and analytics.

An analysis of publications available in the Scopus database identified 36 papers with the keyword phrase "AI in HR processes." The majority of these studies were published in 2024, a period marked by significant growth in interest surrounding AI. Based on a keyword linkage analysis (Figure 1), six key research areas were identified:

- area 1 (red) – Employee Development and Organizational Support; This area links the application of artificial intelligence with processes that support employees and shape their engagement;
- area 2 (purple) – AI in Recruitment and Talent Acquisition; This area connects artificial intelligence with recruitment, employee selection processes, and talent management;
- area 3 (blue) – Future of Work and AI Integration in HR; This area focuses on the future of work and the application of AI in human capital management within a strategic context. It emphasizes machine learning technologies used in HR processes;
- area 4 (orange) - Foundational AI in HR Processes; This area covers general issues related to the fundamental applications of AI in HR processes;
- area 5 (yellow) - Human Resource Management and Personal Growth; This area addresses human resource management in conjunction with employees' personal development;
- area 6 (brown) - AI Adoption in Core HR Functions; This area focuses on adopting artificial intelligence in core HR functions, such as natural language processing and

strategic process management. It also discusses the intent behind AI implementation within organizations.

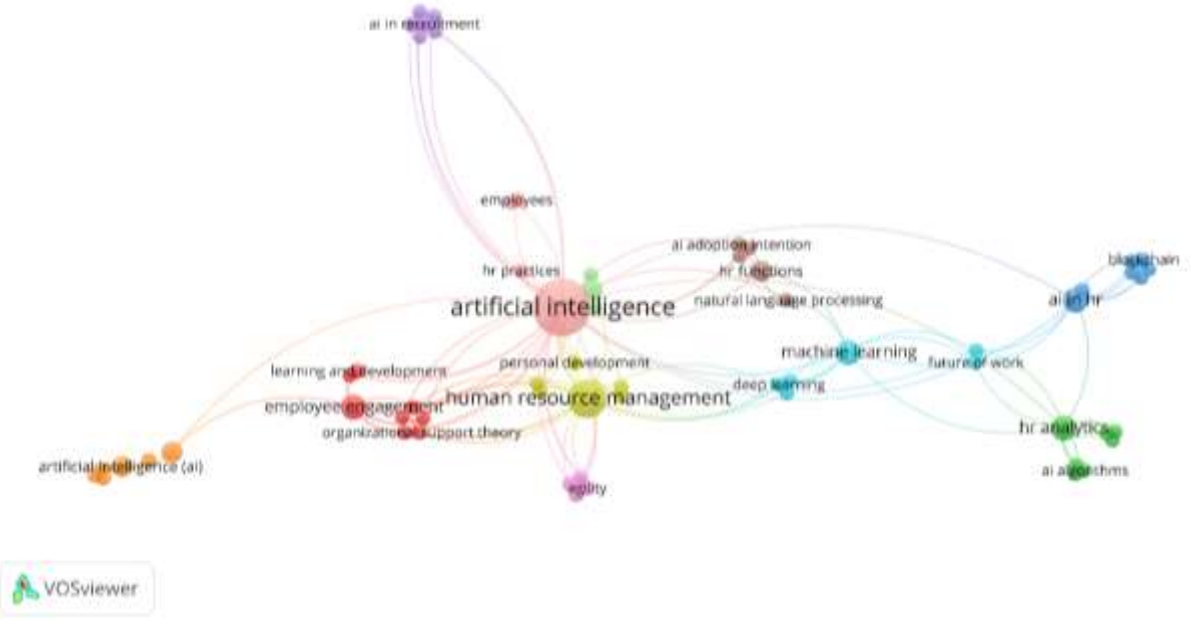

Figure 1. Keyword Linkage Map Based on the Search Query "AI in HR Processes.
Source: own study.

The keyword linkage analysis demonstrated that the topic addressed in this publication aligns with all the identified clusters. The limited number of publications focusing on the application of artificial intelligence in HR processes creates an opportunity to further explore this subject. Identifying research areas (clusters) that reflect various aspects of AI's impact on HR processes constitutes the first step in pinpointing research gaps.

As highlighted by Jia et al. (2022), there is a lack of specific empirical studies examining the long-term effects of AI-based technologies on employee satisfaction and motivation. On the other hand, the literature presents studies that emphasize the significant potential of AI in optimizing HR processes (Marel, Boudreau, 2017) or its use in recruitment and employee selection processes (Tambe, 2019). Jatoba et al. (2021) point out the absence of research comparing the practical outcomes of AI implementation in HR processes. Similarly, Huang et al. (2020) underscore a gap in understanding the barriers to AI adoption in HR processes. In light of the identified research areas, several gaps emerge that warrant further exploration. There is a clear need for studies that investigate the applications of AI in HR processes. The aim of this publication was to identify and assess the current state of AI tool applications in HR processes within large and medium-sized enterprises.

The research presented in this publication, unlike previous studies that often focus on the theoretical potential of AI or rely on quantitative analyses, is based on a qualitative methodology. This methodological approach allowed for an in-depth understanding of the context and specificities of AI implementation in medium and large enterprises. The study contributes to the field by identifying both the benefits and barriers associated with the use of AI in HR

processes. Furthermore, it highlights the key areas where AI is actually being applied in practice.

2. The use of Artifical Intelligence in HR processes

HR processes encompass an organized set of activities related to workforce planning, recruitment, development, evaluation, and employee retention. Their primary goal is not only to ensure and secure the organization's human capital but also to manage it effectively. Modern HR processes are evolving toward a strategic approach, in which the HR function often becomes a business partner supporting organizational goals (Ulrich, 2016; Wandhe, 2020). The widespread use of modern information systems enhances HR process efficiency, allowing for the automation of administrative tasks and a focus on higher-priority activities (Wandhe, 2020). The fundamental HR processes include (Pieniacka, Tochwin, 2024; Konecki et al., 2018; Boxall, Purcell, 2016):

- workforce planning,
- recruitment and employee selection,
- onboarding,
- development and training,
- compensation and benefits management,
- offboarding.

Each of these processes plays a significant role in human capital management and influences organizational efficiency (Stoisk, Leśniewska, 2015). The effectiveness of HR processes increases with the integration of technology, including AI, which enables more precise decision-making and better alignment of actions with employee needs (Qin et al., 2023; Choudhary, Pandita, 2024). Artificial intelligence is transforming HR functions, shifting them from administrative to strategic, particularly in the area of process automation. AI is playing an increasingly important role in human capital management, especially in recruitment processes (Shettigar, 2024; Strang, 2022). AI-based tools facilitate the rapid analysis of candidate data, significantly shortening the selection process and enhancing its efficiency (Li et al., 2021). AI systems can evaluate candidate competencies through hierarchical analysis and machine learning algorithms, reducing the time required for application reviews and minimizing human errors (Strang, 2022; Zhai et al., 2023). Additionally, the use of AI in recruitment allows for the evaluation of candidates for organizational culture fit (Jia, Hou, 2024).

Another HR process supported by AI is employee training and development. By analyzing individual employee needs, AI recommends appropriate training programs, enhancing the effectiveness of skill development (Zhai et al., 2023). AI can also analyze historical data, making the personalization of employee development paths even more precise (Hou, 2024).

The implementation of AI-based solutions in employee training and development processes supports sustainable development strategies and provides recommendations to managers (Jia, Hou, 2024). This, in turn, can influence engagement management and foster employee loyalty (Prasad, De, 2024).

In compensation management processes, artificial intelligence can assist in optimizing e-compensation processes by providing accurate and precise analyses of compensation and benefits structures (Louali. El Abboubi, 2023). This automation also facilitates salary market analysis and adjusts compensation levels to reflect changes in the labor market, enhancing the efficiency of compensation management.

The use of artificial intelligence in HR processes brings both advantages and challenges. Key benefits include the automation of routine tasks, the reduction of cognitive biases, increased fairness in recruitment and employee evaluation processes, and enhanced personalization of training (Strang, 2022; Jia, Hou, 2024; Zhai et al., 2023). On the other hand, several challenges arise with the implementation of AI in HR processes. These challenges include ethical issues related to data privacy, high implementation costs, employee resistance, fear of job loss, inadequate technical infrastructure, and low adoption rates of new technologies (Louali, El Abboubi, 2023; Strang, 2023; Zhai et al., 2023).

3. Methodology

The primary objective of the conducted research was to identify the current state and potential of artificial intelligence application in HR processes. The research problems were formulated as the following questions: 1) In which HR processes do enterprises use artificial intelligence? 2) What are the main barriers to the use (or lack of use) of artificial intelligence in HR processes within enterprises? The research described in this publication employed qualitative methods. Due to the specific nature of the study, a reconstructive method was applied (Mazurek-Łopacińska, Sobocińska, 2018). To collect research material, individual in-depth interviews (IDI) were conducted. As a rule, the number of interviews in a study of this nature should range between 20 and 30, providing a solid basis for analyzing data and drawing conclusions (Olejnik, Kaczmarek, 2018). The interviews were conducted between August and September 2024. The sampling method was purposeful. The respondents included individuals holding positions in HR departments/personnel or payroll departments, HR directors/managers, business owners, or other decision-makers. This selection was dictated by the need to gather detailed and up-to-date information on the analyzed topic. The research was conducted in large and medium-sized enterprises within the private sector. A custom-designed interview guide was developed.

This tool was divided into three research areas:

a) Introductory questions – identifying the use of AI tools in HR processes within the enterprise or the reasons for not using AI in HR processes.
b) Research area 1 – the use of artificial intelligence in HR processes in large and medium-sized enterprises.
c) Research area 2 – barriers to and the future of AI implementation in HR processes in large and medium-sized enterprises.

The identified research areas correspond to the following categories outlined in the keyword linkage analysis (see Figure 1): foundational AI in HR processes and future of work and AI integration in HR. The interview guide included questions regarding the reasons for using or not using AI tools in HR processes and the potential plans for their implementation in the future (considering specific processes they may apply to). Respondents were also asked to identify the benefits of implementing AI solutions in HR processes and their impact on employee experiences, responsibilities, and competencies. Additionally, participants were requested to indicate future trends in the use of AI in HR processes and the key competencies that HR department employees will need in light of the increasing adoption of artificial intelligence.

To analyze the collected empirical material, narrative analysis and qualitative data analysis were conducted using the MaxQDA software. The collected data were transcribed and then subjected to a coding procedure. A total of 115 segments were coded into 9 codes (Table 1).

Table 1.
The coding system used in the qualitative research

Coding system	Fequency
Coding system	115
AI tools in HR processes	18
Benefits of AI implementation in HR processes	16
Barriers to implementing AI tools in HR processes	9
Impact of AI implementation on the employee experience	9
Impact of AI implementation on changes in employee responsibilities	9
Impact of AI implementation on changes in HR employee competencies	9
Reasons for not using AI tools	9
Planning the implementation of AI tools in HR processes	18
AI tools in HR processes	18

Source: Own study based on MaxQDA.

Among the respondents, the largest group consisted of HR department employees (36.8%), followed by HR managers and heads of these departments (31.7%). Just under 16% of respondents held the position of HR Business Partner. The remaining respondents held positions such as board member, company owner/CEO or manager. Most of the surveyed enterprises operate in the manufacturing industry (10 enterprises), while the others belong to industries such as IT, media, banking, e-commerce, and education.

4. Results and discussion

The described study revealed various aspects of implementing artificial intelligence in HR processes. The majority of respondents (56%) stated that they currently do not use AI tools in HR processes. These tools are applied in multiple areas of HR activities (Table 2). HR employees and managers use AI to prepare job advertisements, which accelerates the candidate acquisition process. Additionally, managers utilize AI to improve administrative tasks and generate reports. HR Business Partners (HRBPs) apply automation for generating content, graphics, presentations, and meeting notes. Among HR department heads surveyed, the most common AI applications are related to reporting and candidate selection.

Table 2.
AI Tools Used in HR Processes by Respondent Job Roles

	HR Department Employee	**HR Department Manager**	**HR Business Partner (HRBP)**	**HR Department Head**
AI Tools Used in HR Processes	**Recruitment** HR Department Employee > Large enterprises: 2 - 2 **Recruitment** HR Department Employee > Large enterprises: 2 - 2	**Recruitment** HR Department Manager> Large enterprises: 2 - 2 **Administrative support** HR Department Manager> Large enterprises: 2 - 2	**Reports** HRBP > Large enterprises: 2 - 2 **Various automations** (robots) HRBP > Large enterprises: 2 - 2 **Content generation** HRBP > Large enterprises: 2 - 2 **Graphic generation** HRBP > Large enterprises: 2 - 2 **Presentation generation** HRBP > Large enterprises: 2 - 2 **Tools for summarizing (meeting notes)** HRBP > Large enterprises: 2 - 2	**Report writing** HR Department Head > Large enterprises: 2 - 2 **Recruitment** HR Department Head > Large enterprises: 2 – 2 **Selection and recruitment** HR Department Head > Large enterprises: 2 - 2

Source: own study based on MaxQDA.

The implementation of AI brings numerous benefits. One of the most frequently mentioned advantages is time savings. Thanks to AI, the processes of application selection and reporting are significantly shortened, as noted by both HR employees and managers. Automating simple tasks reduces time burdens and allows staff to focus on more complex activities. AI tools also foster the generation of new ideas and improve communication with candidates. HR Business Partners (HRBPs) emphasized that automation increases the efficiency of actions, which translates into higher work quality. As one respondent stated, a benefit of using AI in HR processes is that "there is no need to import data manually; you only need to verify it, which takes minimal time, so we achieve significant time savings on simple tasks."

Despite the numerous benefits, AI implementation also involves certain barriers (Figure 2). Lack of experience in working with artificial intelligence and the high costs of implementation and maintenance are significant obstacles. Additionally, AI models require continuous training and do not always operate with precision, which limits user trust in automation. There are also concerns related to data security and a low level of awareness regarding the potential of AI solutions. Furthermore, organizations often experience resistance to change and a preference for working with people rather than computers.

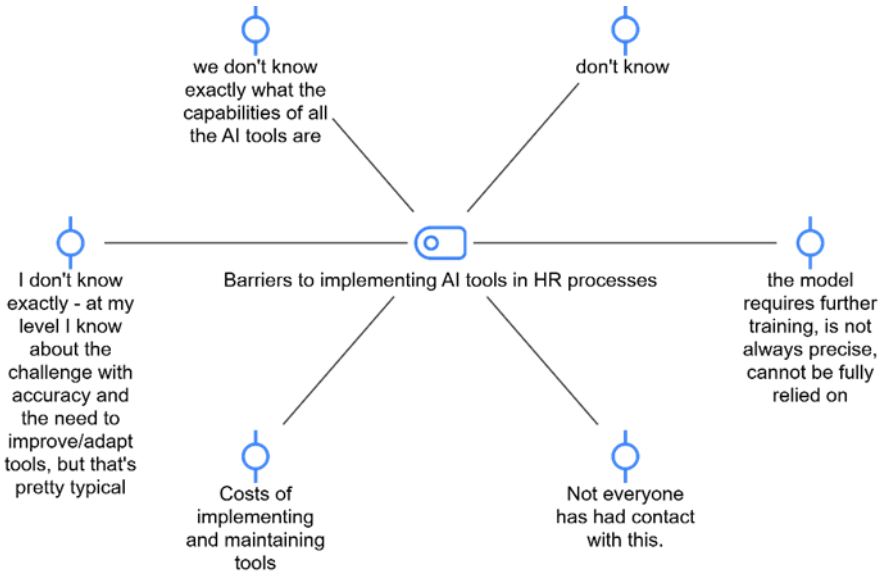

Figure 2. Single code "Barriers to implementing AI tools in HR processes" model (coded fragments)
Source: own study based on MaxQDA.

Respondents were asked to indicate how the implementation of AI solutions in HR processes affects the employee experience. Their assessment was described as varied. Among the benefits, they mentioned improved work comfort and enhancements to recruitment processes. HR employees noted that AI tools can accelerate processes; however, in some cases, automation may lead to rigid procedures and reduced flexibility in analyses. As one respondent explained: "It always improves and speeds things up, makes things a bit easier, but it also makes them a bit rigid — we get data presented in a specific way, we observe specific parameters. This has somewhat reduced the need for additional analyses and obscured other parameters. A significant positive is the ability to have data served on a platter. Some tasks provoke fear. For example, fear of job loss with the advancement of AI because some support roles might disappear completely."At the same time, respondents expressed concerns about job losses stemming from the automation of simple support tasks. Despite this, employees show a positive attitude toward changes associated with the implementation of artificial intelligence in HR processes.

The implementation of new technologies involves introducing changes within organizations. The study addressed the issue of changes in HR employees' responsibilities and competencies resulting from the adoption of AI solutions. According to the conducted research, these

changes are noticeable, though not always clear-cut. AI tools, to some extent, reduce the need to engage additional personnel for performing simple tasks, which saves time for roles such as recruiters. The automation of HR processes also reduces human errors, making reporting and data analysis processes less prone to mistakes. However, respondents indicated that the implementation of AI in HR processes requires the acquisition of new skills, such as prompt writing, the operation of automation tools, and the enhancement of employees' digital competencies.

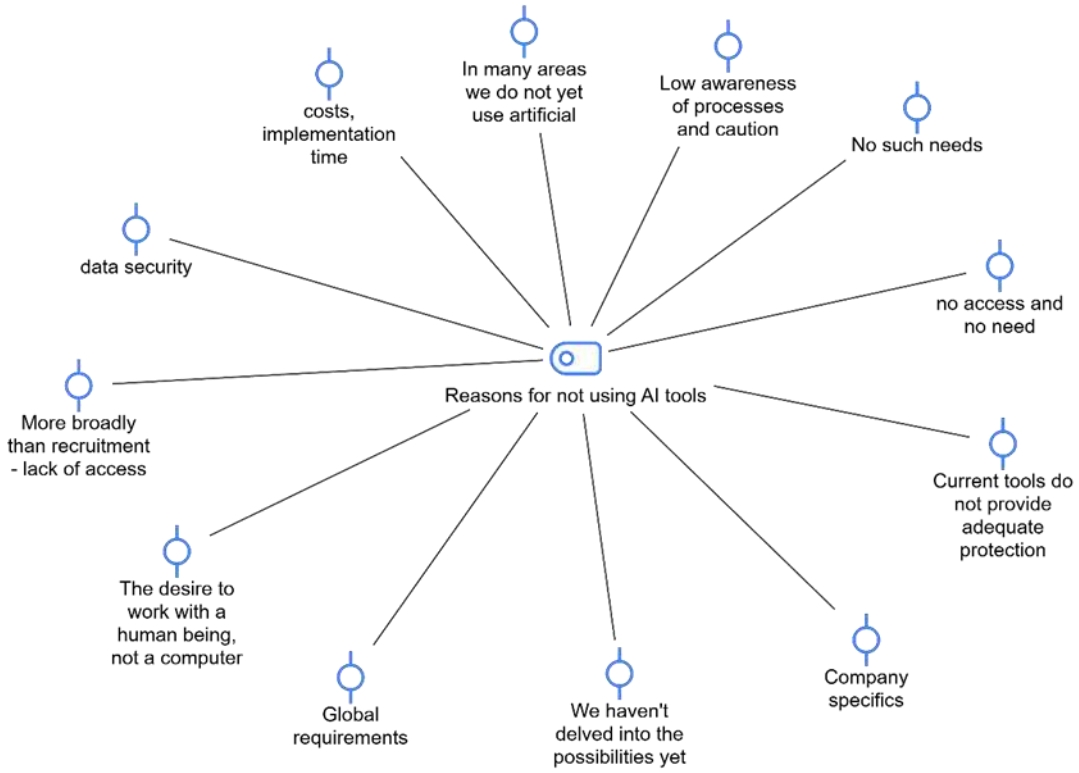

Figure 3. Single code "reasons for not using AI" model (coded fragments).

Source: own study based on MaxQDA.

In the group of respondents who indicated that AI tools are not used in HR processes at their workplace, the reasons for this phenomenon were identified (Figure 3). These reasons include no need for AI beyond recruitment, the specific nature of the organization, implementation costs, and concerns about data security. In many cases, respondents noted that employees do not have access to the appropriate tools or lack the skills necessary to use them. Some mentioned that organizations prefer human-to-human communication rather than human-to-computer interactions. Respondents were also asked about plans to implement AI in HR processes in the future. While some expressed a willingness to adopt AI, they noted a lack of concrete plans and actions. HR managers and department heads expressed interest in introducing AI, but these decisions are often postponed due to technological, financial, or organizational barriers.

The conducted research revealed that artificial intelligence (AI) is most frequently utilized in recruitment processes, automation of administrative tasks, and report generation. Similar findings were reported by Shettigar (2024) and Li et al. (2021), who highlighted that AI accelerates candidate selection processes, improves job matching accuracy, and eliminates human

errors. However, in this study, only 44% of respondents declared the use of AI tools in HR processes, which indicates their limited implementation in medium and large enterprises. In the literature, such as the research by Jatobá et al. (2021), AI is also shown to be employed in more advanced areas, including the personalization of career development paths and employee engagement analysis. These applications were not observed in the present study, which suggests that technological and competency-related limitations in the surveyed organizations may pose significant obstacles to fully leveraging AI's potential. These findings underscore the need for greater support for organizations in implementing AI not only in operational but also strategic HR processes.

Another significant finding of the study concerns the barriers to AI adoption. Respondents identified high implementation costs, lack of technical competencies, and concerns about data security as the primary challenges. These results align with the findings of Huang et al. (2020), who emphasized organizational barriers such as distrust of AI algorithms and ethical controversies related to biases embedded in AI models. Additionally, the current study highlighted employees' resistance to technological changes. Similar observations were made by Louali and El Abboubi (2023), who pointed out that fear of job loss is one of the key factors hindering the adoption of new technologies. In contrast, Marler and Boudreau (2017) noted that organizations successfully implementing AI often invest in employee training and skill-building, which facilitates the acceptance of such tools in daily operations. The results of the present study suggest that implementing AI requires a holistic approach that considers not only technological but also psychological and organizational factors.

Finally, the study found that AI application in HR processes offers numerous benefits, such as time savings, error reduction, and improved analysis quality. Zhai et al. (2023) emphasized that AI tools streamline process management, particularly in recruitment and HR data analysis. However, as noted by Jia and Hou (2024), there remains a lack of research on the long-term effects of AI on employee satisfaction and engagement. The findings of this study confirm that, in the short term, AI implementation improves work comfort and process efficiency but may also lead to procedural rigidity and concerns about losing control over key decisions. Future research should focus on the long-term impact of AI on organizational culture, the relationship between employees and technology, and strategies to support the adaptation of these tools in an evolving work environment.

5. Summary

In an era of widespread digitization and continuous technological development, the comprehensive yet gradual introduction of AI-based solutions into organizations is inevitable. Implementing AI, especially in HR processes, presents both challenges and risks. One of

the key issues is the risk of algorithmic bias. This risk can arise from reinforcing existing stereotypes if AI models are trained on inappropriate data (Prasad, De, 2024). Another challenge is the issue of data privacy. AI systems collect and analyze vast amounts of information, which can lead to violations of employee privacy (Strang, 2022). Furthermore, a critical challenge is resistance to change and the fear of humans being replaced by machines (Louali, El Abboubi, 2023). Despite these challenges, AI has the potential to significantly improve the efficiency of HR processes within organizations. However, attention must be given to ethical considerations and minimizing associated risks (Tinguley et al., 2023).

The research showed that although artificial intelligence has significant potential to improve HR processes, its use is currently limited to specific areas such as recruitment, report generation, and the automation of simple administrative tasks. A substantial portion of respondents (56%) do not use AI tools in HR processes, primarily due to cost barriers, lack of skills, and resistance to change. At the same time, those who use AI recognize benefits such as time savings, improved data quality, and enhanced communication with candidates. the results partially confirmed the hypothesis.

The results of the study provide clear answers to the research problems formulated in the introduction. The first research problem, which aimed to identify the HR processes in which enterprises use AI, revealed that AI is primarily applied in recruitment, administrative task automation, and report generation. However, more advanced applications, such as employee engagement analysis or personalized training paths, remain underutilized. In response to the second research problem, which focused on identifying barriers to AI implementation, the study highlighted significant challenges, including high costs, lack of technical skills, and concerns about data security. Additionally, organizational resistance to change and employees' fear of job displacement were identified as critical obstacles. These findings demonstrate that while AI offers substantial potential benefits, its adoption is hindered by both technological and human-related barriers, necessitating targeted strategies to address these issues.

The research also underscores the need for enterprises to develop competencies and infrastructure to overcome these barriers and better utilize AI's capabilities. These insights provide a valuable basis for further exploration of AI adoption in HR and for formulating practical recommendations for organizations. The author acknowledges the limitations of the described study. Primarily, the research included only large and medium-sized enterprises and a limited number of respondents from HR departments. The purposeful sampling method used may affect the generalizability of the findings to other industries and sectors. Additionally, the study focused on qualitative analysis methods, which limit the ability to precisely determine the scale of the phenomenon on a quantitative level. Another limitation is the lack of analysis of the long-term effects of AI implementation on employee engagement and satisfaction.

Future research directions should include expanding the research sample to encompass various industries and sectors to obtain a more representative picture of AI use in HR. It would also be valuable to conduct quantitative research to determine the scale of the phenomenon and

its impact on organizational efficiency. Another important area could be the analysis of the long-term effects of AI implementation in HR processes, with a particular focus on employee satisfaction, engagement, and motivation. Research should also focus on identifying best practices for AI implementation and strategies for minimizing barriers related to costs and resistance to change.

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THE IMPACT OF PRO-LOYALTY ACTIVITIES ON CUSTOMER BEHAVIOR DURING THE HIGH-INFLATION PERIOD

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Purpose: The aim of this article is to present research on the impact of inflation on customer loyalty.
Design/methodology/approach: The objectives were achieved by conducting research and obtaining results in the form of conclusions. The main research method was a survey conducted among customers. The thematic scope of the research was the issue of customer loyalty in the face of increasing inflation.
Findings: During the work, it was discovered that despite rising inflation, customers continue to buy products from companies to which they are loyal. Additionally, a number of other interesting findings were discovered. The actions of companies and the behavior of customers are independent of each other. According to the research, companies react to inflation, but their marketing activities are not a sufficient stimulus to stop its effects. Customers at best buy the same amount, and most often less, than before inflation.
Research limitations/implications: In the future, research should be carried out in the event of even more increasing inflation and on a larger research sample.
Practical implications: Showing the needs of loyal customers shows companies how to communicate with them during rising inflation. In addition, the results of the research would show companies what customers expect from them during this time.
Social implications: The research will have an impact on improving the mutual relations between companies and their customers. As a result, customers will be satisfied and companies will gain really loyal customers in the long term.
Originality/value: What is new in the article is that the research has been updated in a period of rising inflation. The research is addressed to both the clients of companies themselves.
Keywords: loyalty, communication with customers, needs of customers, customer behavior, inflation
Category of the paper: research paper.

1. Introduction

The concept of inflation has a long history in economics. In the mid-19th century, inflation meant an increase in the money supply or money in circulation not backed by metal money.

Later, the term inflation meant an increase in the money supply or an increase not offset by an increase in the demand for money, which led to a general increase in prices. After the Keynesian revolution, however, it came to mean an increase in the price level (Bryan, 1997). Austrian economists (Friedman, 1968) viewed inflation as a monetary phenomenon, pointing out that only changes in the money supply could lead to a general increase in prices. Mises strongly pointed out the harmful consequences of the change in terminology that was a consequence of the Keynesian revolution. Mises advocated the following definition of inflation: inflation is an increase in the money supply, or an increase not offset by a simultaneous increase in the demand for money (Mises, 1953). Most later economists followed this definition and focused on developing the theory of the Cantillon effect (Cantillon, 2010), that is, the analysis of how the inflow of new money changes and distorts market data. (Mousten Hansen, Newman, 2022). In general, inflation is (Depa, 2017):

- an increase in the general level of prices, which directly results in the degradation of money. This results in a decrease in its purchasing power. The purchasing power of money is the amount of goods and services that can be purchased for a unit of money, i.e. money spent now is worth more than in the future. This means that the basket of goods that we can buy for a certain amount of money now will be smaller in a year.
- a constant increase in the average level of market prices, which is caused by the increase in production costs;
- a faster increase in global demand in relation to the increase in the supply of goods and services;
- an excessive increase in the supply of money in circulation in the economy.

High inflation means that consumers plan their spending thoughtfully. They limit it and try to save as much as possible. During high inflation, you can see whether consumers are truly loyal customers. However, companies have the opportunity to keep customers. They can introduce loyalty programs that will help customers save money. The way a company treats its customers is also important, it is about an individual approach and meeting customer expectations.

The Central Statistical Office presented information on inflation in Poland (Figure 1). In September 2024, inflation was 4.9%. This means a significant increase compared to the previous month, when the rate was 4.3%. This means that the rate of price growth in September was higher than in August, while the forecasts indicated a reading of 4.8%.

Inflation in Poland has been systematically falling since the beginning of 2023, when it peaked at 18.4% in February. Since then, we have observed a gradual decline in the inflation rate, which in the first quarter of 2024 reached a level below 3%. However, since April 2024, a renewed increase in inflation has been visible. Forecasters estimate that inflation will be around 5% by the end of the year. In addition, forecasts indicate that average inflation in 2025 will be around 4.2-5.2% (Money). The inflation rate in Poland is presented in Figure 1.

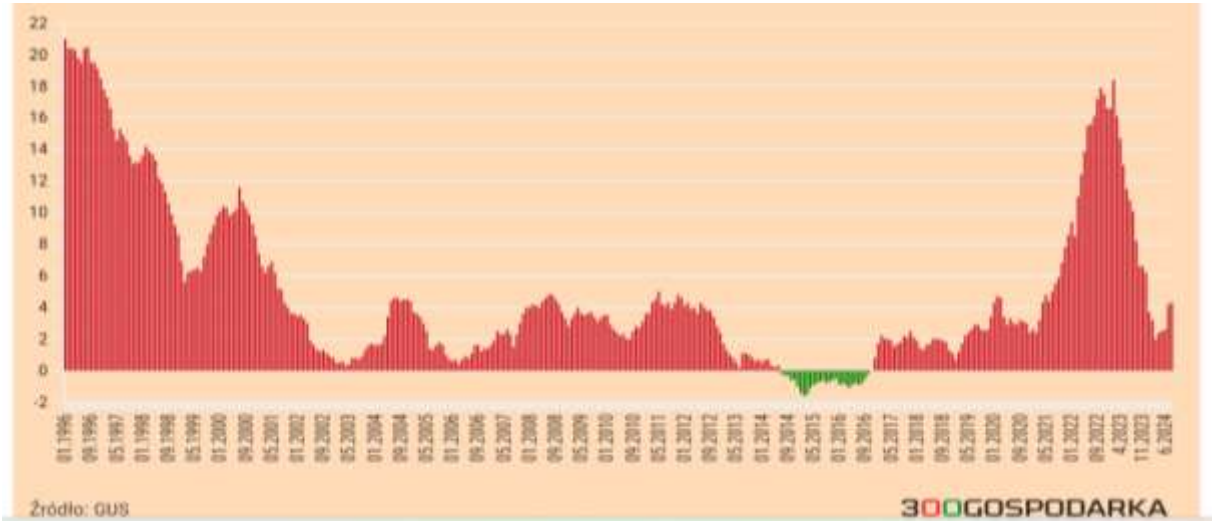

Figure 1. Inflation rate in Poland.

Source: https://300gospodarka.pl/news/inflacja-w-polsce-na-przestrzeni-lat-wykresy-gus-nbp.

Inflation influences consumer behavior in the market. Behaviour in a broad sense is defined as "any observable reaction to stimuli from the environment or all reactions and attitudes of a living organism to the environment" (Nowa Encyklopedia Powszechna PWN). One of the most important consumer behaviours is consumption behaviour. They constitute one of the two spheres of human economic activity, which are aimed at directly satisfying consumer needs, i.e. using the means of consumption (Żuchowski, Brelik, 2007). Consumer behaviour includes actions related to decision-making, and it begins with the awareness of needs and ends with the consumer's assessment of the accuracy of the decision, including the exchange of information (Żuchowski, Brelik, 2007). During high inflation, consumers may change their shopping behaviour at the initial stage of awareness of needs. They may re-evaluate their needs, and may give up on some purchases that are not essential. During high inflation, prices rise, so in connection with the change in consumption behaviour, consumers may buy fewer products.

The consumer will seek information about the products they have chosen to meet their needs and then evaluate them and ultimately choose the most appropriate ones for them. Assuming that the consumer makes purchasing decisions during high inflation, they can remain loyal to the products they have bought so far but can also swap them for other, e.g. cheaper ones. They can also buy smaller quantities of their favorite products. Can companies influence the consumer's decision-making? Are they able to keep a loyal customer with them? The answer is yes. The fight for the customer is fought in various ways. Companies use promotions, price reductions, improve the quality of their products or services.

2. The impact of inflation on consumer behavior

In the current unstable economic situation, customers may seek stability, which may increase loyalty to trusted brands, but may also cause consumers to look for other shopping options. Companies that want their customers to remain loyal to them should compete on the market with prices and prove that their products are valuable. In addition, if companies have to increase product prices, they should also clearly inform customers about this. When the fight for customers increases during high inflation, one of the solutions available to sellers is a loyalty program. The popularity of loyalty programs has changed in individual years, e.g. in 2023, grocery stores and gas stations dominated loyalty programs, and since 2016, programs from the fashion and drugstore sectors have also appeared (Marketing biznes). When customers assess their financial situation as good, small gifts are not important to them. Saving a few zlotys on shopping may not have meant much to many consumers, and points were earned on the side. When looking for savings, consumers start to appreciate more everything that is available cheaper or for free (Księgowość Infor).

Related to customer loyalty is the concept of trust, and consumer trust is linked to existing reputation. Brands that consistently provide high-quality services are likely to do better during times of high inflation. As inflation increases, price sensitivity increases, and as product prices increase, consumer purchasing power decreases. During this time, consumers are more discerning about their purchases, comparison shopping, comparing prices for the same or similar products across stores and online to ensure they are getting the best possible value. In addition, consumers are more rigorous in managing their spending. Brands often add value through increased innovation, additional benefits, and higher quality. Brands that do this offer fairer prices and are more likely to earn customer trust (Alemany, 2024).

There are strategies that can increase the profitability of companies, including:

1. If a company needs to raise prices, it should inform consumers about this; honest communication will increase consumer trust.
2. Practicing value-oriented marketing, emphasizing what benefits customers receive by buying the company's products despite the price increase.
3. Offering customer-oriented pricing strategies, adjusting prices to customer segments based on needs and price sensitivity.
4. Improving customer service and communication, giving priority to customer service, including quickly answering customer questions, especially those related to product prices and inflation.
5. Prioritizing long-term relationships, building customer trust, especially during high inflation, engaging in nurturing relationships with customers. Customers should feel appreciated and satisfied (Alemany, 2024).

The company should develop the so-called relational orientation. This means that one of the key areas of activity of such an enterprise is developing lasting relationships with other market participants, and in particular with customers (Sudolska, 2011).

Companies have the capabilities and tools to survive a period of high inflation. By building trust, companies will gain the loyalty of consumers who need security during high inflation (Alemany, 2024). Consumers like to participate in loyalty programs, collect points, get something for free. Therefore, companies should not treat this topic superficially. During high inflation, those companies that focus on providing unique, exclusive offers, will operate both offline and online, combine various promotions and take care of customers in various fields will gain an advantage on the market (Focus on Business).

3. Methods

As the literature review has shown, the level of inflation can affect consumer behavior. Companies are aware of this and more often use loyalty programs and tools in their promotional policy. However, consumer perceptions may differ from company expectations. People's beliefs are most often not logical, but psychological. This means that inflation perceptions are not based on actual price changes on the market, but on changes that draw our attention. This is visible in the reception of information about price increases.

The perception of high inflation varies greatly depending on the category. Most often, we look at the basket of goods and what the prices were a year ago, while consumers use a subjective assessment based on things they know the price of and often buy.

When it comes to changes in behavior in response to inflation, there is a visible diversity. Promotions are used, which changes its perception, because it is observed at different times.

Consumer behavior can take the form of giving up a product, buying in smaller quantities, but also buying in bulk, considered cheaper. So inflation can actually increase the number of purchases in the short term.

It is impossible to generalize that everyone buys less or buys cheaper, because it depends on many factors.

Due to the granularity of the data, companies must look at the specific category in which they operate and, depending on the results, respond to inflation in different ways. This usually involves modifying loyalty programs or tools that stimulate this loyalty. Companies' actions will go in many directions, most often already proven in the past. An example is the action of introducing and promoting lower-tier brands or value brands when premium products become less popular. A store brand is distinguished because sales of store brands tend to increase in times of inflation. Another action is offering discounts on basic goods, which are supposed to increase sales of other, more expensive brands when buying in a given store.

Another thing that companies do is the so-called downsizing, i.e. deliberately reducing the weight or quantity of products in the package or the content of the main (more expensive) ingredients in the product while maintaining the same price, used mainly to reduce costs and increase profitability (Biznes Onet).

People's beliefs are not logical because they assess uncertainty not on the basis of facts, but on feelings. In turn, companies believe that the best antidote to price increases is to use a more aggressive loyalty program or a loyalty-boosting tool. This article is an attempt to verify these behaviors and actions. The aim of the article is to verify the hypothesis about the effectiveness of using pro-loyalty actions by companies during high inflation.

The opinions of 119 consumers on their purchases and loyalty to companies during high inflation were analyzed. This group was deliberately selected so that only those responsible for the main food purchases in the household participated in the study. Therefore, units considered typical in terms of the objectives of the overall study (Rószkiewicz, 2002) and (Escher, 2023) were examined.

The objective formulated in this way was translated into three research questions, but concerning the overall study:

RQ1: What are the purchasing behaviors during the period of high inflation?

RQ2: What are the opinions of consumers regarding loyalty towards companies?

RQ3: What are the observations of consumers regarding the use of loyalty programs by companies?

For the purposes of this article, some of the questions that concerned consumer behavior and their reception of pro-loyalty programs and tools were used.

The survey method was used in the research, implemented using the CAWI technique, which is a form of an online survey. The research tool was a survey questionnaire. The research used non-random sampling, i.e. the selection of typical units.

The data were statistically processed to examine the independence between post-inflationary buyer behavior and company actions using the chi-square test. The chi-square test examines whether the data are independent of each other. In this case, a null hypothesis was put forward, which assumes that there is no relationship between post-inflationary customer behavior and company pro-loyalty actions. The alternative hypothesis assumes that pro-loyalty actions affect customer behavior during periods of high inflation. The output table contains empirical (observed) data. For further analysis, theoretical data should be determined for each cell according to formula 1.

$$n'_{ij} = \frac{n_{i.} * n_{.j}}{\sum_{i,j=1}^{n} n_{ij}} \quad (1)$$

where:

ni. - boundary value of rows I;

n.j - boundary value of columns j;

∑nij - sum of all observations.

After determining the theoretical values for each of the cells of the output table, the value of the empirical chi-square statistic can be calculated according to formula 2.

$$\chi 2 = \sum_{i=1}^{k} \sum_{j=1}^{s} \frac{(n_{ij} - n'_{ij})^2}{n'_{ij}} \quad (2)$$

where:

nij – empirical (observed) values of cell ij;

n'ij – theoretical values of cell ij.

The $\chi 2$ statistic calculated in this way is compared with the theoretical statistic taken from chi-square tables with (k-i)*(s-1) degrees of freedom at the assumed probability. Most often, a 5% chance of making an error is assumed, i.e. 0.05 in the chi-square distribution table.

4. Results

The results used in this article are part of a larger whole. Almost ¾ (68.7%) of women took part in this study, and only slightly over ¼ (30.3%) of men. This structure is reflected in reality, where women more often make purchases of basic goods.

The survey questionnaire included several important questions that were an introduction to this article. The answers to one of them indicate that almost all respondents are loyal to some company. This was in the range of over 90%.

Another important question was to check how many points respondents feel loyal to a given company. It turns out that almost 80% of respondents declare their loyalty at a high level.

The questions related to the topic of inflation confirmed that respondents feel its effects. Again, almost 90% of respondents selected this option. Despite this, almost all respondents (93%) are still loyal to their favorite companies despite inflation, but at the same time, more than half (58%) have not observed companies using particularly attractive discounts, rebates, or rewards and receiving any additional value. This in turn affects the feeling of being treated individually and exceptionally.

The main topic of this article is the relationship between inflation and related pro-loyalty actions of companies and the behavior of their loyal customers. In other words, the article verifies the opinion on whether and to what extent pro-loyalty actions of companies reduce high inflation experienced by their customers. The hypothesis assumes that there is no relationship between post-inflationary behavior of customers and the actions of companies. In order to verify it, 119 people, customers of various industries, were surveyed. The results of the study are presented in Table 1.

Table 1.
Buyer reactions to inflation and company actions

	Without changes	I buy a little less	I'd rather give up on the purchase	I definitely won't buy it
Loyalty programs	12	45	7	3
Discounts, prizes	14	48	4	0
Better quality products	1	16	1	0
Cheaper products	10	21	3	2
Better quality customer service	7	25	5	1
Clear communication about price increases	10	27	3	2
Taking care of the client	12	39	5	1
Loyalty to the company	26	69	8	3
More information	14	36	4	1
Individualization	6	35	5	2

Source: Own study based on research.

Due to the fact that the calculation of the $\chi 2$ statistic requires a count of at least 5, the responses "I rather give up the purchase" and "I definitely give up the purchase" were combined. This is how Table 2 was created. With the column "I give up the purchase", which is already the basis for calculations. It should also be emphasized that there were no responses where respondents declared an increase in willingness to make purchases after companies used loyalty programs or tools.

After standardizing the data, the theoretical values of the ij cells were calculated. They are presented in Table 3.

Table 2.
Modified buyer response numbers to inflation and firm actions

	Without changes	I buy a little less	I'd rather give up on the purchase	Total
Loyalty programs	12	45	7	64
Discounts, prizes	14	48	4	67
Better quality products	1	16	1	18
Cheaper products	10	21	3	34
Better quality customer service	7	25	5	37
Clear communication about price increases	10	27	3	40
Taking care of the client	12	39	5	56
Loyalty to the company	26	69	8	103
More information	14	36	4	54
Individualization	6	35	5	46
Total	112	361	60	533

Source: Own study based on research.

Table 3.
Theoretical numbers of buyers' reactions to inflation and companies' actions

	Without changes	**I buy a little less**	**I'd rather give up on the purchase**	**Total**
Loyalty programs	14,1	45,4	7,5	67,0
Discounts, prizes	13,9	44,7	7,4	66,0
Better quality products	3,8	12,2	2,0	18,0
Cheaper products	7,6	24,4	4,1	36,0
Better quality customer service	8,0	25,7	4,3	38,0
Clear communication about price increases	8,8	28,4	4,7	42,0
Taking care of the client	12,0	38,6	6,4	57,0
Loyalty to the company	22,3	71,8	11,9	106,0
More information	11,6	37,3	6,2	55,0
Individualization	10,1	32,5	5,4	48,0
Total	**112,0**	**361,0**	**60,0**	**533,0**

Source: Own study based on research.

According to the chi-square test procedure, the theoretical and observed numbers were used to calculate the empirical chi-square statistic.

$$\chi 2 = \frac{(14-14{,}1)^2}{14{,}1} + \frac{(45-45{,}4)^2}{45{,}4} + \frac{(7-7{,}5)^2}{14{,}1} + \cdots + \tag{3}$$

$$+ \cdots + \frac{(35-32{,}5)^2}{32{,}5} + \frac{(5-5{,}4)^2}{5{,}4} =$$

$$= 13{,}2$$

The empirical statistics were compared with the theoretical statistics from the chi-square distribution tables with the appropriate degrees of freedom. The degrees of freedom were calculated according to the formula (number of rows -1)*(number of columns-1). In this case, the number of degrees of freedom will be 18, because (10-1)*(3-1), and the confidence level – 0.95. The theoretical statistics from the chi-square distribution tables with 18 degrees of freedom and significance at the 95% level is 28.8693.

The empirical statistic is □2 13.2 and is lower than the theoretical statistic (28.8693). Therefore, there is no basis for rejecting the hypothesis of independence of features with the given probability (0.95). Based on this result, it should be stated that with 95% probability, the actions of companies and the behavior of customers are independent of each other. This means that according to the conducted research, companies react to inflation, but their marketing activities are not a sufficient stimulus to stop its effects. Customers at best buy the same amount, and most often less, than before inflation.

5. Discussion

There is a common belief that loyalty programs are always a way to keep loyal customers with a company, but in conditions of high inflation this situation may change. High inflation causes prices to rise and consumers buy fewer products. This has also been shown by the research in this article. The research shows that in a situation of high inflation, higher prices, consumers are still loyal to their favorite companies or reduce their purchases and buy slightly fewer products. Companies could alleviate such a situation by using various tools such as price reductions or various types of promotions. Companies that want to maintain customer loyalty must focus on offering competitive prices, proving that their products have value. Companies should also honestly communicate changes to the product to the customer and also provide the highest level of customer service.

6. Conclusion

The article presents the results of research on consumer behavior on the market in conditions of high inflation. Inflation in Poland has been systematically falling since the beginning of 2023, when it reached its highest level of 18.4% in February. Since then, a gradual decline in the inflation rate has been observed, which in the first quarter of 2024 reached a level below 3%. However, since April 2024, a renewed increase in inflation has been visible.

During high inflation, consumers can change their shopping behavior at the initial stage of becoming aware of their needs. They can reassess their needs, and they can give up some purchases that are not essential. High inflation leads to a decrease in customer loyalty, because they are forced to look for savings and therefore look for other, better offers for them.

The main topic of this article is the relationship between inflation and the related pro-loyalty activities of companies, and the behavior of their loyal customers. In other words, the article verifies the opinion on whether and to what extent pro-loyalty activities of companies reduce the high inflation felt by their customers.

The hypothesis assumed that there is no relationship between post-inflationary customer behavior and company actions. According to the conducted research, it turned out that companies react to inflation, but their marketing activities are not a sufficient stimulus to stop its effects. Customers at best buy the same amount, and most often less, than before inflation. It is recommended to conduct similar studies after some time, when inflation increases significantly again and it will be possible to compare the results.

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DETERMINANTS OF THE FUNCTIONING OF METAL COMPANIES IN SUPPLY CHAINS

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Purpose: The purpose of this article is to identify and assess the nature of the relationships of metal companies in supply chains and the basic determinants of development of these relationships and the perception of the role of supply chain management in business practice?
Design/methodology/approach: The paper presents the results of a pilot study on the key elements of cooperation among metal companies in supply chains. The research was carried out using the author's survey questionnaire and covered companies operating in Poland. The issues studied included such elements as: the competences of companies in forming relationships, the reflection of the role and place of supply chain management in the organizational structure of the surveyed companies, the assessment of the role of the surveyed entities in the supply chain, the place of the leader or coordinator in supply chains, the level of involvement of partners, and the supply chain integration and relationship formation activities undertaken.
Findings: The results obtained allowed to identify the role and place of the surveyed companies in supply chains, as well as the key competencies and actions taken to integrate and develop supply chain cooperation.
Research limitations/implications: The article is exploratory in nature and provides the basis for further research in building effective corporate relationships in supply chains.
Practical Implications: Understanding inter-organizational relationships is a fundamental part of supply chain management, which, based on the results, remains a significant challenge for many companies.
Social implications: Shaping supply chain relationships is an important aspect of business operations that result in collaboration to create value for customers. Originality/Value: The research niche presented in the article concerns the application of a survey of opinions and judgments, based on an original survey questionnaire, in the group of companies from the metal industry.
Keywords: supply chain, metal industry, enterprises in the supply chain
Category of the paper: research paper.

1. Introduction

In the changing conditions of business entities, an important role is played by identifying areas and resources to increase competitiveness, among which building relationships among

business partners in the supply chain can be of particular importance. The important determinants shaping the sustainable competitive advantage of modern enterprises undoubtedly include quality of cooperation among business partners and creation of relationships with partners in integrated supply chains. The basis of such cooperation is the integration and development of relationships within the company, and then the transfer of these practices to the respective links, until the entire supply chain is fully integrated. The effects of these activities can present both opportunities for development and increased competitiveness, but also significant challenges.

The purpose of the study is to identify and assess the nature of the links and present the basic determinants of the formation of relationships of metal industry enterprises in supply chains and the role of supply chain management in business practice. Achievement of the goal of the paper required identification of the key competencies of the surveyed companies in this scope, as well as of the measures taken to integrate and develop supply chain cooperation. The research method used was an original survey questionnaire addressed to the industry enterprises conducting their business in Poland. The realization of the research objective involved the following research questions:

- What are the supply chain management competencies of the surveyed companies?
- How is the role of integration and development of relationships in the supply chain reflected in the organizational structure?
- How do companies assess their place and role in the supply chain?
- What is the level of cooperation in the supply chain of the companies?
- How do the surveyed companies assess the involvement of partners in decision-making?
- What actions are being taken for supply chain integration?

Obtaining answers to the above questions made it possible to identify the role, place, scope of integration and cooperation in the surveyed companies, as well as the factors influencing the formation of relationships. In addition, they formed the basis for the formulation of the research thesis: the cooperation of metal enterprises with economic partners can be of different nature, which affects the formation and level of relationships in supply chains.

2. Cooperation of enterprises in the supply chain

The theoretical basis of the integrated supply chain concept is M.P. Porter's value chain, in which the pursuit of value growth for customers requires taking action beyond individual companies is strictly determined by appropriate market relationships with customers and suppliers (Pisz et al., 2013).

As K. Rutkowski states, a single company cannot compete with a supply chain, in which, thanks to the extensive cooperation of its links, synergistic effects are achieved leading to an increase in potential which could not be achieved through cooperation based solely on

transactions. Companies in industries operating in global markets have replaced the concept of an internal value chain with a system of value creation created by all the links of the chain (Rutkowski, 2005)

The essence of business entities' activity is to increase value for both customers and all stakeholders. The surplus benefit of entering into partnerships within supply chains is an important determinant of the development of relationships aimed at increasing value as measured by both quantitative and qualitative indicators (Zarządzanie łańcuchem dostaw, 2007).

Supply chains can therefore be considered a network of organizations that collaborate with each other to deliver the products desired by the market, as well as the process of creating value for the customer (Tarasiewicz, 2014). An important role is therefore played by the integration of business processes across the supply chain, referred to in the literature as supply chain management (Cooper et al., 1997).

The basis of the modern interpretation of supply chain management is the tendency to integrate activities within individual organizations. It involves setting the strategic direction of the business, determining the type of activities, organizational structures, processes to integrate the operations conducted, selecting potential partners, and overseeing the activities (Schary et al., 2002). It can be defined as the comprehensive management of the entire network of partners and the relationships among them (Harrison, van Hoek, 2010).

The essence of modern supply chain management is the decision-making process involved in synchronizing the physical, informational and financial streams of demand and supply flowing among its participants in order for them to achieve competitive advantage and create added value for the benefit of all its links, customers and other stakeholders (Witkowski, 2010).

In turn, supply chain management (Bozarth, Handfield, 2007) is defined as: the active management of supply chain activities and relationships among the respective links in the chain in order to maximize customer value and achieve sustainable competitive advantage. These are conscious efforts by a company or group of companies to build and operate supply chains in the most efficient and effective way possible (c.f. Stock et al., 2010; Larson, Halldorsson 2004).

A special role in building competitiveness in the modern economy can be attributed to the formation of both internal and external relations among entities. At the same time, the increase in the importance of relationships represents one of the most significant development trends in contemporary mechanisms of value creation, competitiveness, innovation, knowledge enrichment and diffusion (Shinet al., 2019; Ralston et al., 2017; Høgevold et al., 2019; 2020).

Working closely with partners and including them in the value creation chain, which is characterized by an effective flow of information/knowledge and a willingness to bring core competencies to the relationship, provides the basis for more efficient use of resources, cost reduction, and the potential for increased flexibility and synergies for partners (Yeh et al., 2020; Loury-Okoumba, Mafini, 2021).

The basis for modern interpretation of supply chain management (Witkowski, 2010; Swierczek, 2012) is the trends of holistic orientation to flows and processes, a network concept (Blaik, 2017, 2018), integration of activities within individual organizations (Szozda et al., 2016), and the formation of relationships both within the enterprise and across the supply chain (Qu et al., 2015). Therefore, the essence of supply chains is the creation of a network of relationships among companies, which includes such issues as managing the physical flow of tangible goods, financial resources and information. A high degree of efficiency and reliability in supply chain operations requires joint planning, coordination, monitoring, but most importantly - information sharing and risk sharing. Particular importance in this context should therefore be given to understanding the determinants, dependencies and interactions among partners in supply chains.

3. Research methodology

The research was conducted in 50 Polish companies in the metal sector, covering the broad metal industry, i.e. the production and processing of steel and steel products. The detailed structure of the surveyed companies in terms of size (according to the classification of activity), type, scope of activity, ownership of capital employed and duration of existence in the market, is shown in Figure 1. The selection of the research sample was purposive (microenterprises were not included in the study).

The research method used was an original survey questionnaire, consisting of questions on the characteristics of the studied companies and the research problems addressed. The questionnaires were filled out by people in managerial positions, mainly in the field of supply chain management or other related fields, and the results obtained were analyzed quantitatively and qualitatively.

In terms of business size, well-established large and medium-sized companies played the main role in the study group. Their activities were largely international in scope. In terms of ownership of the capital involved, these were companies with Polish capital. Manufacturing companies dominated among the respondents. This is reflected in the results regarding the place and role played by the surveyed companies in supply chains (see Figure 2).

The metal companies surveyed are primarily manufacturers located as an initial or middle link in the supply chain and often also serve as downstream suppliers or suppliers of metal products to multiple industries.

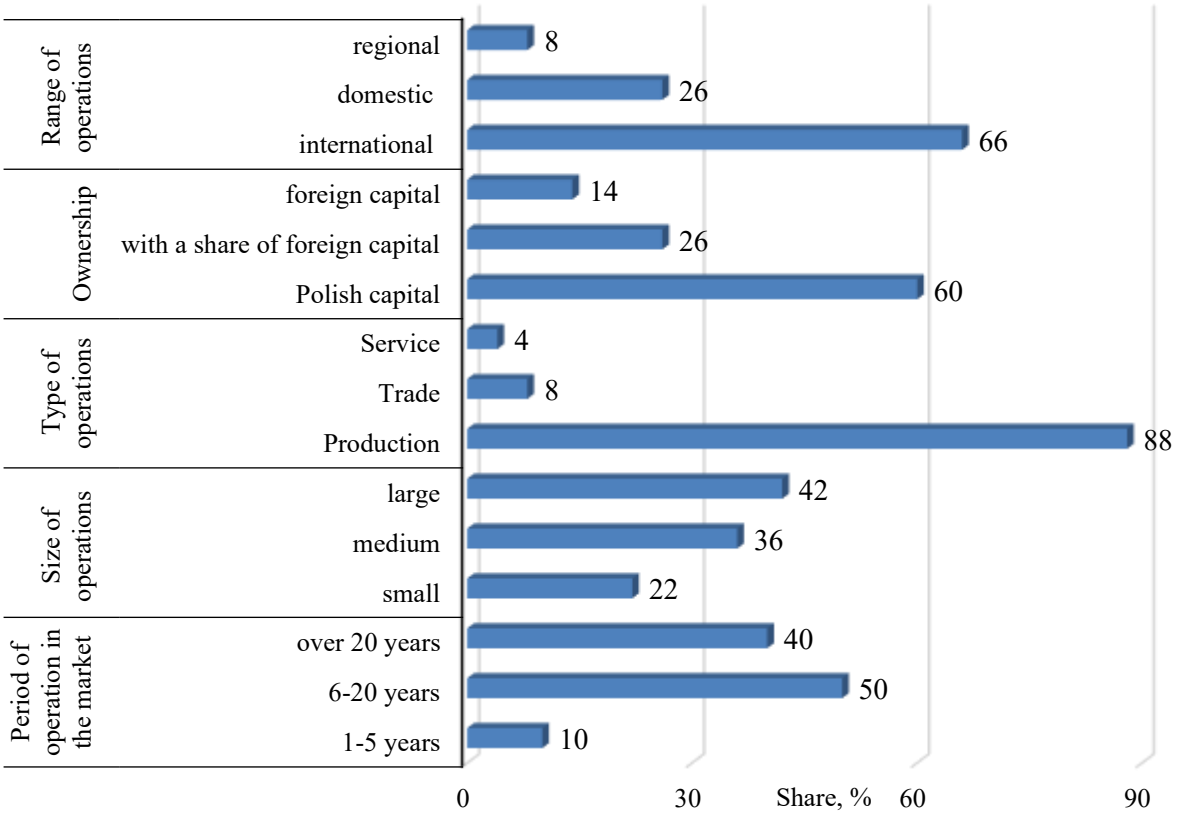

Figure 1. Characteristics of the surveyed businesses.

Source: Own study.

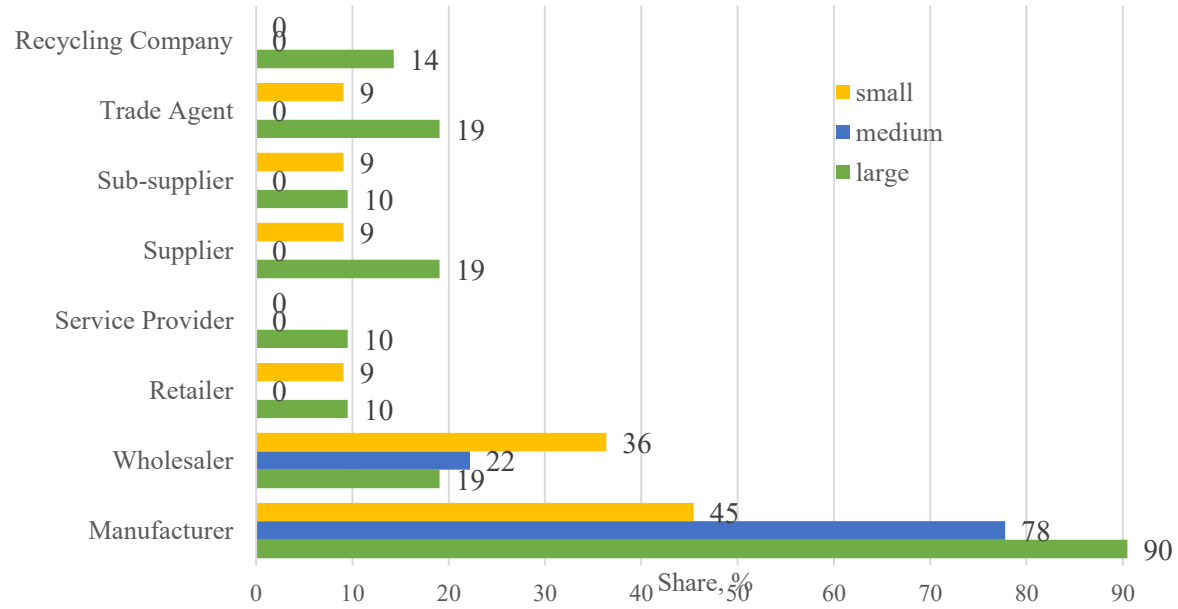

Figure 2. The role of the surveyed companies in the supply chain.

Source: Own study.

4. Research results

The surveyed companies in the metal industry cooperate with many business partners, but for the purposes of this research and outlining the scale of cooperation, a question on the number of suppliers, customers and business intermediaries, was included. The results obtained are as follows: suppliers - the average number is 94 entities: large companies - 155, medium-sized - 70, small - 54), customers - on average 568 entities (large enterprises -1214, medium-sized - 291, small - 199), commercial intermediaries - on average 17 entities (large enterprises - 36, medium-sized - 8, small - 6). However, it is worth noting that the surveyed companies cooperate with economic partners to varying degrees. These could be links based on sales transactions, short-term/periodic agreements or long-term relationship-based cooperation. The results of the survey on relationships formed indicate that the formation of relationships mainly relates to activities within the organization (especially in small enterprises it is 91% of answers, while in medium-sized enterprises and large enterprises - more than 50% of answers). This indicates that companies are aware that the basis for broader supply chain cooperation is internal integration. Creating relationships with suppliers and customers is the domain of about half of large enterprises and about 30% of medium-sized enterprises, while small enterprises indicate relationships with customers and suppliers to a small extent. In the case of ties with commercial intermediaries, relationship formation is indicated by 18% of small, 28% of medium-sized and 24% of large enterprises.

The results of the research on the supply chain management competencies of the surveyed companies indicate the basic elements that characterize the level of supply chain integration, and these include: the existence of a supply chain management unit in the organizational structure, implementation of an integrated management system, measurement of performance, participation in purchasing and sales consortia, supply risk analysis and assessment, joint research on product development, supply chain-wide management concepts and systems, information system integration and supply chain controlling. The results obtained regarding the competencies of companies in the area of supply chain management are shown in Table 1.

The respondents' answers allow us to conclude that the integration of supply chain management activities is primarily the responsibility of the logistics department/unit. This is understandable given that the role of supply chain management is seen as the next stage in the development and integration of logistics tasks (cf. Blaik, 2017). However, the basis of this integration is the creation of partnerships with the respective links in the supply chain. Respondents' answers underscore an awareness of the important role of supplier and customer relationships regardless of the size of enterprises. Another aspect is emphasis of the important role of integration in such areas as the information and management systems, but in the case of many supply chain management competencies, in the business practice of the surveyed entities they refer to the enterprise, and the indications for the scale of the entire network are lower.

Table 1.
Competencies of supply chain management in surveyed companies

Enterprise Competencies, %		high	medium	low
Existence in the organizational structure of the unit responsible for supply chain management	no units	10	17	45
	unit, logistics department	38	56	27
	individual persons in functional departments	43	17	27
	member of the management board	5	6	0
	supply chain management unit/department	19	11	0
Developing partnerships	with suppliers	57	61	45
	with customers	57	61	45
	distributors	19	6	9
	service providers	33	28	36
	with recovery organizations	29	22	18
Integrated management system	in the company	48	61	64
	across the supply chain	43	17	18
Measurement of the effects of operation	in the company	52	72	64
	across the supply chain	38	17	0
Participation in consortia (groups) related to	shopping	38	44	36
	sales	38	17	26
Supply analysis and risk assessment	in the company	52	50	45
	in the supply chain	38	28	9
Supply chain product research and development		33	6	18
Supply chain-wide management concepts and systems		24	39	18
Integration of the information system		57	22	27
Preparation for supply disruptions and irregularities		43	22	27
Controlling the supply chain		24	6	0

Source: own study.

Another of the issues analyzed was the dependencies that exist between partners in supply chains. The results of the indications are shown in Figure 3.

Few of the companies surveyed play a leadership role in a supply chain. A significant number of large enterprises have equity ties with customers, while small and medium-sized enterprises were more likely to have equity ties with suppliers. In contrast, more than 55% large and medium-sized enterprises indicate that they operate within a network of peers. In the case of small businesses, however, 75% carry out their activities in a dominated network.

Another aspect studied was evaluation of the level of cooperation, and the results obtained are shown in Figure 4.

Most often, respondents indicated cooperative collaboration (60% of small businesses, about 40% of large and medium-sized companies on average). A significant number of companies, regardless of size, indicated relationships involving the exchange of information for ongoing transactions. In the case of medium-sized enterprises, strategic partnerships and related long-term cooperation and information exchange in making joint decisions were indicated most often (compared to other enterprises), but this is definitely not the dominant nature of the relationships of metal companies.

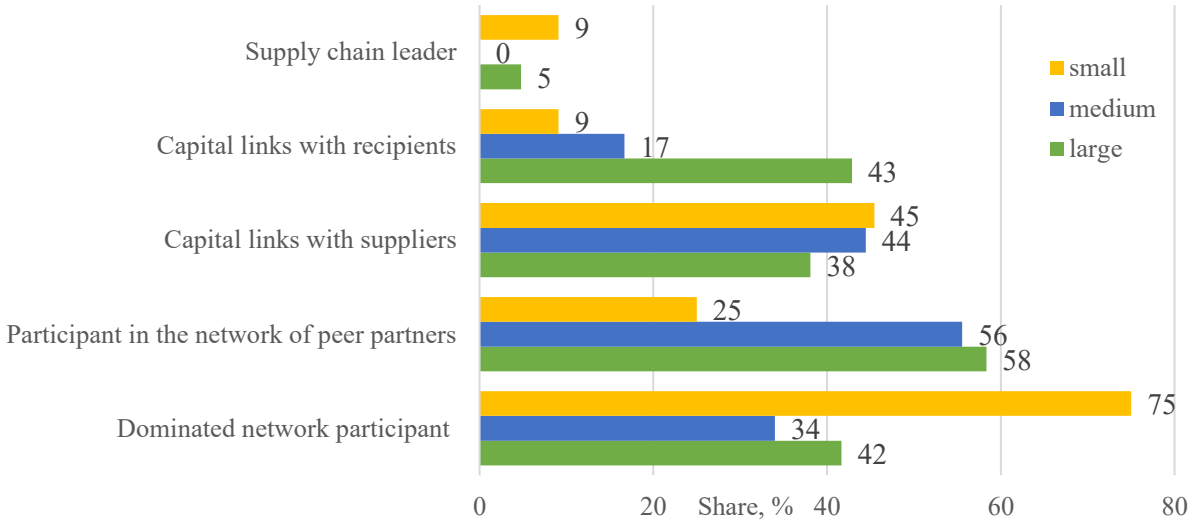

Figure 3. Network dependencies of enterprises.

Source: own study.

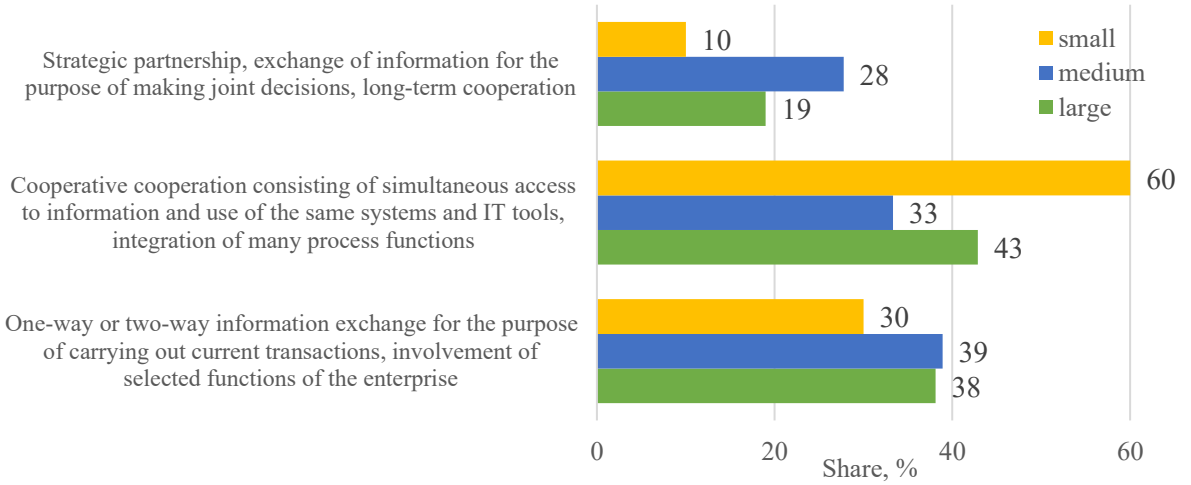

Figure 4. Assessment of the level of cooperation with economic partners

Source: Own study.

An important issue in the study of relations between business partners is communication, exchange of information and, in the case of partnerships, also participation in decision-making. Another issue was to obtain information on which contractors develop partnerships with the surveyed companies, and what is the type of agreements. The results are shown in Figure 5.

Respondents' answers on participation in the supply chain decision-making process indicate significant limitations in this regard, or even a lack of such participation (more than 60% of medium-sized enterprises). Only 14% of large companies indicate a high level of involvement in this area. It is worth pointing out, however, that a significant proportion of respondents from large and small enterprises co-participate, with customers, in the decision-making process. Links in this scope with suppliers are present in a significant proportion of medium-sized companies.

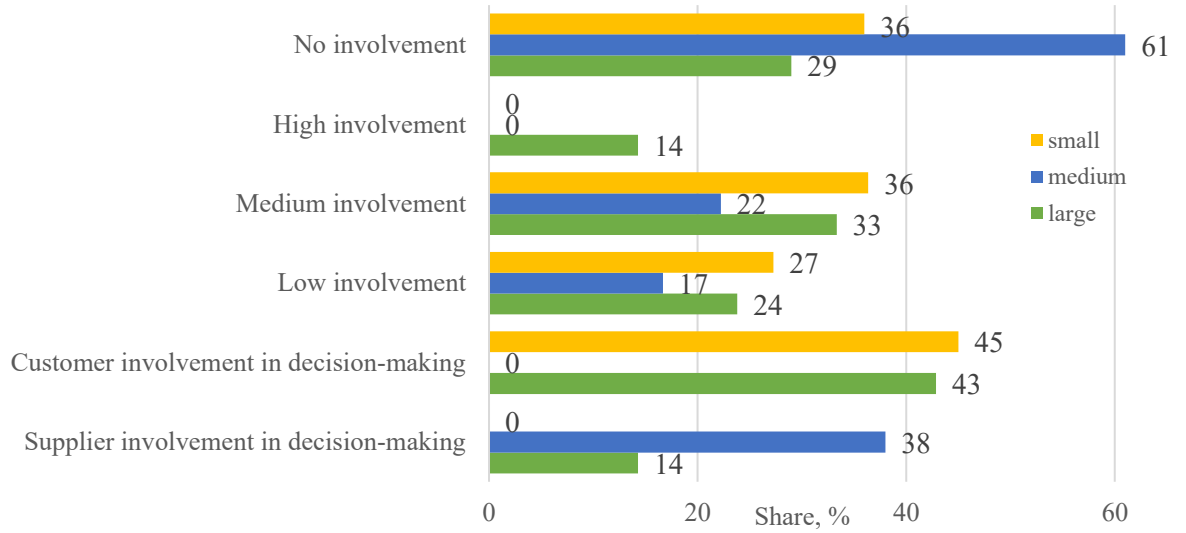

Figure 5. Participation of Partners in Decision-Making.

Source: Own study.

5. Conclusion

The modern economy is characterized by a high level of competition and an extensive network of connections and dependencies. Metal industry companies play a significant role in the economy and are an important link in many supply chains, so the quality of cooperation of economic partners and relational resources are some of the most important factors that determine competitiveness, and an important development trend. In turn, understanding the determinants of inter-organizational relationships is a fundamental element of supply chain management.

Based on the research conducted at metal industry companies, it can be concluded that creating relationships based on partnership principles is a significant challenge for many companies. Closer cooperation mainly refers to customers and suppliers, but it does not necessarily refer to strategic partnerships, which are characterized by long-term cooperation and joint decision-making. The predominant form of relationship is the exchange of information to implement current transactions and (long-term) agreements with customers, suppliers and distributors. The results obtained can form the basis for further research into the factors that constitute the main barriers and constraints to development of partnerships, which undoubtedly constitute the basis of competitiveness.

The obtained results indicate the important role of the logistics department in the integration of activities related to supply chain management. At the same time, this integration requires the creation of partnership relations between individual links of the supply chain, which are, however, conditioned by the maturity of supply chains, which is a basic element of the efficiency and effectiveness of supply chain management (cf. Cheshmberah et al., 2020). Another significant limitation is the challenges and barriers to cooperation within the supply

chain, which affect the effectiveness of supply chain management in business practice, such as, among others, information exchange, trust, lack of conviction about the possibility of cooperation on a partnership basis with contractors, limited application of modern supply chain management concepts (cf. Jain, 2020). Another important direction to be taken into account in the pursuit of supply chain maturity is the reduction of dominance in collaborative and sustainable supply chain development (cf. Sánchez-Flores, Cruz-Sotelo, Ojeda-Benitez, Ramírez-Barreto, 2020).

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SOCIAL NETWORKING SITES IN THE MANAGEMENT OF NONGOVERNMENTAL ORGANIZATIONS – THEORETICAL IMPLICATIONS

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Purpose: The purpose of this paper is to analyze the application of social networking sites potential (SNS), mainly Facebook by non-governmental organizations regarding the role of SNS in communication and image establishment in modern organizations.
Design/methodology/approach: To achieve the objective of this paper, the analysis of available secondary data, which consists of reports and scientific studies, statistics and research conducted by international and domestic NGOs. The second stage of the study involved collecting illustrative material from official Facebook fan pages run by three NGOs with the highest number of observers according to the data from November 2024 to analyze effective instruments of their communication with stakeholders.
Findings: Communication with the organization's environment is particularly important in non-profit sector, hence the documentation of activities performed contributes to the entity's credibility and credibility and trust is the basis for the perception of third sector organizations The functions of social media in the activities of non-governmental organizations can be divided into three areas: informational, social engagement and mobilization.
Research limitations/implications: The presented study is of conceptual character and is based mainly on available secondary data. More in-depth study based on the empirical material is necessary to demonstrate social media use in practice of non-governmental organizations in establishing their communication strategies.
Practical implications: Presented paper outlines a framework for analyzing effective communication strategies developed by non-profit sector entities. Social networking sites are important for non-governmental organizations in the perspective of fulfilling their statutory goals (information and communication activities about organization's performance and results), image establishment (tasks consisting in creating and strengthening relations with the stakeholders) and obtaining funds (information policy in the context of fundraising).
Originality/value: The paper addresses important issue in the perspective of the advancement of non-profit organizations, mainly in terms of their growing professionalization. Development and implementation of communication policy as well as selection, and use of appropriate communication channels needs to be preceded by the diagnosis of communication needs and resources available.
Keywords: information and communication technologies, non-governmental organizations, social media management, social network sites
Category of the paper: conceptual paper.

1. Introduction

In the social sciences, non-governmental organizations are most often understood as specific forms of social self-organization that have a permanent social identity, are private in nature, can use the work of volunteers in their activities, are independent, non-commercial and are created on account of voluntary decisions of their founders, organizers and members (Gliński, 2006, p. 22).

The essence of non-governmental organization is defined as an effective independent institutional mediator between business and governmental sector, which play an important role in the economic system of the state. NGO is described regarding two aspects of its role in contemporary socio-political and socio-economical system. Firstly, NGO definition relates to a socio-political institution that contributes to the solution of socio-political issues of a global and/or local nature and is capability of generating ways and means to solve them; secondly the term of NGO refers to the socio-economic body that is able to actively contribute to the economic and social life of society by creating jobs, providing various services (paid and free) that stimulate the improvement of the level and quality of society's life (Vakhovych et al., 2022).

At the organizational level, non-governmental organizations are: a specific organizational form (dependent on the legal system of a given country); organizational goals (the most important of which is the non-profit nature of the goals that distinguishes NGOs from enterprises); a community created by people who cooperate with each other, building specific structures, mobilizing resources and ideas, entering into various relationships with each other; management structures; formalization (many organizations gradually become formalized as they develop and their structures often resemble enterprises or public organizations); cost-effectiveness, because in order to achieve their goals, non-governmental organizations obtain resources from the environment, and it is crucial for them to effectively manage these resources, because they usually have a limited amount of them (Bogacz-Wojtanowska, 2024, pp. 22-23).

“In 2022, there were 103.4 thousand non-profit organizations operating in Poland, associating 8.3 million members. They created 153.4 thousand full-time jobs, which constituted 1.4% of the average employment in the national economy. In connection with the war operations in Ukraine, the organizations provided assistance to 17.5 million people and provided material and financial support worth PLN 1.6 billion” (Statistics Poland, 19.12.2023).

The growing role of the non-profit sector and the development of methods and forms of operation of non-governmental organizations are the cause of organizational changes, including professionalization or corporatization of third sector entities (Broomley, Meyer, 2015; Schmidt, 2020; Bogacz-Wojtanowska, 2024). Professionalization, among others, is evident in the field of communication between non-governmental organizations and stakeholders with the use of instruments provided by social network sites (SNS) for this purpose. This paper aims to collect and synthesize material to address the question how third sector entities in Poland use

social media for communication purposes, what they can achieve thanks to their activity in social media, and what difficulties they encounter.

2. Methods

The course of study involved two steps – the first stage was analysis of secondary data (desk research), which consists of scientific literature, national and international statistics, available reports on Polish third sector performance in digital sphere, research conducted by non-governmental interntional organizations etc. Part of the collected data concerned the scientific perspective on global trend of increasing the use of social networking sites by non-governmental organizations, to global increase of social networking sites by non-governmental organizations and accompanying issues like professionalization of the non-profit sector. The general perspective was enriched by the data relating to the Polish context – showing the significant growth in applying social media tools by domestic NGOs for the purpose of information, mobilization and social engagement. The material collected from extensive literature overview was then analyzed and synthesized.

The main question posed in the paper address the use of social network sites in the management of non-governmental organizations, particularly in what way the use of social networking sites contributes to the informational purposes, image creation and community establishment. The second stage involved collecting illustrative material from official Facebook fan pages run by three NGOs with the highest number of observers according to the data from November 2024 (Facebook Trends Polska Grudzień 2024, Sotrender, 2024). The highest numbers of followers during this time were recorded by: Great Orchestra of Christmas Charity with over 1,5 million followers; DKMS – international bone marrow donor center with more than 600 thousand observers; Siepomaga.pl – crowdfunding initiative with over 570 thousand followers. Great Orchestra of Christmas Charity (WOŚP) is known for its effective use of social media to promote its activities, mobilize audience and organize annual finals for donations. DKMS fund uses social networking sites for education purposes and to encourage registration as potential bone marrow donors. Siepomaga.pl is the largest Internet platform in Poland enabling the organization and support of online charity fundraising. These organizations provide inspiring examples of effective communication with stakeholders using social media in order to advocate to their missions and goals.

3. Results

New media have redefined the concept of communication, they have become tools of the unavoidable social, cultural and political change of recent years (Celiński, 2014, p. 8). The growing role of social media in the functioning of various entities - enterprises and the public sphere - has not been without influence on the activities of entities of the so-called third sector. Non-governmental organizations utilize social media to foster supportive relationships with the public by engaging individuals and/or communities in collaborative efforts to enhance service delivery (Namisango, Kang, 2019). Many scientists have drawn attention to the issue of the use of social media by non-governmental organizations. The study of Seungah Nah and Gregory D. Saxton (2012) considers the drivers for organizational employing social media as communication instruments for NGOs, emphasizing the role of strategies, capacities and external pressure. Identification of barriers regarding the use of social networking sites by non-profit entities such as institutional policies, target audience concern or insufficient recognition of the potential of social media for strategic communication was also the subject of extensive analysis (Campbell et al., 2014). Research on content published by 100 largest non-profit organizations in the USA on Twitter (X platform) allowed Gregory D. Saxon and Kristen Lovejoy (2012) to classify the messages according to their functions which are information, community and action. Recently, Carolyn J. Cordery with co-authors (Cordery et al., 2023) analyzes the impact of digital transformation on the efficiency, management and accountability of non-governmental organizations, highlighting both opportunities and challenges related to the implementation of digital technologies in the third NGO sector, considering the diversity of stakeholders, regulations as well as resource constraints. An important aspect from the perspective of NGO activity is obtaining financial resources; the issue of use of social media for fundraising purposes is also undertaken as a research topic in contemporary scientific reflection (Elvira-Lorilla et al, 2023).

In Polish context the question of employing social networking sites in the performance of non-governmental organizations is eagerly undertaken.

Non-governmental organizations apply social media to establish effective communication on key areas for organization, for example: implementation of statutory goals, image activities and fundraising (Łosiewicz, 2018, pp. 322-323). Active communication and promotion activities contribute to the organization's competitive advantage (Domański, 2010). Professionals engaged in the non-profit sector admit that tools provided by social network sites are effective regarding event engagement, raising brand awareness, recruiting volunteers, online fundraising and advocating for statutory purposes (Developmentaid.org, 19.07.2024). Social network sites provide tools for the implementation of various activities in the communication field: information, promotion and image creation, e-mobilization, expressing attitudes, obtaining support (Dąbrowska, 2019, p. 12). According to the Nonprofit

Tech for Good Report, most NGOs worldwide use social network tools regularly; the leading platform among nonprofit professionals is Facebook – 96% of 1,732 non-profit organizations in 116 countries use Facebook pages (Nonprofit Tech for Good Report, 2023). According to data collected and shared by Klon/Jawor Association, in 2018 about 63% of Polish non-governmental organizations NGOs were present in social networking sites (Smoliński, 2021, p. 60). It should be noted however, that more current data on the subject in Poland in not available since aforementioned publication.

Most nonprofit organizations have limited financial resources, therefore social network sites provide effective tools for advocacy, building engaged community, recruiting volunteers, or acquiring donors and sponsors. Even organizations with small budgets can use the potential of social platforms to become visible in the digital world. The dominance of Facebook as a medium used by NGOs for communication purposes is unquestionable, despite the growing interest in other communication channels, such as X platform (Twitter), Instagram or TikTok. Since its launch in 2004, Facebook has evolved over the years into a very extensive medium, providing a wide range of communication possibilities. "In terms of information functions, Facebook surpasses its competitors due to its unrivaled reach, ease of use, and complete freedom in the form of information transmission" (Smoliński, 2021, p. 62).

The functions of social media in the activities of non-governmental organizations can be divided into three areas: informational, social engagement and mobilization. Information function covers a whole range of content relating to the everyday life of the organization: performed activities, conducted projects, reports issued, which may be relevant to the organization's target group (Smoliński, 2021, p. 61). Social engagement consists of establishing dialogue and community, since the content published should encourage the public to exchange opinion, while at the same time strengthening the bonds between them (Smoliński, 2021, p. 61). The mobilization function consists in changing the attitude of participants in the communication process from awareness of the existence of a given entity to action on its behalf – which is de facto a measure of the effectiveness of the communication strategy conducted by the NGO (Smoliński, 2021, p. 61). A report conducted by the Klon/Jawor Association on the image of non-governmental organizations in Polish society indicated that media coverage is the main source of knowledge about non-profit organizations among Poles, which leads to the recognition of large foundations, while the voice of other organizations is certainly less audible (Klon, Jawor Association, 2015, p. 7). The aforementioned report showed that attitude of many non-profit organizations toward communication policy was reluctant at that time. The development of network communication has become an opportunity for third sector promotional activities that do not inconsistent with their mission (no costs related to designing and distributing promotional materials).

Communication with the organization's environment and stakeholders is particularly important in non-profit sector, hence the documentation of activities performed contributes to the entity's credibility and credibility and trust is the basis for the perception of third sector

organizations (Łosiewicz, 2018, p. 298). Online tools and new communication practices led to the concept of online accountability, which "refers to how an organization justifies and accounts for its actions through Internet technologies and two-way communication with stakeholders" (Cooley, 2024).

Many organizations have joined online communities for quick and effective communication with the public and its members and social network sites have become an integral part of their daily communication. Likewise non-governmental organizations (NGOs) are no exception: they also actively use SNS for reaching the target audience, share information, establish image, communicate and organize online dialogue. Increasing interest in the use of digital tools by NGOs reflects broader changes of the Internet use by the entire society.

4. Disscusion

Non-governmental organizations, while conducting their tasks, become participants in the market space – therefore, one of the important elements of their performance is the preparation and implementation of an effective information policy (Łosiewicz, 2018, p. 322). Strong and well-structured presence in social media, constant cooperation with the audience facilitates the effectiveness of non-profit organizations' activities by making it easier to reach diverse groups of stakeholders. Social networking sites enable building social networks or social relationships between people; they constitute a platform for user representations, their profiles and social connections, thus providing them with mutual communication (Dąbrowska, 2019, p. 24). Extensive usage of the Internet by NGOs to communicate with the environment is one of the noticeable trends in the sector: in the period of 2002-2021 the percentage of organizations present on the Internet increased from 20% to over 90% (in 2021 more organizations had account in social networks than a website) (Klon, Jawor Association, 2022, p. 10). The development of the Internet is changing the traditional image of a stakeholder, which transfers old activities to the area of virtual performance – this evolution of stakeholders requires non-governmental organizations to modify their approach towards the potential of social networking sites (Leoński, 2016).

Publishing content that clearly communicates the mission and values of an organization is a key element of building a brand identity – this may include the history of beneficiaries, examples of specific activities performed by the NGO, and explanations of why a given mission is important to society. As far as communication activities are concerned, some platforms – including Facebook – allow to choose settings regarding the visibility of published content, which is unquestionably a good solution for different types of institutions along with non-governmental organizations, to disseminate information regarding organization's activity. Such

an approach may contribute to the increase in the number of people interested in the organization's endeavors, and thus raising the level of support (personal, financial, etc.) (Dąbrowska, 2019, p. 134).

In terms of informing, organizations can use posts or multimedia posts, however Facebook provides several other tools that allow to increase the visibility of the publish content: likes, marking followers, sharing content, or inserting a hashtag. It is worth noting, that since its introduction, the "like" button has influenced the concept of image management in the digital sphere – great number of likes has a positive impact on the assessment of the image - it makes it more credible, increases its rank and prestige (Dąbrowska, 2019, p. 165). The second important indicator is the number of followers. The greater the number of followers, the more users will see the published posts. When one follows a profile or page, materials published by this person or page may appear in the follower's news feed. In Facebook, people who are friends are followed automatically. A larger number of followers means a wider reach of messages, better visibility in the digital world and potentially more occasions for the interaction.

The profiles of organizations that received the highest number of "like" reactions in November 2024 were selected for analysis (Facebook Trends Polska Grudzień 2024, Sotrender, 2024). The Great Orchestra of Christmas Charity uses Facebook profile to announce upcoming initiatives, such as charity runs – encouraging participation and support for the campaign, regularly informs about the activities of its foreign staffs, emphasizing the global reach of the initiative (for example publishing information from teams working on the final Grand Final abroad); the foundation also informs what medical equipment was purchased from public donations and where it was delivered. Inserting hashtag in creating content is important – using hashtags allows you categorize content and makes it easier for users to find posts related to specific initiatives. The Great Orchestra of Christmas Charity actively uses the stories function on its Facebook profile. Thanks to stories, the foundation can keep its followers up to date with current events, initiatives and behind-the-scenes of its activities in a dynamic and engaging way. DMKS foundation actively uses Facebook account for information: educational posts about bone marrow and stem cell donation are published. This organization also employs stories for sharing experiences of people who have received help. The DMKS initiative engages its followers encouraging them to use hashtags – for example the official hashtag #studentDKMS of the campaign "For You It's 5 Minutes, for Someone It's a Whole Life". Siepomaga.pl publishes the stories of beneficiaries – the stories of people in need of support are regularly shared, which allows donors to better understand the situation of beneficiaries; Siepomaga.pl often uses video materials to present current donations; when the fundraising campaign is completed, the foundation informs about its result and current situation of the beneficiaries, which builds trust to the initiative.

In the aspect of image creation and promotions, the following instruments can be applied: posts on current events, posts on novelties, occasional posts (holiday greetings, organizations anniversaries, meetings), encouraging audience to press like for individual posts, commenting,

online competitions, tagging photos, conversations using Messenger (Dąbrowska, 2019, p. 172). One of the biggest challenges is to skillfully manage information in the digital space od social networking sites and follow the changing behavior of the information recipient (Fabjaniak-Czerniak, 2012, p. 186). Social media is based on the two-way communication: initiating contact and then conducting a dialogue with community of participants may, in the long perspective, constitute the foundation for establishing a lasting relationship and gaining brand supporters. The two-way paradigm of communication also means that there is a possibility of receiving feedback (not always positive) for every piece of information posted or shared – this in turn can lead to spontaneous and uncontrolled creation of content about the brand or organization (Fabjaniak-Czerniak, 2012, p. 187). Entities chosen as significant examples to illustrate the performance of nonprofit organizations in social networking sites utilize variety of tools supporting image creation. The Great Orchestra of Christmas Charity promotes its charitable activities, uses instruments for engaging the community and raising awareness of the initiatives it runs. Apart from regularly shared content, the foundation utilizes evaluation function. Facebook community by means of ratings and reviews assesses foundation profile, what contributes to the increase in visibility and credibility. The Great Orchestra of Christmas Charity cooperates with local communities – local teams of WOŚP with partners like local culture centers promote events related to the organization's performance, engaging local communities in charity. It is also worth paying attention to profile photo overlays on Facebook. By adding official WOŚP overlays to their profile photos, users express their support for the initiative and at the same time increase its visibility on social media. Each such overlay is visible to the user's friends, which helps to spread awareness of WOŚP's activities and encourages more people to get involved in the campaign. The DKMS Foundation also uses overlays on Facebook as a promotional and educational tool. Such activities aim to raise awareness of bone marrow donation and build a community around the foundation's mission. By adding overlays to their profile pictures, users express their support for DKMS initiatives and help promote the idea of donation. DKMS encourages Facebook users to organize birthday charity fundraisers for the foundation. Users can set a financial goal, duration of the campaign and invite friends to support. Publication of achievements and statistics also contributes to the image creation. DKMS foundation shares successes, such as the number of newly registered donors or transplants performed. Another instrument of promotion is organizing social events and challenges: Siepomaga.pl suggests creating Facebook events and engaging challenges that mobilize the community for active participation and financial support. Siepomaga.pl also encourages fundraiser organizers to share links to their campaigns on private Facebook profiles. By involving family and friends, the reach and potential financial support are increased.

Certainly, the important issue regarding using digital tools by NGOs is the level of competence of staff members involved in the managing of the organization's account – running an organization's profile is often done intuitively, or based on experience from using private profiles, many non-governmental organizations do not invest in developing competences in this

area, which is directly related to the quality of the content created (Dąbrowska, 2019, p. 167). According to researchers, effective use of social networking sites depends on different factors: geographical (the area of the organization's operation); economic (the organization's budget including allocation for social media management); and organizational (number of members and their abilities regarding social networking sites management) (Dąbrowska, 2019, p. 209). Development and implementation of communication policy as well as selection, and use of appropriate communication channels needs to be preceded by the diagnosis of communication needs and resources available. The aforementioned organizations demonstrate high awareness and professionalization of the social media use, but this is often not the case for smaller organizations. It is worth noting that both location, size, type and scope of activity can be a significant factor differentiating the quality of communication with the environment in social networking sites.

5. Conclusion

Technological growth is an important aspect of the rarely identified with the development of the organizational capabilities of non-governmental organizations. However, the impact of technological solutions and development on the non-profit sector was not perceived as inevitable, because initially non-governmental organizations have been recognized as technologically handicapped, which usually did not interfere with their activities and implementation of statutory goals (Bogacz-Wojtanowska, 2013, p. 90). In fact, access to new technologies means the possibility of improving or expanding the scope of services provided, increasing access to information or facilitating contact with stakeholders. The most popular social network sites used by non-profit organizations is Facebook – NGO's apply Facebook for digital marketing, and fundraising campaigns.

Expanding the range of means of accessing the audience has a practical aspect in the context of the functioning of the NGO sector: most non-governmental organizations are focused on achieving their goals, but often suffer from a lack of time, and new technologies can help solve many problems; thus, the third sector organizations facilitate communication, while supporting further development. An important aspect regarding the social media use in non-governmental sector emphasizes the advancement of non-profit organizations, mainly in terms of their growing professionalization.

The analysis of literature and the collected examples of the use of social networking sites by Polish non-governmental organizations shows how important a strategic approach to digital communication is. Efficient use of digital information and communication tools requires a professional approach – in this sphere the difference is most visible between smaller entities suffering from staff shortages (e.g. local organizations from rural areas) and organizations with

larger budgets that manage to undertake coordinated information and communication activities. Indicators in this area are the number, type and frequency of published content, use of hashtags, engaging followers in discussions, etc. Content published on the profiles of smaller organizations is often incidental, and messages do not conform into a coherent communication strategy. In-depth analysis considering how smaller non-governmental organizations cope in the digital world and how they use the potential of digital communication is worth undertaking.

Although the presented article refers only to the activity of three well-known entities of the third sector, based on the analysis undertaken, it is possible to formulate research hypotheses that are a basis for in-depth qualitative and quantitative research considering the differences between organizations, such as: level of operation, type of organization, location, and scope of activity.

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XR TECHNOLOGY IN MANUFACTURING – EXPLORING OF PRACTICAL APPLICATIONS

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Purpose: The purpose of this paper is to provide a comprehensive analysis of the practical applications of Extended Reality (XR) technologies in the manufacturing industry, aiming to identify both internal and external factors that facilitate and inhibit XR implementation.
Design/methodology/approach: The study used a multi-step approach, starting with an extensive literature review covering the latest publications, technology reports and case studies from reputable databases (Scopus, Web of Science, Semantic Scholar) and sources from 2019-2024. The literature review focused on key trends, benefits, challenges, and practical implementations of technology XR in manufacturing. Following this, two complementary analyses – STEEPVL and SWOT – were conducted to examine social, technological, economic, environmental, political, value-based, and legal factors. These methodologies were chosen to provide a comprehensive understanding of the multi-dimensional factors influencing XR implementation.
Findings: This study's primary finding is that XR technology has substantial potential to increase productivity and drive innovation within the manufacturing industry. XR optimizes production processes, enhances training and safety, and supports diagnostics, making enterprises more competitive and flexible. However, its implementation also presents significant challenges, including high initial costs, the need for ongoing personnel training, and the risk of rapid obsolescence. Additionally, external factors, such as legal and regulatory constraints and public acceptance, are critical, as they shape both the pace and scale of XR technology's adoption across different regions.
Research limitations/implications: Although XR technology has diverse applications across various sectors, this study focuses specifically on its use in manufacturing, which limits the generalizability of the findings. Additionally, despite using defined criteria for selecting and classifying factors within the STEEPVL and SWOT frameworks, some subjectivity remains due to the reliance on expert predictions and opinions. These findings reflect the current state of the technology; as XR advances, future assessments of its impact may evolve significantly.
Originality/value: The originality of this study lies in the combination of STEEPVL and SWOT analysis, offering a cross-disciplinary perspective on XR technologies in manufacturing. This approach facilitates a more detailed examination of the factors influencing XR adoption, while the classification of factors as current or potential provides a dynamic, time-sensitive understanding that can better inform industry stakeholders and decision makers.
Keywords: manufacturing, extended reality, mixed reality, virtual reality, augmented reality
Category of the paper: research paper, literature review.

1. Introduction

Digital transformation is the process of integrating new digital technologies into all aspects of an enterprise's operations, fundamentally changing the way business is run, and value is delivered to customers. The Top 10 Digital Transformation Technology Trends are additive manufacturing, advanced computing, AI and machine learning, big data, and analytics, blockchain, 5G, cybersecurity, digital twins, extended reality (XR), and the Internet of Things (IoT). (Startsup Insights, Manufacturing Trend Report)

Extended Reality (XR) is an umbrella term that includes both Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR). (Kaplan et al., 2020; Billinghurst, Nebeling, 2021; Mhaidli, Schaub, 2021; Ratclife, Soave, 2021; Gugenheimer et al., 2022) It involves a broad spectrum of technologies, differing in the degree of immersion i.e., integration with the real world. (Report Tech Trends, 2024) One can think of XR, as a collective name for virtual technologies, both those we know today and those yet to be created, supplementing or replacing the perception of the real world with additional elements from the virtual world. (Figure 1).

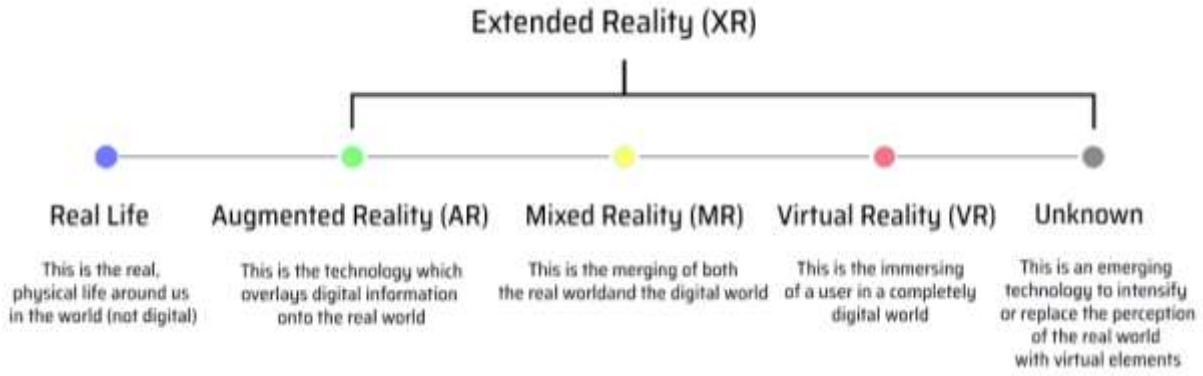

Figure 1. Extended reality spectrum.

Source: author's work based on appinventiv insider.

Virtual Reality is a technology that allows users to enter a completely virtual world, using special VR glasses or helmets. The user is completely immersed in an artificial environment, which can be computer-generated or based on recorded content. On the other hand, augmented reality is a technology that superimposes digital elements, i.e.: images, sounds and animations, over the user's real environment. (Hirzle et al., 2023) Meanwhile mixed reality is a combination of VR and AR. In an MR environment, the user can see and co-integrate with both digital objects and the real environment. The main technological differences are in the level of interaction and immersion. Terminology in the field of mixed reality and extended reality technologies is dynamic and used differently depending on the source. Often the acronyms MR and XR technology are used interchangeably as synonyms, so it is important to understand the context in which the term is used. (Speicher et al. 2019; Doolani et al., 2020) Interestingly, in the literature, extended reality technology is also presented as a subfield of artificial intelligence.

(Habeeb et al., 2024) A key aspect of defining XR is that the term encompasses a broad spectrum of educational experience delivery options, ranging from low-tech, episodic interactions to fully immersive, enduring platforms. (Ziker et al., 2021) Due to its elevated level of immersion and sensory engagement, this technology effectively enhances users' critical thinking skills across various tasks. (Alsaleh et al., 2022) XR technologies fill the gap between the digital and physical worlds in manufacturing. They also fit into the Industry 4.0 paradigm, in which digitization, automation and connected systems are integral to the operation of modern factories. (Cárdenas-Robledo et al. 2022) The integration of physical production processes with advanced digital technologies is supported by XR through the introduction of interactivity, automation, and visualization. They improve manufacturing processes by allowing users to interact and feel involved in the design process, especially through interactive simulations and 3D visualizations (Ismail et al., 2023). The authors (Gac et al., 2019) found that the usability of an immersive tool depends on the clarity and design of the user interface. It can be concluded that intuitive and well-designed interfaces are critical to enhancing user experience and effectiveness in immersive tools, as they reduce cognitive load and facilitate smoother interactions with the technology.

The manufacturing industry is constantly working to increase competitiveness by integrating information technology into key processes. A survey conducted by XRA and RXN Group of 600 CEOs and decision-makers from manufacturing enterprises across the country found that 81% of them believe that immersive technology like XR benefits manufacturing. (Report AR/VR/XR Survey, 2021) XR technologies, which include VR, AR, and MR, play a significant role in this support. The industry is undergoing a transformation from traditional labor-intensive practices to more advanced and integrated systems. Early deployment of XR technologies increases the momentum of work. Integrating XR with other technologies offers deeper insights into manufacturing processes, allowing for better decision-making.

The application of XR in the process of digital transformation of enterprises was presented in the form of a comparative table of selected manufacturing areas (Table 1).

Table 1.
Manufacturing phases and when to use which XR technology

Manufacturing Phases	Tasks	Useful XR Technology
Introductory Phase	Safety, training, orientation training, planning and designing of new tasks	MR, VR
Learning Phase	Sorting, picking, keeping, assembling, installation	AR, VR, MR
Operational Phase	Inspection, packing, monitoring assembly line, assembly	MR,
Tangent Phase	Using rare tool/ machinery, hand tool, power tool	AR, MR
End Phase	Cleaning routine (process, shovel, sweep, clean work areas, inspection)	AR, MR

Source: based on (Doolani, S. et al., 2020, Cárdenas-Robledo et al., 2022).

Augmented reality technology has been proven to be helpful also in areas such as remote assistance, training, facility management or product inspection and design. (Bottani, Vignali, 2019) Also in areas such as visualization (Ferraguti et al. 2019; Angrisani et al., 2020; Alves et al., 2022;) simulation (Cai et al., 2020) tracking and operation (Calandra et al., 2021) assembly (Hoover et al., 2021), maintenance (Havard et al. 2021). In turn, Virtual Reality is used in the field of assembly (Grappiolo et al., 2021; Ottogalli et al., 2021), simulation (Fang et al., 2019; Perez et al., 2019; Huerta-Torruco et al., 2022) Mixed Reality is especially used in the field of assembly (Dimitropoulos et al., 2021, Ariansyah et al., 2022), maintenance (Siyaev, Jo, 2021; Ariansyah et al., 2022), training and simulation (Malik et al., 2020a et al., Malik 2020b).

Mixed reality technology is the most flexible technology, and it can be used in almost any phase. In a production scenario, it can be used for training in any phase because it is not completely immersive like VR and allows the user to see their real world along with digital information. (Doolani et al., 2020). A review (Cárdenas-Robledo et al., 2022) shows that MR is likely to become a dominant technology, supported by various devices such as tablet HMDs and VR and AR-enabled glasses with added physiological and environmental sensors. Furthermore, the development of affordable, user-friendly XR applications is expected to accelerate their adoption in various sectors.

In literature, there are increasingly frequent forecasts about the future of XR in the industry, indicating further technological development and its growing application across various manufacturing sectors. However, while the potential benefits of XR technologies are well documented, their successful integration and implementation in manufacturing is still an area of current research. Stakeholders must deal with various technological, organizational, and user-related barriers.

The author used the method of literature analysis and critique, and did SWOT and STEEPVL analyses, which is an original approach to the study of XR technology in manufacturing. The combination of these two methods provided a more multidimensional insight into the internal and external factors affecting the implementation of XR technology, considering environmental, technological, social, economic, legal, value and local aspects. This approach, which is rare in the literature on XR technology, especially in an industrial context, makes the work novel. Internal strengths and weaknesses, as well as external opportunities and threats related to the implementation of augmented reality technologies in production are identified. In addition, the paper considers future potential scenarios for XR development, considering the dynamic nature of technological progress and the changing regulatory and social environment.

The paper includes an introduction, a review of national and foreign bibliography and technology reports, a description of the methodology and a discussion. It ends with a summary, which additionally considers potential trends that may influence the development of XR technology soon and suggestions for further research.

2. Methods

The initial phase involved an in-depth literature review to establish the theoretical and practical foundations of XR applications in manufacturing. Relevant scientific publications and technology reports from 2019 to 2024 were collected, with a focus on the manufacturing industry. The review highlighted key trends, potential applications, and challenges related to XR in manufacturing.

A STEEPVL analysis was then conducted to assess the long-term, multi-dimensional impacts (social, technological, economic, environmental, political, value-based, and legal). This was followed by a SWOT analysis that provided a comprehensive understanding of both internal and external factors influencing XR implementation. The selection of methodologies aimed at balancing depth with breadth, and the complementary nature of SWOT and STEEPVL helped provide a structured and nuanced perspective for industry stakeholders.

3. Results

This paper presents the results of two research methods: STEEPVL analysis (Table 2) and SWOT analysis (Table 3), which in the previous chapters were enriched with a review of the subject literature.

Table 2.
STEEPVL analysis of XR technology in manufacturing

Category	Current factors	Potential factors
Social	Younger employees are more open to implementing innovative technologies, which can facilitate the implementation of XR in the workplace.	As organizational cultures evolve to embrace innovation, the acceptance and integration of XR technologies are likely to improve.
	Older employees may resist XR due to a lack of familiarity and comfort with innovative technologies, posing a challenge to widespread implementation.	As technological literacy improves across all age groups, resistance to XR from older employees may decrease, aiding broader implementation.
	The shift towards remote work can increase the demand for XR technologies to facilitate virtual collaboration and training.	XR can provide intuitive and engaging training tools that bridge generational gaps in the workplace.
Technological	The combination of XR with IoT and AI enhances the ability to monitor and optimize production processes in real-time	Edge computing can enhance XR performance by processing data locally, reducing latency and improving real-time responsiveness.
	The absence of standardized protocols and frameworks for XR technology can create compatibility issues and hinder its broad implementation.	The establishment of industry standards for XR technology will facilitate better integration with existing systems, promoting wider implementation.

Cont. Table 2.

Category	Current factors	Potential factors
	The deployment of 5G networks can significantly improve the speed and reliability of XR applications, enabling more seamless and responsive experiences.	XR can integrate with technologies like blockchain for secure data transactions and digital twins for advanced simulations, expanding its capabilities and applications.
Economic	Increased funding and support for Industry 4.0 initiatives can drive the implementation of XR technologies in industrial settings.	XR can facilitate the creation of personalized products, tapping into niche markets and generating new revenue streams.
	The significant upfront costs and the rapid pace of technological change can make XR investments risky and expensive to maintain.	Economic instability can influence the willingness and ability of enterprises to invest in XR technologies, slowing implementation.
	Remote working and virtual meetings with XR support can reduce the need for travel and physical office space, leading to significant cost savings.	Government incentives can lower financial barriers for enterprises, encouraging investment in XR technologies.
Ecological	XR can help optimize manufacturing processes, reducing waste and environmental impact.	Strict environmental regulations can encourage enterprises to implement more energy-efficient XR solutions to meet sustainability goals.
	XR can enable virtual prototyping and testing, reducing material waste and energy consumption in the development process.	Advances in energy-efficient technologies can help mitigate the environmental impact of XR systems.
	The energy-intensive nature of XR systems can increase the environmental footprint and costs.	Using renewable energy sources to power XR systems can further reduce their environmental footprint.
Political	Data protection regulations can restrict how XR technologies process and store personal data, which impacts their functionality.	The right regulatory framework can encourage the adoption of XR technologies by providing an enabling environment for innovation.
	Trade policies can impact the supply chain and pricing of XR components, thereby affecting their availability and affordability.	Global collaboration can help establish common standards and promote widespread implementation of XR technologies.
Values	Innovative enterprises are more likely to adopt XR technologies to gain a competitive advantage.	An emphasis on ethical data practices and social responsibility can shape how XR technologies are implemented and used.
	XR provides accessible tools for training and collaboration, supporting integration initiatives.	XR can offer broader support for training, facilitating integration and equal access to professional development.
Legal	Compliance with stringent data privacy regulations can pose a challenge for XR implementations, requiring the use of robust data protection measures.	New cybersecurity regulations may require enterprises to enhance their security infrastructure, increasing the cost and complexity of XR implementation.
	The creation and use of virtual content in XR environments can raise complex intellectual property issues that need to be addressed.	Legal frameworks tailored to XR technologies can help address unique issues and promote responsible use.

Source: author's work based on literature review and analysis and technology reports.

Furthermore, organizational leadership plays a critical role in shaping this acceptance by promoting a culture of innovation and offering mentorship programs to guide employees of all ages through the technological shift. Encouraging a growth mindset across all employee demographics can bridge generational divides, easing the integration of XR technologies. Additionally, the rise of remote work further increases the demand for XR, especially for virtual

collaboration and training, as enterprises seek ways to maintain productivity and communication across dispersed teams.

Establishing industry standards for XR will be key to overcoming these barriers and ensuring that XR technologies can integrate seamlessly with existing systems. Moreover, the deployment of 5G networks has the potential to revolutionize XR applications by providing faster and more reliable data transmission, enabling smoother and more immersive XR experiences. Future integrations could expand XR's capabilities, such as combining blockchain technology for secure data transactions or using digital twins for advanced simulations in manufacturing, leading to more efficient and transparent production systems.

From an economic perspective, the implementation of XR technologies requires substantial investment, which can be a significant challenge, particularly for small and medium-sized enterprises (SMEs). They struggle with the high upfront costs of XR, including hardware, software, and necessary infrastructure. Government incentives, such as grants or tax incentives, can help mitigate these costs, making XR implementation more accessible. Larger enterprises, while having more financial resources, still face challenges related to scaling XR solutions across multiple sites. These enterprises may also have competing priorities for their capital expenditure, such as investments in IoT or AI. Alleviating the financial strain, enterprises can explore options like leasing XR hardware, entering pilot programs with XR vendors, and collaborating across sectors to share resources and reduce costs. Additionally, XR technologies offer the potential to create new revenue streams, such as personalized products or on-demand manufacturing services, which can offset the initial investment by opening niche markets.

The energy-intensive nature of XR systems, particularly in data centers and 5G infrastructure, increases the environmental footprint due to reliance on non-renewable energy sources and rapid hardware obsolescence. To mitigate these impacts, enterprises can use renewable energy, adopt energy-efficient hardware, and utilize cloud-based XR solutions. Additionally, virtual prototyping can reduce waste, while promoting recycling and responsible disposal of outdated XR devices helps address electronic waste concerns.

The political and legal landscape significantly impacts implementation of this technology. Data protection regulations require robust measures, complicating its implementation, while trade policies affect the cost and availability of components. Legal issues, such as intellectual property rights for digital assets, also pose challenges. Tailored legal frameworks and government support can help address these concerns, fostering innovation and creating a conducive environment for approval XR technology.

The results of the analysis constitute valuable input material for the SWOT analysis (Table 3), to facilitate the identification of opportunities and threats. SWOT analysis allows for understanding the strengths and weaknesses of XR technology and identifying opportunities and threats that may affect its use in manufacturing.

Table 3.
SWOT analysis of XR technology in manufacturing

Strengths	Weaknesses	Opportunities	Threats
Increased precision in production planning and monitoring	High initial financial outlay for XR equipment, software licenses, and IT infrastructure adaptation can be a significant barrier to entry, especially for smaller enterprises.	Intelligent XR training programs using AI for personalized training can enhance learning outcomes and efficiency, adapting to individual user needs.	The risk of personal data leaks and manipulation by enterprises or malicious actors poses significant security and privacy concerns, potentially hindering implementation.
The continuous development of XR technology and increasing market interest	Integration issues with existing systems can pose significant challenges, requiring additional resources and time to resolve compatibility problems.	Potential government incentives and funding opportunities for implementation advanced technologies like XR, which can reduce financial barriers and encourage investment.	Changing legal regulations and data protection standards can impose additional requirements on XR systems, increasing compliance costs and complexity. This can deter enterprises from implementation XR technologies.
Interactive training with real-task simulations minimizes error risks and ensures faster adaptation of new employees to processes.	The need for robust technical support and maintenance services to ensure the smooth operation of XR systems, which can be resource intensive.	Expanding niche markets for personalized products with XR, increasing the enterprise's revenue potential and geographic reach.	The rapid pace of technological advancement in XR can lead to the quick obsolescence of current solutions, necessitating frequent updates and replacements. This can significantly increase operational costs and create financial strain.
Remote diagnostics and support enable immediate service assistance, minimizing production downtime reduces maintenance costs.	A lack of specialized personnel with the necessary technical knowledge and skills to implement and manage XR solutions can hinder implementation and effective utilization.	Explore opportunities for partnerships and collaborations with technology providers, educational institutions, and industry leaders to drive innovation and implementation of XR technologies.	Evolving industry standards require continuous adaptation and compliance, which can lead to additional investments and updates. This can be resource-intensive and may slow down the implementation process.
Real-time data visualization allows ongoing analysis of process efficiency, enabling quick decision-making and process optimization.	Potential mental health issues for users, such as eye strain and dizziness from prolonged XR use, can affect employee well-being and productivity.	Identifying new areas where XR can add significant value expands its applications and benefits, driving further implementation and innovation.	The lack of standardization and common protocols among different XR platforms affects interoperability, making it challenging to integrate various systems and technologies seamlessly.
XR simulations and training reduce physical risks by better preparing employees for demanding conditions, potentially lowering workplace accidents and related costs.	Potential resistance from employees who may be reluctant to implement innovative technologies, and the need for change management strategies to facilitate smooth transitions.	New business models based on XR open innovative revenue streams and market opportunities, driving growth and diversification. Possibility of Influencing manufacturing standards	Dependence on foreign XR technology suppliers can increase costs and supply chain risks, particularly in times of geopolitical instability or trade restrictions.

Cont. Table 3.

Strengths	Weaknesses	Opportunities	Threats
The ability to conduct distributed teamwork in a virtual environment enhances collaboration and can lead to more efficient project management and execution.	Difficulty in providing a wide field of view (the range of the observable world at any given moment), currently AR/VR devices can provide 90°	Predictive maintenance XR tools combined with IoT data enable fault prediction and planned maintenance, reducing downtime and maintenance costs.	Increasing environmental regulations may impose stricter limits on emissions and carbon footprints, potentially restricting XR implementations due to their energy consumption and environmental impact.
Having a technological advantage over competitors can provide a significant market edge, attracting more clients and investment.	The need for continuous modernization due to rapid technological advancements may require frequent updates, increasing operational costs and potentially causing disruptions.	Integration of XR with big data and predictive analytics enhances the ability to predict failures and optimize production in real-time, improving operational efficiency.	The implementation of XR technologies introduces new cybersecurity threats, as these systems can be vulnerable to hacking and data breaches. Ensuring robust security measures is crucial to protect sensitive information.
Increased employee engagement using XR technologies can boost productivity and job satisfaction, leading to better overall performance.	Increasing complexity in managing XR systems necessitates collaboration between different platforms and communication protocols, which can complicate system management and maintenance.	XR-driven hazard simulations tailored to specific working conditions can improve safety training and preparedness, reducing workplace accidents.	Economic fluctuations can impact decisions to implement XR technology due to the high initial investment costs. Enterprises may delay or cancel XR projects during economic downturns.
Growing awareness that XR is a contemporary tool integrated into various industries facilitates its implementation and integration into existing workflows.	Limitations like compatibility and interoperability	The ability to create large-scale virtual programs expands training and operational capabilities, enhancing scalability and reach.	Currency fluctuations and raw material market instability can affect the costs of maintaining XR infrastructure, especially for imported components, leading to increased financial uncertainty.
XR proves to be a powerful tool for improving collaboration in supply chains and with customers, enhancing efficiency and customer satisfaction.		Long-term cost savings from reduced production defects can improve profitability and operational efficiency.	Negative public opinions about XR technologies can hinder their implementation.
		Development of more advanced and affordable XR devices increases accessibility and implementation, driving market growth.	Social resistance to XR and innovative technologies can slow down their implementation.
		Development of educational programs and specialized training in XR enhances workforce skills and readiness, support further implementation.	Health risks associated with prolonged use of XR, such as eye strain and dizziness, can affect employee well-being and productivity. Cybersickness.

Source: author's work based on literature review and analysis and technology reports.

Growing interest and technological advances in Extended Reality are expanding its applications across industries, particularly in enhancing collaboration, training, and manufacturing efficiency. XR training, particularly in augmented reality, reduces mental load compared to traditional methods (Doolani et al., 2020) enabling risk-free workplace scenario simulations that promote cost savings, improved occupational risk prevention, and enhanced decision-making (Ortega-Gras et al., 2023). XR also supports sustainable manufacturing by optimizing resource use and reducing material waste throughout the product lifecycle—from design to reuse (Chu, Pan, 2024).

XR applications improve coordination between remote teams, streamline project management, and enable faster feedback collection, cutting costs and reducing delays. Immersive virtual workspaces provide clearer, consistent project understanding, accelerating design processes (Cox, Theorem, 2024). In manufacturing, XR integrated with edge computing supports real-time data analysis and process optimization, reducing latency and increasing productivity. This technology also supports sustainable practices by minimizing the need for travel and enabling accurate simulations. It also facilitates real-time collaboration with remote teams and stakeholders, such as virtual factory tours that allow remote suppliers to understand spatial limitations and workflow constraints without the need for physical visits. This can lead to more efficient design adjustments and better alignment with production requirements. (Cox, Theorem, 2024) By the way, VR enables ergonomic workstation analysis by recording worker movements and integrating with Digital Human Modeling (DHM) tools to test various body types. A VR application in automotive cable assembly demonstrated its effectiveness in simulating manual tasks and identifying physical limitations (Reinhard et al., 2020). However, some challenges remain, including VR's technical limitations, high setup costs, and discrepancies between simulations and real-world conditions.

Despite its advantages, XR also comes with significant challenges, including high upfront costs, complex systems integration, compatibility issues and the need for specialized technical knowledge. The Future Today Institute report (Report Tech Trends, 2024) identifies eleven macro sources of disruption, including technology, media and telecommunications, demographics, environment, government, public health, education, geopolitics, infrastructure, economy, and wealth distribution that may impact implementation. XR technologies carry the risk of personal data leakage, which can be manipulated by enterprises or malicious actors for profit, which weakens trust and stifles innovation. (Report ... XRSI, 2021). Worker resistance, potential health effects such as eye strain, and privacy concerns – such as the collection of biometric data – are additional hurdles XR technology can inadvertently reveal the “biometric psychographics” of employees through eye tracking and video analysis, revealing emotional responses. When combined with brain-computer interface data and AI analysis, this can reveal sensitive personal data such as ethnicity and health, often beyond the user’s control. Additionally, the immersive nature of this technology may encourage users to share more personal information in virtual environments. (Vale, Berrick, 2023; Aziz, Morris, 2023; Raport: Human Capital

Trends 2024).Therefore, it is important to discuss opportunities and threats and develop common strategies to minimize the risk of abuse in the long term (Report ... XRSI, 2021; Report Tech Trends, 2024) Going further, technological challenges, such as display latency and limited field of view in AR/VR/MR devices, need to be addressed (Report Augmented and Virtual Reality Market..., 2024). Another challenge is motion sickness in VR, known as cybersickness, addressed through research into proprioception and sensory rebalancing. Studies show that music can alleviate symptoms, help reduce nausea and improve the comfort of VR. These findings could lead to more personalized and enjoyable virtual experiences.

Despite the barriers presented, the potential benefits of extended reality are more significant. It can improve safety, through virtual threat simulations and predictive maintenance capabilities, reducing downtime and repair costs when combined with IoT. Governments can promote XR implementation by lowering financial barriers and expanding XR reach. XR's integration with digital twins and AI is another promising area, as illustrated by Tomaszewska (2023), who points out that such synergies can improve operational efficiency and foster innovation within Industry 4.0. In addition, personalized XR-based training programs, supported by AI, offer customized learning solutions that address the needs of an aging workforce. The literature review shows that there is a need to combine digital twin, robotics and XR technologies to drive innovation, increase operational efficiency and support industrial collaboration within Industry 4.0. Research on these integrated technologies should also be continued to deepen their application and further development in industrial practice. (Feddoul et al. 2023).

However, the rapid evolution of XR standards and dependence on foreign suppliers introduces risks, requiring regular updates and compliance. Economic and political factors, such as market fluctuations and emissions regulations, may also influence the decisions of smaller enterprises facing high initial investments. While upfront costs remain high, the long-term financial benefits of XR implementation are becoming increasingly evident, and the development of more affordable XR devices continues.

4. Discussion

The Engineering.com report shows that most enterprises in the AEC industry are already using VR or plans to implement it within the next five years. The main driver of VR adoption is the return on investment – 49% of respondents indicated that VR helps detect design issues at earlier stages, resulting in cost savings. Other motivating factors include better remote collaboration (44%), reduced travel costs (35%), and sustainability (21%). VR enables more effective communication and reduces the need for rework through immersive design reviews and tools such as issue tracking and BIM data inspection. (Research Report: VR in AEC: Usage, Challenges and Opportunities, Autodesk, 2023) Companies like Walmart and Lufthansa have

integrated VR to improve skills, from customer service to technical maintenance. VR offers a low-risk environment for hands-on learning, building muscle memory before real-world tasks. VR and AR are aiding prototyping and training processes in the automotive industry, helping enterprises like Ford and Jaguar Land Rover reduce costs and improve efficiency. Virtual prototyping and AR enable early error detection and improved product quality. BMW, meanwhile, has introduced XrealAir 2 AR glasses into its vehicles to display navigation and vehicle information, changing the way people interact with technology and ushering in a new era of smart glasses. In manufacturing, XR enables true-to-reality digital twins, optimizing complex systems and processes, such as automotive design and urban planning. Spanish startup OWO has unveiled a haptic vest that induces physical sensations, creating the foundation for deeply immersive tactile experiences in virtual worlds. (Report Tech Trends, 2024) French startup Weviz develops real-time 3D visualization software to support industrial design verification and reduce prototyping costs. (Manufacturing Trend Report, 2024)

Modelling and Simulation as a Service (MSaaS), in combination with Extended Reality (XR), is a transformative approach within Industry 4.0 that addresses contemporary challenges in design and manufacturing. Furthermore, XR generates new business value by streamlining the customer journey, optimizing employee performance and enabling the development of innovative content and services. (Mourtzis et al. 2024) Using XR technologies such as AR and VR, researchers can create immersive mock-ups to evaluate materials for reuse or recycling before deconstruction even begins. These simulations could provide information on the quality and reusability of materials, making it easier to determine which ones can be effectively recovered. XR-enabled feasibility studies can virtually simulate the deconstruction process, helping stakeholders identify challenges, refine techniques, and make informed decisions in advance. This forward-thinking approach not only improves decision making, but also drives more efficient and cost-effective practices in the deconstruction sector, setting a new standard for sustainable production and manufacturing. (Habeeb et al. 2024)

Major tech enterprises, including Microsoft, are integrating immersive collaboration features into their tools, like Microsoft Mesh in Teams, to enhance virtual meetings. This includes 3D avatars, spatial audio, and virtual environments, aiming to make remote collaboration more natural. Competing startups like Jugo and Frame also offer immersive meeting solutions, focusing on realism and customization. (Report Tech Trends, 2024) 5G's support for massive data transfer and real-time interactions offers new opportunities for XR applications, especially for remote collaboration and live events. This collaboration between XR and 5G is expected to drive growth and innovation. (Extended Reality Market Size, Share, Trends... 2023).

5. Summary

Extended Reality technologies, including virtual reality, augmented reality, and mixed reality, are rapidly gaining prominence across industrial sectors, becoming key trends in manufacturing (Manufacturing Trend Report, StartUs Insights, 2024). The successful integration of XR into industrial environments depends on a variety of factors, including social, technological, economic, and legal considerations. While younger workers' openness to innovative technologies and the shift toward remote work are accelerating XR implementation, challenges remain, such as generational gaps in technological acceptance and the high upfront costs of implementation. Additionally, XR's integration with another innovative technologies like the Internet of Things or Artificial Intelligence enables real-time monitoring, increasing production efficiency and reducing waste. However, the lack of standardized industry protocols, along with concerns around data privacy, cybersecurity, and regulatory compliance, continues to pose significant barriers. On the positive side, advancements in 5G technology and increased funding for Industry 4.0 initiatives are strengthening XR's potential. Nonetheless, the environmental impact of XR technologies, including high energy demands, necessitates a focus on sustainable practices. A supportive regulatory framework, global cooperation on standards, and government incentives are crucial to overcoming these challenges and driving broader XR adoption, enabling enterprises to gain a competitive edge and adapt to evolving organizational cultures.

To maximize XR's full potential, further research need in the following areas:

1. It would be worthwhile to expand research on XR interoperability and compliance standards, especially about integration with other industrial technologies such as digital twins and AI systems. Establishing unified standards could facilitate large-scale XR implementation and increase its overall effectiveness.
2. Given the high upfront costs and complexity of XR technologies, it is crucial to explore strategies to lower these financial barriers for smaller enterprises. Research could focus on models such as leasing, subscription-based systems, or government subsidies aimed at making XR solutions more accessible to SMEs that are constrained by financial constraints.
3. As XR adoption increases, developing tailored training programs that address the different learning preferences of different generations is essential to improving workforce acceptance. Structured change management processes can help overcome resistance and ensure a smoother transition to XR technologies.
4. XR technology has the potential to improve sustainable manufacturing practices. Future research should explore the use of XR simulations to assess the potential for material reuse and recycling in manufacturing processes.

Furthermore, future research should explore cross-sector collaborations for XR adoption, especially in areas where multiple industries could share resources, knowledge, and applica-

tions. For instance, XR technologies currently utilized in healthcare for training and maintenance could be adapted for similar uses in manufacturing. Additionally, the exchange of best practices between sectors like AEC and manufacturing could uncover synergies, particularly in design visualization, project management, and collaborative remote work. Collaborative XR initiatives across sectors could lead to the development of standardized frameworks, shared resources, and solutions for familiar challenges such as data security and system integration, thus making XR adoption more accessible and sustainable for all.

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INTERPERSONAL TRUST IN PROFESSIONAL AND SOCIAL RELATIONSHIPS AMONG GENERATION Z: AN INTERNATIONAL PERSPECTIVE

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Purpose: The purpose of this article was to find correlations in the evaluation of factors affecting trust in co-workers and friends and colleagues. The opinions of Generation Z representatives were analyzed (using respondents from Poland, Spain and Turkey as examples).
Design/methodology/approach: The analyses presented here are part of a broader study on the trust Generation Z places in entities from different spheres of life. The article focuses on perceptions of trust in co-workers and friends/colleagues. The survey was conducted using CAWI and PAPI methods with a sample of 656 respondents.
Findings: Aspects with the greatest and least influence on trust in both co-workers and friends/colleagues were identified, and statistically significant differences in perceptions of these aspects by nationality were analyzed, as well as the correlation between respondents' ratings of each trust factor.
Research limitations/implications: The research sample, lack of representativeness of the sample.
Practical implications: The article indicates whether trust-building behavior in the private sphere can be transferred to the professional sphere.
Originality/value: The article points out differences in the perception of trust constructs among young Poles, Spaniards and Turks.
Keywords: trust, aspects of trust, generation Z, co-workers, friends
Category of the paper: research paper.

1. Introduction

For a number of years, we have been operating in the world of BANI (Casiso, 2020). A world that is complex, unsettled, non-linear and incomprehensible. The BANI model has supplanted the descriptive VUCA model, which has described the world since the 1990s as fragile, anxious, non-linear and incomprehensible (Piątkowska, 2021; Kucharczyk-Capiga, 2022). However, regardless of how we perceive the reality around us, its complexity remains a fact (Musiol, 2022; Piątkowska, 2021; Krzemiński, 2021).

Trust makes it possible to cope with the complexity of the surrounding world (Luhmann,1979). Accordingly, the interest in it can be attributed, among other things, to the growing uncertainty associated with dynamic changes in the environment and their unpredictable nature (Królik, 2015). On the other hand, the increasing virtualization of life has contributed to the weakening of relationships and the decline of trust in teams (Lu et al., 2017; Romeike et al., 2016) in both planes of life – professional and private; in addition, despite the ever-increasing popularity of work-life balance (Tomaszuk et al.,2023), these two planes continue to intersect.

Hence, the purpose of the article is to find correlations in ratings of factors affecting trust in co-workers and friends/colleagues. The study included Generation Z, which has the highest level of distrust among all generations present in the labor market. This is a group that struggles to establish personal relationships (Gajda, 2017), but at the same time is socially oriented (Wiktorowicz et al., 2016) and declares the need to establish relationships in the real world (Dentsu Aegis Network, 2019). The following research questions were formulated:

RQ 1: Which factors are most and which are least likely to influence Generation Z representatives' trust in friends/colleagues?

RQ 2: Depending on nationality, are there statistically significant differences in the evaluations of Generation Z representatives regarding perceptions of the importance of individual factors of trust in friends/colleagues?

RQ 3: Is there a correlation between Generation Z representatives' ratings of individual factors of trust in co-workers and colleagues/friends?

Basic statistical measures and non-parametric statistics were used to obtain responses to RQ. Calculations were made using the Statistica package. The structure of the article includes several sections. The theoretical section presents a literature review on aspects of trust. The next section contains a description of the research methodology used. Then the results of the author's research were presented and analyzed. The final section of the article presents a summary and discusses conclusions and research limitations.

2. Literature review

Trust is a construct of interest in many disciplines (Adler, 2001; Gilbert 2010; Smarżewska, 2018; Fulmer et al., 2012; Lewicki et al., 2006; Tomaszuk, 2024a). According to psychologists, it is a personal trait (Rotter, 1967), according to sociologists it is a social structure (Lewis et al.,1985), according to economists it is a mechanism of rational choice (Williamson, 1993). In the context of management, it is the belief that a person acts favourably toward a relying party by behaving or reacting in a predictable and mutually appropriate manner (Paliszkiewicz, 2013). A review of the definitions of the concept (Tschannen-Moran, Hoy 2000; McKnight, Chervany 2001; Mayer et al., 1995; Blomqvist, 1997; Friman et al., 2002; Koźmiński, 2004;

Bugdol, 2010; Paliszkiewicz, 2013; Kharouf, Lund, 2019; Nienaber et al., 2015; Searle et al., 2018; Büssing, 2002; Tschannen-Moray, Hoy, 2000) made it possible to define the concept of interpersonal trust as the trustee's belief that the recipient of the trust will not let him down, will not take conscious actions that could harm or hurt him (Wasiluk, Tomaszuk, 2020).

Interpersonal trust is an extremely complex and dynamic phenomenon (Guinot et.al., 2013; McCauley, Kuhnert, 1992), especially since, depending on the chosen role, different mechanisms of it are activated (Kilduff, Tsai, 2005). Interpersonal trust-building is an interactive process in which parties learn or unlearn how to build and maintain trustworthiness under certain conditions (Six, Sorge, 2008). Regardless of the conditions, common features of trust include the belief that the other party will act benevolently; taking the risk that the other party may not meet expectations of benevolent behavior; and interdependence (Bews, Martins, 2002; Hay, 2002; Lämsä, Pučėtaitė, 2006; Schoorman et al., 2007). Numerous studies indicate that trust facilitates both social functioning and individual actions with positive results (Colquitt et al., 2007; Dirks, Ferrin, 2001).

Trust, often conceptualized as a multidimensional construct (van der Berg, Martins, 2013; Spadaro et al., 2020), isolates beliefs and the resulting intentions or behaviors. Beliefs relate to perceptions of the trustworthiness of others, while intentions reflect acceptance of vulnerability and actions taken to obtain possible benefits (Clark, Payne, 1997; Das, Teng, 2004; McKnight et al., 1998; Yu et al., 2014).

Most commonly, five basic dimensions of trust are identified (Tschannen-Moran, 2004): honesty (telling the truth, keeping promises, accepting responsibility); benevolence (showing goodwill, being supportive, guarding confidential information); openness (engaging in open communication, sharing important information and making decisions); dependability (consistency, responsibility, fulfilling obligations, keeping commitments) and competence (abilities, qualifications, skills).

Despite the relevance of each dimension, their relative value may vary with respect to the subjects of interpersonal relationships (Yavas, Çelik, 2010). In contrast, the most common sources of trust are considered to be (Grudzewski et al., 2007; Mayer et al., 1995):

- knowledge derived from the repetition of previous interactions between the parties,
- calculation estimated as the advantage of benefits over possible costs,
- values held by norms belief in the honesty and goodwill of the partner,
- the skills, competencies and qualities of the partners that allow them to exert influence,
- benevolence and willingness to do right by the trustee despite the clear motivation to act for profit.

Despite the fact that interpersonal trust involves a relationship between two entities and can vary depending on the reference point (Colquitt et al., 2007), the literature does not abound with studies comparing how the same trust constructs are perceived in relation to different entities (embedded in different spheres of life).

3. Methodology

The multidimensionality of the construct determines the use of diverse measurement scales (Żądło, 2014). The construction of the research tool was based on the Mishra and Mishra (1994) measurement scale, which was adapted to the purpose of the study. The implemented scale is included in Table 1.

Table 1.
The measurement scale used

S	Statement
S1	I trust that my co-worker/friend should be completely honest with me
S2	I trust that my co-worker/friend should prioritize the interests of the university over his own
S3	I trust that my co-worker/friend should keep the promises he/she makes
S4	I trust that my co-worker/friend should be a competent person in his/her work
S5	I trust that my co-worker/friend should always express true feelings on important issues
S6	I trust that my co-worker/friend should look after my well-being
S7	I trust that my co-worker/friend should have a significant share in the success achieved by a university
S8	I trust that I should be able to rely on my co-worker/friend
S9	I trust that my co-worker/friend should undertake actions that are consequence of previous declarations
S10	I trust that my co-worker/friend should share important information with me
S11	I trust that my co-worker/friend should care about the future of the university
S12	I trust that my co-worker/friend should help to solve important problems at the university
S13	I trust that my co-worker/friend should have consistent expectations towards me
S14	I trust that my co-worker/friend should be able to make personal sacrifices for the university
S15	I trust that my co-worker/friend should be willing to acknowledge their own mistakes
S16	I trust that my co-worker/friend should help the university in crisis situations

Source: compiled from (Mishra, Mishra 1994).

Respondents were asked to indicate their position on each statement (separately for each subject), on a five-point Likert scale.

The reliability of the scale was checked using Cronbach's α coefficient. The calculated statistics (0.84 for the measurement scale used to measure trust in co-workers and 0.81 of friends/ acquaintances) indicate sufficient and high consistency, respectively, of the items included.

The analyses presented here represent a narrower slice of the research conducted (the total sample consisted of 1185 respondents from 21 countries), the purpose of which was to identify differences in evaluations of factors influencing trust in selected entities in the opinion of Generation Z.

The article focuses on the responses of respondents who are representatives of the three most numerous nationalities – Spaniards, Poles and Turks. The characteristics of the respondents (N=656) are included in Table 2. The respondents were people born after 1995, and have experience in the labor market. The survey was conducted in late 2021 and early 2022 with a combined technique, using CAWI and PAPI methods via a snowball method. The methods

used made it possible to achieve a high level of standardization and minimize the interviewer's influence on the respondents' opinions, and provided a sense of complete anonymity, which contributed to increasing the quality of the data collected (Malhotra, 2010).

Table 2.
Characteristics of respondents

Country of origin of respondents	Number (%) of respondents
Spain	342 (52.1%)
Poland	230 (35.1%)
Turkey	84 (12.8%)
TOTAL	656 (100%)

Source: compiled on the basis of the conducted survey.

4. Analysis of research results

The article focuses on discussing the results of the study on trust in friends/ colleauges. As the results on trust in co-workers have been more extensively described through the prism of comparative analysis with components of trust in supervisor (Tomaszuk, Wasiluk, 2023), in this article they are presented only for comparative analysis. Descriptive statistics were used to present the results, the significance of statistical differences was verified using the Kruskal-Wallis test (Table 3).

Analysis of the data allows us to identify the aspects that are most and least likely to affect trust in friends and colleagues. Overall, the highest interest, due to the arithmetic mean, can be observed in the opinions of Poles. They considered sincerity, keeping promises and reliability to be the most important, in turn. Sincerity and reliability were also found to be of greatest importance to Turks. The third most important component of trust for this nationality is assistance in emergency situations. Analysis of the survey results also allows us to conclude that Spaniards value completely different components in the aspect of trust in friends/ colleagues, and these are: concern for well-being, expression of true feelings (sincerity) and participation in successes. For the most important aspects of trust, the coefficient of variation remained at low (Poles and partly Turks) or average (Spaniards and partly Turks) values.

Representatives of all analyzed nationalities were more in agreement when it came to opinions on the three aspects of least importance in forming trust in friends and acquaintances. In Poles and Turks, there was full agreement – representatives of both nationalities considered putting the common interest before their own, having specific expectations with regard to friends and colleagues, and the ability to make personal sacrifices to be the least important components. Putting the common interest before one's own also turned out to be the least important component for Spaniards, as did honesty (the most important in the opinion of Poles

and Turks) and competence. The coefficient of variation for the statements analyzed remained average. The Kruskall-Wallis test conducted confirms that there are a number of statistically significant differences by nationality - differences were not found only in statements regarding the need to be concerned about well-being (S6), having a significant stake in the successes achieved (S7) and concern for the future (S11). The most differences were observed between Poles and Spaniards (13) and related to perceptions of S1, S2, S3, S4, S5, S8, S9, S10, S12, S13, S14, S15, S16. Poles and Turks differed in their perceptions of 6 trust components (S2, S3, S5, S8, S9, S10). The fewest differences – 5, were observed when comparing opinions on trust in friends/colleagues for Spanish and Turkish nationalities (S1, S3, S4, S15, S16).

Table 3.
Evaluation of statements of the trust in co-workers and colleagues/ friends' measurement scale by nationality of respondents

*	Objective of trust	Total		Spaniards		Poles		Turks		H	P
		x	V	x	V	x	V	x	V		
S1	Trust in co-workers	4.00	26.64	3.72	30.55	4.36	18.75	4.18	25.24	49.40	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	4.15	26.26	3.67	32.25	4.73	13.68	4.55	14.64	160.9	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
S2	Trust in co-workers	3.26	35.89	3.57	30.48	2.73	38.97	3.44	36.75	71.07	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
	Trust in friends and colleagues	3.29	34.47	3.61	28.57	2.77	38.53	3.45	35.23	75.96	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
S3	Trust in co-workers	4.07	23.47	3.72	26.73	4.50	15.78	4.35	18.73	103.5	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	4.16	25.20	3.73	27.16	4.76	13.06	4.25	30.09	169.5	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks, Poles and Turks									
S4	Trust in co-workers	4.10	23.64	3.81	26.80	4.53	15.25	4.10	23.86	75.39	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
	Trust in friends and colleagues	3.80	26.16	3.68	26.28	3.92	26.21	4.01	24.01	14.41	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
S5	Trust in co-workers	3.76	27.42	3.57	28.85	3.97	25.04	3.96	25.21	25.28	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	4.20	23.33	3.93	26.08	4.65	15.04	4.04	24.76	90.02	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
S6	Trust in co-workers	3.31	32.89	3.47	30.20	3.08	33.99	3.26	38.11	17.29	<0.05
		Statistically significant differences exist between Poles and Spaniards									
	Trust in friends and colleagues	3.99	24.30	4.01	23.84	4.02	23.75	3.82	27.60	2.42	0.29
		Statistically significant differences do not occur									

Cont. Table 3.

*	Objective of trust	Total		Spaniards		Poles		Turks		H	P
		x	V	x	V	x	V	x	V		
S7	Trust in co-workers	3.85	25.67	3.73	25.68	4.04	20.61	3.82	35.68	17.86	<0.05
		Statistically significant differences exist between Poles and Spaniards									
	Trust in friends and colleagues	3.89	26.42	3.93	25.17	3.93	24.72	3.61	35.23	3.34	0.19
		Statistically significant differences do not occur									
S8	Trust in co-workers	3.89	25.61	3.66	26.36	4.30	18.71	3.71	33.06	65.61	<0.05
		Statistically significant differences occur between Poles and Spaniards									
	Trust in friends and colleagues	4.17	23.57	3.88	25.00	4.72	13.58	3.85	30.07	132.3	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
S9	Trust in co-workers	4.03	23.71	3.81	26.31	4.35	16.80	4.02	26.16	41.15	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
	Trust in friends and colleagues	4.05	23.51	3.87	23.43	4.40	18.10	3.82	32.03	53.36	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
S10	Trust in co-workers	3.94	27.91	3.71	28.87	4.27	22.18	3.95	34.22	43.70	<0.05
		Statistically significant differences exist between Poles and Spaniards									
	Trust in friends and colleagues	4.14	23.26	3.89	24.95	4.51	16.93	4.18	26.31	68.67	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
S11	Trust in co-workers	3.78	25.60	3.66	26.65	3.86	24.30	4.04	23.54	15.29	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	3.88	27.10	3.81	28.06	4.03	23.78	3.79	31.51	5.68	0.059
		Statistically significant differences do not occur									
S12	Trust in co-workers	3.84	24.67	3.83	25.10	3.85	23.58	3.88	26.05	0.29	0.86
		Statistically significant differences do not occur									
	Trust in friends and colleagues	4.02	25.23	3.80	28.88	4.34	17.86	4.02	24.99	35.43	<0.05
		Statistically significant differences exist between Poles and Spaniards									
S13	Trust in co-workers	3.52	32.18	3.72	28.83	3.23	34.41	3.51	36.04	28.89	<0.05
		Statistically significant differences exist between Poles and Spaniards									
	Trust in friends and colleagues	3.59	30.64	3.74	28.04	3.42	32.93	3.44	33.57	12.24	<0.05
		Statistically significant differences exist between Poles and Spaniards									
S14	Trust in co-workers	3.09	39.74	3.38	34.59	2.62	42.18	3.19	43.65	54.96	<0.05
		Statistically significant differences occur between Poles and Spaniards, Poles and Turks									
	Trust in friends and colleagues	3.52	30.84	3.74	24.91	3.24	35.54	3.35	37.84	25.75	<0.05
		Statistically significant differences exist between Poles and Spaniards									
S15	Trust in co-workers	4.10	22.43	3.76	25.04	4.51	15.04	4.32	20.05	103.0	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	4.09	24.82	3.71	26.20	4.68	13.71	4.00	31.05	147.5	<0.05
		Statistically significant differences exist between Poles and Spaniards, Spaniards and Turks, Poles and Turks									
S16	Trust in co-workers	3.70	27.58	3.63	28.54	3.73	25.87	3.93	27.60	8.16	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									
	Trust in friends and colleagues	4.13	23.20	3.91	25.95	4.38	18.12	4.30	21.61	35.29	<0.05
		Statistically significant differences occur between Poles and Spaniards, Spaniards and Turks									

Note: * - Statement.

Source: compiled on the basis of conducted survey.

Spearman's rank correlation analysis conducted for ratings of statements of the trust in co-workers and friends/ colleagues measurement scale (Table 4) indicates that the existing correlations are positive.

Table 4.
Spearman's rank correlation for ratings of statements of the trust in co-workers and friends/ colleauges measurement scale by nationality of respondents

Statement	total		Spanish		Poles		Turks	
	P	rS	P	rS	p	rS	p	rS
S1	<0,05	0,40	<0,05	0,25	<0,05	0,33	<0,05	0,67
S2	<0,05	0,38	<0,05	0,12	<0,05	0,47	<0,05	0,53
S3	<0,05	0,47	<0,05	0,32	<0,05	0,40	<0,05	0,28
S4	<0,05	0,35	<0,05	0,34	<0,05	0,37	<0,05	0,32
S5	<0,05	0,31	<0,05	0,15	<0,05	0,38	<0,05	0,53
S6	<0,05	0,20	>0,05	0,08	<0,05	0,34	<0,05	0,34
S7	<0,05	0,25	<0,05	0,20	<0,05	0,21	<0,05	0,51
S8	<0,05	0,40	<0,05	0,19	<0,05	0,31	<0,05	0,62
S9	<0,05	0,34	<0,05	0,15	<0,05	0,50	<0,05	0,40
S10	<0,05	0,35	<0,05	0,16	<0,05	0,44	<0,05	0,45
S11	<0,05	0,24	<0,05	0,21	<0,05	0,21	<0,05	0,46
S12	<0,05	0,10	>0,05	0,00	<0,05	0,20	<0,05	0,27
S13	<0,05	0,30	<0,05	0,19	<0,05	0,37	<0,05	0,45
S14	<0,05	0,39	<0,05	0,25	<0,05	0,41	<0,05	0,53
S15	<0,05	0,45	<0,05	0,22	<0,05	0,49	<0,05	0,52
S16	<0,05	0,25	<0,05	0,17	<0,05	0,26	<0,05	0,38

Source: compiled on the basis of conducted survey.

Correlations are present for all statements when comparing the opinions of Poles and Turks, and for most statements (excluding S6 and S12) of Spanish respondents. However, an analysis of the rS values shows that in the case of Spanish respondents, the correlations are overwhelmingly low, only in the case of S3 and S4 a medium level of correlation can be observed. For Polish respondents, most of the correlations have a medium level (except for S7, S11, S12 and S16, where a low level of correlation was observed). The highest level of correlation was observed for Turkish respondents – only for S3 and S12 a low level of correlation was observed; analysis of the remaining statements indicates an average (S4, S6, S9, S10, S11) and high (S1, S2, S5, S7, S8, S14, S15) level of correlation. In practice, this means that an increase in ratings of statements related to trust in colleauges/friends goes hand in hand with an increase in ratings of statements related to trust in co-workers to the highest degree for Turkish respondents, followed by Polish and Spanish respondents.

5. Summary

The entry of Generation Z into the labor market implies many challenges related to its functioning in the organizational structures of companies and organizations. This requires, among other things, an understanding of the trust components that are most relevant to this generation. The article attempts to check whether trust behavior in private life can be transferred to the canvass of professional life. In light of the analysis, the conclusion emerged that aspects of trust relevant to Generation Z are differentiated more by the nationality of the trustee than by the subject of trust. A comparative analysis of trust aspects for respondents in relation to superiors and academics teachers led to the same conclusion (Tomaszuk, 2024b). These findings confirm previous studies that point to cultural specificity in the formation of professional and social relationships. Sunardi and Putri (2020) emphasized that trust in professional relationships plays a key role in achieving job satisfaction, especially when it is based on reliability and support. Moreover, Ng's (2020) research showed that trust between co-workers moderates behaviours such as knowledge sharing, which can be an important element in cross-cultural relationships.

The analyses conducted indicated that the biggest differences are between Poles and Spaniards, which may be due to different traditions of collectivism and individualism. Ömüriş et al. (2020) noted that cooperativeness fosters trust, while competitiveness may weaken it, which may explain the differing results in the perception of trust aspects in different national groups. Interestingly, Poles and Turks showed full agreement on the least important aspects of trust, such as putting the common interest before one's own. These results may reflect universal tendencies in professional relationships that place more emphasis on individual benefit.

The analysis indicates that the highest level of correlation between trust ratings in professional and social relationships is found among Turks, suggesting their greater consistency in perceptions of these two types of relationships. Similar conclusions were drawn by Kipkosgei et al. (2020), indicating that coworker trust plays a key role in increasing cooperation and knowledge sharing. In turn, Srivastava and Mohaley's (2022) research highlights that trust in co-workers is an important mediator between authentic leadership and job satisfaction, suggesting that organizations should emphasize building quality relationships in the workplace.

However, the study's limitations stem from the possibility that specific socio-cultural contexts may influence the results, which requires further comparative research. Undoubtedly, limitations also include the lack of representativeness of the sample. Nevertheless, the study can provide a starting point for further consideration, especially since horizontal trust as an object of analysis is often overlooked in the literature in favor of vertical trust (Hao et al., 2022).

Trust is a multidimensional phenomenon that varies according to nationality, cultural context and interpersonal relations. The results of the study provide valuable insights for professional relationship management practices and underscore the importance of specific approaches in building trust in workplaces.

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EXPECTATIONS OF GENERATION Z TOWARDS CHARISMATIC LEADERSHIP

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Purpose: The aim of this study was to identify differences in the perception of individual traits that make up charismatic leadership, as defined by the subscales of the Conger-Kanungo Charismatic Leadership Scale. The study examines which leadership qualities are most and least valued by Generation Z and explores whether statistically significant differences exist in respondents' evaluations of these traits.
Design/methodology/approach: The research utilized the Conger-Kanungo Charismatic Leadership Scale, adapted to measure Generation Z's specific expectations of charismatic leadership. Data were collected through paper (PAPI) and online (CAWI) surveys distributed via social media. The sample included 394 Generation Z respondents with backgrounds in social sciences, who evaluated the traits on a five-point scale. The data were analyzed using descriptive statistics (mean, median, standard deviation, skewness, and kurtosis) as well as one-way ANOVA and Scheffé's post-hoc test to assess statistically significant differences across subscales.
Findings: The highest ratings were given to "Personal Risk" and "Strategic Vision and Articulation," suggesting that Generation Z values leaders who are willing to take risks and who communicate a clear, inspiring vision. "Sensitivity to Member Needs" also received high ratings, emphasizing the importance of empathy in building trust-based relationships. Lower ratings for "Sensitivity to the Environment" and "Unconventional Behavior" indicate that these qualities are seen as less critical in charismatic leadership by Generation Z.
Research limitations/implications: The study's limitations include a lack of sample representativeness, which restricts the generalizability of the findings. Future research could explore cross-cultural differences in the perception of charismatic leadership, analyze variations in expectations by industry or sector, and investigate how individual personality traits affect leadership expectations.
Originality/value: This study contributes to both academic knowledge and practical applications by providing insights into Generation Z's expectations of leadership in the workplace. The findings enrich the field of human resource management literature and offer valuable guidance to organizations seeking to align leadership strategies with the values and preferences of young employees.
Keywords: Generation Z, charismatic leadership, Conger-Kanungo Scale, leader traits, leadership preferences
Category of the paper: research paper.

1. Introduction

Today's labor market is a space where multiple generations coexist, each bringing unique experiences, values, and approaches to work. In organizations, representatives of four generations meet: the Baby Boomers, Generation X, and the younger generations Y and Z, with each group shaped by different historical events, social conditions, and economic contexts (Sidor-Rzadkowska, 2018, 88). This generational diversity poses a challenge for companies, which must adapt their management style to meet the specific needs and expectations of various age groups (Różańska-Bińczyk, 2022). Differences in values and priorities, work approaches, and motivations require managers to be flexible and aware of the complexities involved in managing a diverse team (Warwas, Wiktorowicz, Jawor-Joniewicz, 2018, p. 22).

In this context, the integration of the youngest generation—Generation Z—into the labor market holds particular significance. Although there is extensive literature on generational differences, Generation Z remains relatively underexplored due to its brief presence in the workforce (Dwivedula, Singh, Azaran, 2019). As members of this generation grow in influence and numbers, organizations must adapt their management strategies and develop new approaches to effectively engage and attract young employees. Forecasts suggest that by 2028, as much as 58% of the global workforce may consist of Generation Z, which will significantly impact organizational culture and employee management practices (Forum Odpowiedzialnego Biznesu, 2022).

The entry of this generation into the labor market has far-reaching implications. Employers face the challenge not only of adapting existing management models but also of redesigning their recruitment strategies and hiring processes. Companies that fail to consider the specific needs of this group may encounter difficulties in recruitment and retention, especially amid increasing competition for talent (Leoński, Pluta, Wieczorek-Szymańska, 2020). Addressing the needs and expectations of Generation Z is critically important in both academic and practical contexts; only by adapting management strategies to meet their requirements can organizations fully leverage the potential that this transformative generation brings to the market.

2. Review of the literature

Generation Z, consisting of individuals born after 1995 who are now entering the workforce, brings a new approach to professional life and a fresh set of values that differ significantly from those of older generations. Growing up in a fully digital world, this generation has unparalleled access to information, fostering in them the ability to quickly assimilate knowledge and a strong capacity for multitasking. Accustomed to immediate access to data, they are less patient with

traditional, slow decision-making processes, often prioritizing speed over accuracy in task execution (Grabiwoda, 2018, p. 51). Their work style and expectations differ markedly from those of previous generations, who generally valued stability, hierarchy, and loyalty to the organization. Focused on personal growth and the achievement of their own goals, Generation Z tends to challenge these traditional values.

Generation Z demonstrates a high level of career flexibility and is more inclined toward frequent job changes, seeking not so much a stable career as continuous opportunities for growth and skill acquisition (Muster, 2020, p. 134). They also prefer clear and transparent career paths but without long-term commitments to a single organization, which contrasts with Millennials and Baby Boomers, for whom loyalty was foundational in professional relationships. Generation Z is less interested in job stability and places a greater emphasis on individual challenges and rapid advancement. This mindset leads them to question traditional hierarchical structures, as they expect more partnership-oriented relationships with their supervisors (Rogozińska - Pawełczyk et al., 2019, p. 29). This need for equality in the workplace shapes their attitude toward authority—young employees expect leaders not only to set rules but also to create space for dialogue and to be open to their ideas and needs.

Research shows that maintaining a work-life balance is essential for Generation Z. They are strongly attached to flexibility, both in terms of working hours and location. Remote or hybrid work is not seen as a privilege but as a standard they expect, stemming from their view of work as one of many aspects of life rather than its central focus (Berge, 2019; Vilanova, 2019). Gen Z expects leaders to respect these needs and for organizations to create a work environment that preserves their work-life balance (Lima-Vargas, Cervantes-Aldana, Lima-Vargas, 2022). Supervisors who fail to understand this may struggle to maintain their engagement and loyalty, further highlighting Generation Z's distance from traditional authoritarian structures.

At the same time, the literature emphasizes Generation Z’s strong focus on individualism. Members of Generation Z place a high priority on self-development and achieving personal goals, which may reduce their inclination for long-term collaboration and make building loyalty to employers more challenging. This tendency to view themselves as independent of the organization does not support respect for traditional hierarchies and corporate values (Leśniak, 2022, 69). These employees expect organizations to be flexible, providing them with space for individual growth and autonomy, often regardless of norms that governed older generations. As a result, Generation Z's approach to work is sometimes perceived as less empathetic or team-oriented, while also being more demanding of employers.

Additionally, members of Generation Z prefer a work environment that does not rely on rigid rules and authority based solely on hierarchical position, but rather on partnership and authenticity. They expect their supervisors to be not only professionals but also leaders who are open to building trust-based, transparent relationships. A lack of such an approach can quickly lead to a decrease in their engagement and motivation, making them more likely to seek other employment opportunities (Generation Z in the Labor Market, 2019). Generation Z rarely

accepts authority uncritically; on the contrary, their natural approach involves questioning the status quo. This tendency can create tension in their relationships with supervisors if they are not given the space to express their opinions and participate in decision-making processes.

The characteristics of Generation Z and its tendency to question authority highlight the need to examine its approach to leadership, particularly charismatic leadership. Since charismatic leadership relies on building authority and influence based on the leader's personal traits rather than solely on formal position, it may align with the specific expectations of Generation Z. However, it is worth exploring how this generation defines effective leadership and which qualities it values, so that leaders can better adapt their style to meet the needs of young employees. Research on Generation Z's preferences for charismatic leadership could provide organizations with valuable insights, enabling them to more effectively address the needs of this younger generation, foster engagement, and enhance long-term loyalty.

To examine how Generation Z perceives charismatic leadership, statements from the Conger-Kanungo Charismatic Leadership Scale were adapted—a psychometric tool designed to assess the level of charismatic traits in a leader. This scale enables evaluation of the extent to which leaders possess charismatic qualities essential for effective team leadership and inspiring its members. It is based on the assumption that charismatic leadership results from a combination of the leader's personality, behaviors, and subordinates' perceptions. This latter aspect, the perception of the leader as charismatic, largely depends on the leader's ability to inspire, motivate, and create a shared vision of the future (Conger et al., 2000). Numerous studies confirm that this scale is a reliable and valid tool in various cultural and organizational contexts (Conger et al., 1997; Halverson et al., 2004; Rowold, Kersting, 2008; Lian et al., 2011).

The Conger-Kanungo Scale encompasses various dimensions that collectively aim to capture the essence of a leader's charisma. Within this tool, three categories of behaviors are distinguished:

1. Strategic behaviors – related to the ability to create a vision and persuade the team to realize.
2. Prosocial behaviors – reflecting concern for the well-being and needs of others.
3. Leadership behaviors – focused on inspiring, delegating, and managing the team.

These three categories form the foundation for more specific subscales, which enable a deeper analysis of selected aspects of charismatic leadership. The detailed subscales that make up the Conger-Kanungo Scale include (Conger, Kanungo, 1994; Conger et al., 1997):

1. Strategic Vision and Articulation – the leader's ability to create and communicate an inspiring vision that mobilizes the team to take action.
2. Environmental Sensitivity – the ability to analyze situations, understand context, and adapt actions to changing conditions.
3. Sensitivity to Member Needs – the leader's capacity for empathy, understanding team members' needs and concerns, which fosters trust and engagement.
4. Personal Risk – the leader's willingness to take risks in pursuing the vision, demonstrating courage and commitment to the organization's success.

5. Unconventional Behavior – the leader's approach to problem-solving in a non-traditional manner, enhancing their charisma.

These five subscales allow for the measurement of specific aspects of charismatic leadership and provide measurable categories for analysis. The Conger-Kanungo Scale is widely used in both academic research on leadership and in management practice, especially for leader assessment and development. It enables organizations to identify leaders with high charismatic potential and to evaluate leadership effectiveness in terms of motivating and inspiring teams to achieve shared goals.

3. Research methods

The aim of this text was to identify differences in the perception of specific traits that constitute charismatic leadership, as defined by the subscales of the Conger-Kanungo Scale. The following research questions were formulated:

RQ1: Which charismatic leadership traits are rated the highest and which the lowest by respondents?

RQ2: Are there statistically significant differences in the perception of specific charismatic leadership traits among respondents?

The following research hypothesis was proposed:

H: There are statistically significant differences in the perception of specific charismatic leadership traits, with traits related to personal risk and the leader's strategic vision being rated higher than traits such as environmental sensitivity or unconventional behavior.

The analyses presented in this article are part of a broader study conducted among Generation Z representatives in 2022 (from January to December). Data were collected using two methods: a paper-based survey (PAPI) and an online survey (CAWI). The online survey was hosted on Google Drive, and a link to it, along with a request to complete it, was distributed via social media. Respondents who completed the survey were also asked to share it further among their acquaintances.

For the analyses included in this article, only questionnaires completed by individuals with a background in social sciences were used (n=394). This group consisted of 232 women (59%) and 162 men (41%). Respondents rated individual statements related to charismatic leadership using a five-point scale, where 1 meant "strongly disagree" and 5 meant "strongly agree." The responses obtained were coded and subjected to statistical analysis using the Statistica 14.0 software.

The reliability of the adopted measurement scale was assessed using Cronbach's alpha, which yielded a value of 0.80. This result indicates a high level of internal consistency for the tool, confirming the scale's reliability in measuring the variables under study.

Several key statistical tools were used in the data analysis, enabling a detailed assessment of differences in the perception of specific charismatic leadership traits. First, basic descriptive statistics, such as mean, median, standard deviation, skewness, and kurtosis, were calculated for each of the Conger-Kanungo Scale subscales analyzed. These indicators allowed for determining the overall rating level for each trait, as well as understanding the distribution characteristics, including consistency and potential asymmetries in the ratings.

To test the significance of differences between the various subscales of charismatic leadership, a one-way within-subjects analysis of variance (ANOVA) was conducted. The ANOVA results indicated statistically significant differences between the mean ratings for different subscales. To identify which subscales differed significantly from each other, a post-hoc analysis was performed using Scheffé's test. This test, known for its conservativeness, maintains a low risk of Type I error in multiple comparisons, ensuring the reliability and accuracy of the obtained results.

4. Analysis and discussion

Table 1 presents the basic descriptive statistics for the variables studied in the context of the charismatic leadership subscales.

Table 1.
Descriptive Statistics of the Studied Variables

Subscales	M	Me	SD	S	K
Strategic Vision and Articulation	3,95	4,00	0,62	-0,65	0,65
Sensitivity to the Member Needs	3,77	3,67	0,77	-0,36	-0,07
Sensitivity to the Environment	2,48	2,50	1,10	0,39	-0,62
Personal Risk	4,18	4,33	0,71	-0,75	0,04
Unconventional Behavior	3,11	3,00	0,96	-0,05	-0,40
Charismatic leadership	3,66	3,61	0,50	0,10	-0,13

Note: M- mean, Me – median, SD - standard deviation, S – skewness, K - kurtosis.

Source: own study.

The results indicate generally high ratings for key charismatic leadership traits, with moderate variability in the outcomes. The mean values for most subscales are in the upper range of the scale, suggesting a positive perception of the analyzed traits within the studied group, particularly regarding the leader's ability to formulate and communicate a vision and willingness to take personal risks. Low standard deviations and similar values between the mean and median in most subscales indicate relatively consistent ratings of specific leadership aspects, which may reflect a stable perception of charismatic traits in leaders among respondents.

The highest ratings were given to the subscales "Personal Risk" (4.18) and "Strategic Vision and Articulation" (3.95), suggesting that a leader's willingness to take risks and ability to create and communicate an inspiring vision are perceived as key elements of charismatic leadership by respondents. In contrast, the lowest mean rating was for the "Sensitivity to the Environment" subscale (2.48), indicating that respondents rated leaders' environmental sensitivity relatively low compared to other aspects of leadership. This subscale also shows high variability in ratings, suggesting diverse perceptions of this trait, and a positive skewness (0.39) indicates a slight tendency toward lower ratings. This may suggest that environmental sensitivity is a less valued trait among respondents in the context of charismatic leadership.

The analysis of skewness and kurtosis for the remaining subscales shows that the distribution of results for most of them is close to normal, with minor deviations. This indicates a uniform perception of leadership traits among respondents, suggesting stability in the ratings and a solid understanding of the specific aspects of charismatic leadership being analyzed. The mean value of the overall charismatic leadership rating (3.66), along with the median (3.61), confirms a generally positive perception of charismatic leader traits among respondents. Additionally, the low standard deviation (0.50) and a distribution close to normally indicate consistency and stability in the opinions of the participants.

The mean value of the overall charismatic leadership rating is 3.64, suggesting that respondents perceive leaders' charismatic traits positively. The median (3.61), close to the mean, indicates consistency in ratings across the respondent group. The low standard deviation (0.48) suggests uniformity in respondents' opinions, reflecting a stable perception of leader charisma. The skewness value (0.16) indicates a slight rightward asymmetry, suggesting a mild tendency toward higher ratings. A kurtosis of 0 confirms that the distribution is close to normal, with a typical level of concentration around the mean.

To determine differences between the subscales, a one-way within-subjects analysis of variance (ANOVA) was conducted. For the respondents, the F-value reached 336.47 ($F(4, 1572) = 336.47$), which was statistically significant ($p < 0.001$), indicating significant differences among the analyzed groups in this sample. The η^2 value was 0.46, meaning that 46% of the variance in the dependent variable is explained by differences between groups. This suggests a strong between-group effect.

Given the above, post-hoc analyses were conducted using Scheffé's test. A number of statistically significant differences were observed (Table 2).

The analysis of Scheffé's test results revealed that all differences between the charismatic leadership subscales are statistically significant, confirming a varied perception of specific traits of a charismatic leader. Respondents attribute the greatest importance to traits related to personal commitment and the leader's courage. The score for the "Personal Risk" subscale (4.18) indicates that a leader's willingness to take risks in pursuing goals is essential for the perception of their charisma and genuine commitment to organizational objectives. The high rating for "Strategic Vision and Articulation" (3.95) emphasizes that the ability to create and effectively

communicate an inspiring vision is highly valued and is crucial for effectively motivating the team.

Table 2.
Results of Scheffé's Test for Charismatic Leadership Subscales

Subscales	Strategic Vision and Articulation M = 3,95	Sensitivity to the Member Needs M = 3,77	Sensitivity to the Environment M = 2,48	Personal Risk M = 4,18	Unconventional Behavior M = 3,11
Strategic Vision and Articulation	-	p = 0,023	p < 0,001	p = 0,001	p < 0,001
Sensitivity to the Member Needs	p = 0,023	-	p < 0,001	p < 0,001	p < 0,001
Sensitivity to the Environment	p < 0,001	p < 0,001	-	p < 0,001	p < 0,001
Personal Risk	p = 0,001	p < 0,001	p < 0,001	-	p < 0,001
Unconventional Behavior	p < 0,001	p < 0,001	p < 0,001	p < 0,001	-

M- mean.
Source: own study.

Similarly, "Sensitivity to Member Needs" (3.77) is also highly valued, suggesting that empathy and understanding of team members are essential components of charismatic leadership. This trait supports the development of trust-based relationships, which is crucial for long-term team engagement.

Lower ratings for "Unconventional Behavior" (3.11) and "Sensitivity to the Environment" (2.48) indicate that while an innovative approach and the ability to adapt to context are added advantages, they are not seen as essential elements of charismatic leadership. Respondents clearly prefer leader traits focused on a clear vision, commitment, and willingness to take risks, suggesting that these attributes are perceived as most important in building charisma and effectively influencing the team.

Based on the conducted analyses, it can be concluded that the initial hypothesis—H: there are significant differences in the ratings of specific charismatic leadership traits, with traits related to personal risk and the leader's strategic vision receiving higher ratings compared to environmental sensitivity and unconventional behavior—was positively confirmed.

The results of the Conger-Kanungo scale analysis indicate that the surveyed Generation Z representatives rate key charismatic leadership traits highly, though the intensity of these ratings varies depending on the specific nature of each trait. Compared with the existing literature, these findings provide a deeper understanding of how the attitudes of the respondents align with the broader context of both earlier and more recent studies on charismatic leadership.

The highest rating among respondents was given to the "Strategic Vision and Articulation" subscale, suggesting that survey participants highly value leaders who can formulate an inspireing and clear vision. This result aligns with previous studies that emphasize the fundamental importance of vision in building trust and mobilizing a team (Avolio, Yammarino, 2013). Respondents, similar to Generation Z in other studies, place particular importance on authenticity and the significance of organizational goals (Aguas, 2019; Schroth, 2019). The higher ratings

for this subscale suggest that a leader's clear vision plays a crucial role in respondents' positive perception of the leader.

The "Personal Risk" subscale also received high scores, indicating that respondents value leaders' willingness to take risks. This trait enhances their perception of the leader's authenticity and increases trust, particularly in dynamic and unpredictable work environments, as confirmed by other studies on Generation Z (Francis, Hoefel, 2018; Schroth, 2019). In this context, respondents rate highly those leaders who take risks, viewing this trait as one that strengthens the leader's credibility.

High scores in the "Sensitivity to Member Needs" subscale indicate that leader empathy is crucial for respondents. They place great importance on inclusivity and support in the workplace, and an empathetic approach by the leader fosters mutual trust and long-term engagement. This finding aligns with previous studies highlighting the importance of close relationships between Generation Z representatives and their supervisors, as well as the need for open communication (Zivkovic, 2022; Goh, Lee, 2018; Francis, Hoefel, 2018; Schroth, 2019).

The "Sensitivity to the Environment" subscale received the lowest ratings, suggesting that respondents consider leaders' ability to adapt to their surroundings to be less important in the context of charismatic leadership. In the literature, environmental sensitivity under changing conditions is regarded as an important trait, particularly in crisis situations (Van Knippenberg, Sitkin, 2013), which may indicate some differences between the survey results and other studies on Generation Z. However, in crisis situations, the importance of this trait may increase (Schroth, 2019), pointing to a potential area for further research.

The "Unconventional Behavior" subscale also received lower scores in the analysis, indicating that although respondents view a leader's non-standard approach positively, it is not considered a key aspect of charismatic leadership. This aligns with previous research, which suggests that unconventional behavior can support the perception of charisma but is not a primary element of effective leadership (House, 1977; Antonakis, Bastardoz, Jacquart, Shamir, 2016).

5. Conclusion

The analyses conducted indicate that Generation Z respondents positively rate key traits of charismatic leadership, particularly a leader's ability to formulate an inspiring vision and willingness to take personal risks. The highest-rated subscales—"Personal Risk" and "Strategic Vision and Articulation"—confirm that Generation Z especially values authentic leaders who are willing to take risks in pursuing their vision, as this allows them to effectively mobilize their team and gain trust. Similarly, the high rating for the "Sensitivity to Member Needs" subscale

underscores the importance of empathy in building long-lasting, trust-based relationships with team members, which is highly valued in inclusive work environments.

Lower ratings for "Sensitivity to the Environment" and "Unconventional Behavior" suggest that traits such as adaptability and a non-standard approach are not considered key elements of charismatic leadership for this group. However, in crisis situations, adaptability may become more significant, as indicated by recent studies. Statistical analyses confirm that the differences between ratings of specific traits are significant, highlighting Generation Z's varied perception of these aspects.

Overall, the study results align with both earlier and recent research on charismatic leadership, suggesting that key traits for Generation Z include a leader's authenticity, vision, and ability to build close relationships, while innovation and adaptability to the environment play a secondary role.

A limitation of this study is the lack of sample representativeness, which prevents full generalization of the results to the entire Generation Z population. Nevertheless, the findings may prove valuable for both the academic community and practitioners. The study results enrich cohort theory by providing insight into young employees' perceptions of charismatic leadership, which may help in better understanding their expectations of leaders in the workplace. Additionally, the study makes a significant contribution to the human resource management literature by analyzing Generation Z's leadership trait preferences, which is crucial for shaping management strategies in dynamically changing organizations.

Future research could explore several key areas that would deepen the findings obtained in this study. It would be worthwhile to consider analyzing differences in the perception of leadership competencies arising from different cultural traditions. Such a study would examine whether expectations of charismatic leadership within Generation Z differ depending on the cultural context. A significant extension would also be to investigate whether respondents' preferences vary by industry or sector in which they are employed, which could provide valuable insights into specific leadership competencies desired in different labor market sectors. Another interesting research direction would be to explore whether specific personality traits influence expectations regarding leadership competencies. For example, analyzing how different personality types assess and respond to various management styles could help better match leaders to the needs of teams with diverse personalities. Such a study could deepen our understanding of the interaction between personality and the perception of charismatic leadership, which would be valuable for both leadership theory and the practice of managing teams in diverse work environments.

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TOWARDS AN IMPROVED APPROACH TO THE METHODICAL PLANNING OF NON-COMMERCIAL CLINICAL TRIAL PROJECTS

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Purpose: The subject of this study is driven by the extensive necessity to enhance the efficiency of clinical trial project management. The objective of this article is to provide a comprehensive overview of the essential characteristics that should define a planning method that can be adapted to the specifics of non-commercial clinical trial (NCT) projects.
Design/methodology/approach: The objectives of the study were achieved by examining a variety of alternative characteristics that the NCT project planning method may possess. A multi-criteria analysis (morphological analysis) was employed.
Findings: The result of the analyses carried out is a summary of the attributes of the NCT project planning method. A total of 19 characteristics were identified as being essential for the NCT project planning method. These include the application of classical methodology, the agile methodological approach and the hybrid approach to project management. This study provides a foundation for subsequent empirical research in this area.
Research limitations/implications: The research has been limited to NCT projects; it is worth conducting similar analyses for commercial projects. The set of features in the article may not be complete. Other factors should be considered.
Practical implications: The majority of extant literature pertains to medical issues; this research, which focuses on considerations from the fields of management and quality sciences, responds to an unmet need on the part of NCT project management theorists and practitioners. The findings of the study have the potential to enhance the efficiency of the project planning process and to optimise the organisation of research teams' work. Furthermore, they can also be valuable for commercial clinical trials.
Originality/value: The results of this study have a significant impact on the efficiency and effectiveness of research preparation in medicine, which is an important source of new knowledge, develops treatment methods and increases people's standard of living. The study fills the gap that is the deficiency of research on improving the efficiency and effectiveness of conducting clinical research projects. The results of the study may be of use not only to management but also to medical staff and researchers.
Keywords: planning method, non-commercial, project management, clinical trial
Category of the paper: research paper.

1. Introduction

Clinical trials represent a pivotal component within the pharmaceutical market and the healthcare sector. Conducting such trials is imperative for advancements in medical science, the development of innovative new treatments, prevention and patient care. A project-based approach is highly recommended, as the development of new medicines involves unique, complex, costly and lengthy projects that require expertise and interdisciplinary collaboration between clinical researchers and scientists associated with many different disciplines. As research confirms, the implementation of project management methodologies has been demonstrated to exert a positive influence in a number of domains within healthcare management, such as the timely accomplishment of organisational goals, cost-containment, and the enhancement of quality (Dobin, Lazar, 2020).

Planning and managing clinical trials, including non-commercial clinical trial (NCT) projects, is usually not easy and requires project management competencies (Sonstein et al., 2022; Mitchell et al., 2022). It has been noted that there are challenges associated with the low efficiency of the implementation of clinical trials, and there is a need to establish a body of good practice in the planning and management of projects in the area of drug development, clinical pharmacology (i.e. the development, evaluation and clinical use of pharmaceutical products) (Harpum et al., 2010; Grudzinskas et al., 2022). In the search for appropriate clinical trial management methods, competence standards for clinical trial project management professionals are constantly developing (Sonstein et al., 2024; Jones et al., 2024).

In the healthcare sector, an increasing interest in the utilisation of project approaches has been observed. However, the existing project management methodologies are not always sufficiently familiar to the healthcare community and do not always meet their expectations (Lunkka et al., 2019). Popular and universal project management methodologies are only partly adaptable to the specificities and needs of healthcare projects and it is sometimes necessary to combine the project approach with other management methods e.g. oriented towards change management or for practitioners to adapt intuitive and improvised approaches not related to specific management concepts and approaches (Gordon, Pollack, 2018).

It is pointed out that good planning of a clinical trial is a very important factor in the success of this type of project (Kim et al., 2023) and recent research on the organisational culture of health sector units in Poland indicates a clear need for health care systems in Poland and worldwide to systematically increase the efficiency of their functioning (Domańska-Szaruga, Jończyk, Knap-Stefaniuk, 2024).

Therefore, the objective of the study was to identify the appropriate characteristics for a planning method that would be suitable for non-commercial clinical trial (NCT) projects. The objectives of the study were achieved by analysing a number of alternative characteristics that a planning method for NCT projects may have. A multi-criteria analysis was employed

to achieve this objective. The resultant analysis provided a comprehensive summary of the attributes of the NCT project planning method, incorporating the application of classical methodology, the agile methodological approach, and the hybrid approach to project management. The paper is constituted by a lead-in to the topic of clinical research project management, an explanation of basic concepts and a review of recent literature on the subject. This is followed by a discussion of the chosen research method – multi-criteria analysis, i.e. the morphological method. Subsequently, the procedure for determining the features of the planning method is presented. The paper concludes with a presentation of conclusions and recommendations for directions of further research.

2. Project management of non-commercial clinical trials

A clinical trial is defined as any study conducted in human subjects with the objective of discovering or confirming the clinical, pharmacological, including pharmacodynamic, effects of one or more investigational medicinal products. Alternatively, a clinical trial may be conducted to identify adverse reactions to one or more investigational medicinal products. Additionally, a clinical trial may be conducted to follow the absorption, distribution, metabolism and excretion of one or more investigational medicinal products with a view to their safety and efficacy (Pharmaceutical Law).

The fundamental classification system divides clinical trials into two broad categories: commercial and non-commercial. Commercial trials are those involving the pharmaceutical industry, usually in the role of trial sponsor. Conversely, a non-commercial clinical trial (NCT) is conducted without the involvement of the pharmaceutical industry. The fundamental premise underlying the conception of an NCT is that the data collected during the course of the trial cannot be utilised for the purpose of obtaining marketing authorisation for designated medicinal products, nor can it be employed to amend extant authorisations. Non-commercial clinical trials can be conducted in an academic setting, where the objective is to gain knowledge of the mechanism of action, efficacy and pharmacokinetics of a drug (Wąsik, Kuczur, 2016). It is important to note that non-commercial clinical trial projects are undertakings for which the trial sponsor, e.g. a university without the assistance of the pharmaceutical industry, has to provide all the necessary resources itself (Finger et al., 2011).

In order to facilitate an understanding of the organisation of a non-commercial clinical trial project in attributional terms, the following example is provided. Prior to the initiation of the planning phase for a clinical trial project, the principal investigator, in collaboration with the sponsor, is responsible for establishing a small working group. This group should comprise investigators, as well as at least one statistician and an individual with expertise in clinical trial methodology. The steering committee is responsible for all significant decisions regarding

the initiation, execution, and termination of the trial. The sponsor is the entity responsible for the trial in question and may also be the funding organisation. The coordinating and data centres are responsible for the day-to-day tasks of running the trial, including randomisation processes, data collection and circulation, reviewing current documentation, and organising monitoring visits to study sites. The endpoint validation committee is tasked with the review of the documentation prepared by the coordination centre for the trial endpoints. The safety assessment committee has the responsibility of communicating with the steering committee and the medical agencies (e.g. EMA or FDA) in the event of any irregularities in the design of the non-commercial clinical trial (Boissel, 2014).

A commonly accepted, general definition of a project posits that a project constitutes a sequence of unique, complex and interrelated tasks that share a common objective, are delivered to a fixed deadline and within a fixed budget, and comply with preset requirements (Kerzner, 2018; Wysocki, 2019). Furthermore, M. Trocki (2003) emphasises that a project constitutes a unique undertaking, executed by a team, distinct from the repetitive activities of the organisation, and employing specialised methods and techniques.

A clinical trial meets all requirements of the project definition (Doganov, Yanev, 2006; Farrell et al., 2010). The specific features of clinical trial projects are as follows: the definition of objectives in the planning phase, the identification of resources necessary to achieve the planned objectives, the planning of activities to achieve these objectives, the continuous monitoring of the progress of the work and its effects on the basis of clear performance criteria, the ongoing evaluation, the closure of the project if the objectives are achieved or cannot be achieved, the implementation of the activities in accordance with a clinical trial protocol prepared in advance and the use of this document as the basis for monitoring the progress of the project (Goodarzynejad, Babamahmoodi, 2015).

In accordance with the clinical trial project management model, five distinct stages can be identified. The initial stage is the definition of the project objectives, i.e. the identification of the objectives, synthesis of current knowledge, information about the drug substance (drug product and other products), scope of work, budget and implementation period. Subsequent to this initial stage, a feasibility study is conducted, which involves an analysis of the viability of implementing the project, an assessment of the availability of resources, including researchers, specialist doctors, and suitable sites (medical centres), and an estimate of the accessibility of technical equipment. In the third stage, resources are allocated, with the principal investigator being hired, researchers (medical staff), patients and volunteers for the study being recruited, sites being recruited, and drugs being ordered (including organising their transport). The penultimate stage is characterised by the initiation of project implementation, encompassing the baseline phase. This phase includes treatment, ongoing monitoring of progress and compliance with the protocol, and safety monitoring (adverse events). The final stage of the project is closure, which

includes the final visit, the organisation of all the data and information obtained, the performance of statistical analyses, the preparation of the final report and the writing of scientific publications (Grzeszczyk, Zawada, 2020).

The present paper is concerned with the planning stage of non-commercial clinical trials, which is defined as the preparatory phase preceding the initiation of the primary research. It encompasses a range of activities, including the identification of the research problem, the review of extant literature, the formulation of a research question, the development of a hypothesis, the determination of the study design, the identification of the target population, and the procurement of informed consent for participation. This stage also involves the establishment of collaborations with experts and the assessment of the overall feasibility of the proposed study. Prior to the initiation of the scientific investigation, researchers must determine the most appropriate data collection strategy, sampling techniques, and statistical analysis methods. Following the formulation of a working hypothesis and its subsequent reformulation as a null and alternative hypothesis, the subsequent step involves deciding on the type of study required to answer the research question and the most suitable methods to implement it (Kiani et al., 2022; Karunarathna et al., 2024).

The research emphasises that the project manager plays a pivotal role in the effective planing, organisation and implementation of optimal processes for the control and monitoring of a clinical trial. The critical steps involved in the planning phase of a clinical trial encompass a range of activities, including the conceptualisation of the study, the review of existing literature, the identification of the problem to be addressed, the formulation of an abstract, the selection of investigators, the development of a protocol, the identification of funding sources, and the creation of a patient consent form, along with numerous additional tasks (Kandi, Vadakedath, 2023).

A comprehensive discourse on the management of clinical research projects can be found in the extensive literature on the subject (Hackshaw, 2009; Friedman et al., 2015; Brody, 2016; Wright, 2017; Chew, 2019).

3. Selected research directions for clinical trial project planning

While there are a number of studies that address methodological approaches to the management of clinical trials, these do not directly relate to management and instead focus on medical aspects. However, the concept of adaptability is frequently utilised, interpreted as an extended and flexible design of clinical trials (Granholm et al., 2023). Adaptive studies are characterised by the implementation of adaptive (transitional) analyses, which are employed for the purpose of adjusting the target sample size, updating allocation coefficients, or initiating the early termination of the study in the event of the fulfilment of a predefined statistical decision rule

(Burnett et al., 2020). Nevertheless, the management of clinical trial projects is addressed through the utilisation of the concept of adaptability in order to facilitate the decision-making process during the planning phase of the projects (Grzeszczyk, Zawada, 2024).

A number of studies have been conducted in the field of non-commercial clinical trial project planning. Among these studies are those focusing on the utilisation of the Hierarchical Interaction Network (HINT). This network is employed to enhance the efficacy of prediction in clinical trials prior to initiation, thus enabling the allocation of greater resources to trials with a higher probability of success, thereby circumventing inevitable failures (Chen et al., 2024). Furthermore, Generative Large Language Models (LLMs) have been utilised in the design of inclusion criteria for clinical trials, constituting an essential element of the protocol and a critical factor in the success of clinical trial projects (Wang et al., 2023).

A range of analytical approaches is being used to facilitate the planning of clinical trials. These include methods to improve the efficiency of managerial decisions in uncertain circumstances, which are made using a multi-stage stochastic programming formulation (Colvin, Maravelias, 2010), and methods to plan a clinical trial based on decision analytic modelling (Keim-Malpass et al., 2023).

The domain of clinical trial project planning includes the aspect of data management, which is integral to the effective execution of research endeavours. The Data Management Plan (DMP) is a crucial element that ensures the systematic and uniform execution of data management operations, thereby maintaining data integrity and facilitating the successful conduct of the study (Maroju et al., 2024).

4. Selected methods and standards for planning clinical trial projects

As stated in the introduction, the management of clinical trial projects adheres to the same standards as the management of other types of projects. The growing importance of projects in the field of clinical research is a phenomenon that is referred to as projectization (Juchniewicz, 2018). This approach entails the extension of project management methodologies to various internal organisational issues, thereby signifying a transition towards a management paradigm that is characterised by projects (Stabryła, 2006). The strong similarity in the approach of clinical research project management theory to R&D projects, as indicated by the literature review, allows for the use of both traditional and agile methodological approaches.

As clinical research is considered to be a type of research and development project, universal management methods and standards are applicable to projects in the healthcare sector and to clinical trial projects. The leading approaches are those developed by organisations such as PMI (Project Management Institute), APM (Association for Project Management), IPMA (International Project Management Association) and Scrum Alliance (Strojny, Szmigiel, 2015).

The PMI methodology, for instance, outlines five phases of the project life cycle (initiating, defining and planning, executing, monitoring performance and closing), and these phases can also be applied to healthcare, pharmaceutical and clinical trial projects (Schwalbe, Furlong, 2017). Recently, there has been a particular focus on agile approaches (Griffiths et al., 2020; Ewings et al., 2022).

In addition to universal methodologies, a number of professional and design standards that are used in clinical trial practice for project management purposes should be noted. One such example is Good Manufacturing Practice, which defines the correct manufacturing procedures to support quality management in production engineering under conditions of considerable technological expertise required and high variability in the characteristics of the products to be obtained (Rahalkar et al., 2022). Furthermore, Good Clinical Practice is a constantly evolving field, with ongoing refinement aimed at enhancing the analysis and risk assessments of non-commercial clinical trials conducted by academic research centres (Le Marsney et al., 2022). Methodological support is also provided by Good Scientific Practice. Among the guidelines formulated are recommendations for the efficient and timely publication of complete results of non-commercial clinical trials, which are sometimes problematic (Riedel et al., 2022). Addressing concerns regarding risks and hazards is facilitated by enhancing Good Pharmacovigilance Practices (Holm et al., 2022).

A formal approach to planning and the use of specialised methods is particularly warranted, and its proper execution can have a positive impact on the results obtained, especially in the case of long-term (strategic) planning of projects with significant risks. However, the agile approaches recommended for such projects suggest less focus on implementing formal planning principles and methods at the beginning of the project (Zwikael, Gilchrist, 2021).

The discourse on clinical trial project management draws attention to best practice in planning such projects, which includes elements such as scope management, estimation, change control, scheduling, resource management, budgeting and performance management (Stewart-Long, 2010).

Research indicates that promising results can be achieved through the combination of multiple solutions, which are improvised and intuitive, and the improvement of change management, especially in the early stages of the project life cycle (Gordon, Pollack, 2018). In particular, it is crucial to improve the implementation of the planning phase of clinical trial projects (Farrell, Kenyon, 2014).

5. Research method

The identification of the anticipated characteristics that are deemed to be possessed by an NCT project planning method is regarded as a problem of identifying the optimal solution

for planning NCT projects. One of the combinatorial methods, belonging to the pragmatic stream of heuristic methods – the method of morphological analysis (Zwicky, 1967) – is applied to solve this planning challenge.

Morphological analysis is characterised by its logical-analytic approach, with creative solutions to problems being sought and achieved through a systematic analysis of all possible solutions (Ujwary-Gil, 2003). The utility of this approach is not confined to any specific field of human activity; rather, it is applicable to all areas, both practical and scientific. Its applications include the study of organisational and legal forms of organisations, external and internal organisational structures, management processes, methods supporting organisational problem solving, activities in projects to analyse and select the appropriate form of project organisation, and the creation of conditions for appropriate methodological support in project management processes (Trocki, Wyrozębski, 2014).

A morphological analysis consists of three consecutive phases (Kozina, 2017):

- problem identification phase - is devoted to identifying the boundaries of the problem and defining it rigorously;
- problem analysis phase - is devoted to extracting the relevant parameters or features that characterise the problem (e.g. factors, functions, elements). Subsequently, variants of the identified parameters are identified;
- problem synthesis phase - consists of sorting out all the parameters and identifying possible combinations of them. Then, the combinations are analysed and evaluated in terms of an overall solution to the problem. Finally, those solutions that are most viable and valuable are selected.

6. Proposed features of the NCT project planning method

In this study, Zwicky's method of morphological analysis was employed to identify the expected characteristics that an NCT project planning method should possess. Firstly, the problem to be solved was formulated: what should the NCT project planning method be characterrised by, so that it is best adapted to the peculiarities of this type of project and enables efficient project implementation, saving the time required for project planning? Secondly, a comprehensive literature analysis was conducted to identify the problem variables, i.e. the main elements (features) determining the solution, and the possible values of these elements (manifestations of the features). Consequently, a list was formulated in which the ordered features and the manifestations of these features were included:

A: Type of organisational structure:

1. Linear.
2. Linear and staff.

3. Linear and staff with functional cells.
4. Functional.
5. Matrix.

B: Regulations/standardization:
1. Detailed, explicit.
2. Detailed, alternative.
3. Framework.
4. Heuristic.
5. None.

C: Division of tasks:
1. Elementary partial work.
2. Exchangeable sub-work.
3. Sequences of operations.
4. Natural parts of the work process.
5. Implementation of the entire work process.

D: Project initiation:
1. General principles of project initiation.
2. Framework for project initiation with key decision points.
3. Detailed procedures and documentation for project initiation.
4. Not relevant/not present.

E: Project definition, definition of project objectives, constraints and requirements:
1. General assumptions of project parameters.
2. Framework definition of project parameters.
3. Detailed and precise definition of project assumptions, objectives, constraints.
4. Not relevant/not present.

F: Project structuring and scope management:
1. Definition of the project framework and general project control rules.
2. Full identification of the project scope and definition of its verification rules.
3. Detailed description of the components of the project scope and a precise procedure.
4. Not relevant/not present.

G: Project flow planning as a function of time:
1. Framework planning of the project flow at a high level of generality.
2. Project flow planning at medium level of detail.
3. Detailed planning of the project flow as a function of time.
4. Not relevant/not present.

H: Project documentation:
1. Low degree of project documentation (basic project documentation).
2. Medium degree of project documentation (framework documentation, basic reporting).
3. High degree of project documentation (complete and comprehensive documentation).

4. Not present.

I: Frequency of projects:
   1. Occasionally.
   2. Regularly (from time to time).
   3. Continuously.

J: Repeatability of projects:
   1. Never.
   2. Occasionally.
   3. Regular.
   4. From time to time.
   5. Continuous.

K: Number of simultaneous projects:
   1. One.
   2. Several.
   3. Several dozens.

L: Linking projects:
   1. Programmes.
   2. Portfolio.
   3. Not present.

M: Project size (budget, time, workload):
   1. Small.
   2. Medium.
   3. Large

N: Fixed: time, budget, workload:
   1. Fully.
   2. Partially.
   3. Not defined.

O: Scope of project in relation to organisation's scope of activities:
   1. Fragmentary.
   2. Partial.
   3. Comprehensive.

P: Compatibility of project and organisation competences:
   1. Fully.
   2. Partial.
   3. None.

Q: Clarity of purpose:
   1. Fully stated.
   2. Partially clear.
   3. Slightly clear.

4. Not clear.

R: Knowledge of results:

1. Results are known.
2. Results are known to a large extent.
3. Results are known to a moderate extent.
4. Not known.

S: Degree of user/customer involvement:

1. High.
2. Medium.
3. Low.
4. None.

Following this, solution variants were created (Table 1).

Table 1.
Features and manifestations of the features of the NCT project planning method

Features	**Possible values**				
A	1	2	3	4	5
B	1	2	3	4	5
C	1	2	3	4	5
D	1	2	3	4	
E	1	2	3	4	
F	1	2	3	4	
G	1	2	3	4	
H	1	2	3	4	
I	1	2	3		
J	1	2	3	4	5
K	1	2	3		
L	1	2	3		
M	1	2	3		
N	1	2	3		
O	1	2	3		
P	1	2	3		
Q	1	2	3	4	
R	1	2	3	4	
S	1	2	3	4	

Source: Author's own study.

Finally, the developed variants were evaluated, and the optimal solution was selected (marked in grey in Table 1).

As illustrated in Table 2, the following section summarises the most advantageous feature values of the NCT project planning method. The organisational structure of a clinical research organisation corresponds to a line-team structure. This organisational arrangement consists

of a project manager and the teams that report to the project manager (along with line managers). The staff cells that support the work of the teams are specialists from different fields, including law, medicine and information and communication technology, who perform advisory functions. The level of applicable regulations and standards for the implementation of clinical trial projects, in any form, can be considered very high – the project sponsor is obliged to comply with the requirements enshrined in numerous legal regulations.

Scientific research units, scientific institutes, medical universities and other clinical research bodies are involved in unique projects and carry them out regularly and continuously as a statutory task. Due to their scope and cost, these projects are most often small to medium-sized and are often long-term initiatives. Organisations often undertake multiple projects simultaneously; however, these projects are not systematically integrated into portfolios or programmes. Research work is divided into elementary units and activities, but due to the nature of research work, i.e. the unpredictability of its results, it is not possible to fully determine the time, budget and workload of individual tasks.

Clinical trial projects are defined by their coverage of a scientific and research area that represents a specific component of the overall activity of the unit (sponsor) conducting the trial. To illustrate this point, consider a clinical trial project within the therapeutic area of cardiology, where the efficacy of one or two drugs for hypertension is being investigated. In contrast, the competence of the project and the organisation is fully compatible. With regard to the initiation and planning of NCT projects, detailed procedures are not available. Instead, a project initiation framework with key decision points prevails. Examples of such key decision points include the necessity for a feasibility study, a research protocol, or obtaining approval from the Regulatory Authority to initiate a study. Given the unique nature of each project, an individualised approach is necessary, resulting in a paucity of detailed instructions on the aforementioned elements. The documentation related to project initiation and planning is prepared in a manner tailored to the type, purpose and specificity of the research project each time.

The definition of the project, its objectives, constraints and requirements is somewhat divergent. These elements are defined with great precision and detail. For instance, the criteria for the inclusion and exclusion of participants (patients) from a study are explicitly delineated, with justifications derived from scientific and medical considerations that are applicable throughout the research project. The subsequent elements of the study are also defined in detail: the characteristics of the components and the scope of the project, and the detailed procedure for its control; the planning of the flow of project activities over time; and the overall documentation of the project. A further notable characteristic of NCT projects is that their objectives are partially specified and the results are known to a moderate degree. This characterisation is substantiated by the observation that a considerable proportion of clinical trials evaluate the efficacy of a specific treatment therapy, among other factors. However, the extent of efficacy remains uncertain, and the outcomes may not align with the initial expectations. A distinguishing feature of NCT projects is the high level of customer involvement, defined as users or recipients of

the project's outcome. This customer involvement is a fundamental aspect of the planning methodology for such projects.

Table 2.
Summary of selected best features of the NCT project planning method

Features	T / A	Manifestations of the characteristics
Type of organisational structure	T	Linear and staff
Regulations/standardization	T	Detailed, explicit
Division of tasks	A	Elementary partial work
Project initiation	A	Framework for project initiation with key decision points
Project definition, definition of project objectives, constraints and requirements	T	Detailed and precise definition of project assumptions, objectives, constraints and requirements
Project structuring and scope management	T	Detailed description of the components of the project scope and a precise procedure for its control
Project flow planning as a function of time	T	Detailed planning of the project flow as a function of time
Project documentation	T	High degree of project documentation (complete and comprehensive documentation of project progress)
Frequency of projects	T & A	Continuously
Repeatability of projects	T & A	Never
Number of simultaneous projects	T & A	Several
Linking projects	T & A	Not present
Project size (budget, time, workload)	T & A	Small or Medium
Fixed: time, budget, workload	A	Partially
Scope of project in relation to organisation's scope of activities	T & A	Fragmentary
Compatibility of project and organisation competences	T & A	Fully
Clarity of purpose	A	Partially clear
Knowledge of results	A	Results are known to a moderate extent
Degree of user/customer involvement	A	High

Note. T = traditional methodologies, A = agile methodological approach.

Source: Author's own study based on Grzeszczyk, Zawada, 2024.

It is evident that NCT projects are characterised by a high degree of formalisation, being subject to a comprehensive regulatory framework that includes numerous laws and good practice guidelines. The medical research regime requires particular care and documentation of research progress, while maintaining a high degree of transparency. However, NCT projects are characterised by an absence of clarity in their objectives, which are often vague and imprecise (e.g. searching for a substance that could be a cure for a particular disease). Additionally, there is often a lack of clarity in the conditions under which these projects would be conducted. Furthermore, the dynamic nature of the research environment means that it is not possible to accurately predict future activities or outcomes of individual research tasks and steps.

As illustrated in Table 2, the NCT project planning method has the potential to be compatible with traditional and agile methodologies. Within the scope of planned work, a distinction

can be made between tasks that fall under the regime of the clinical trial protocol and those that are not precisely defined. The organisational structure, compliance with standards, the plan, structure, course and documentation of the project correspond to the principles of traditional project management methodologies (e.g. PRINCE2). Conversely, the division of work into specific tasks, in addition to the initiation of the project, which predominantly encompasses the preparation of a study protocol or the submission of a funding application (along with the development of a feasibility study) to a task, can be executed in accordance with the agile methodological approach. The efficacy of agile concepts is substantiated by the observation that clinical trials frequently exhibit a high degree of uncertainty regarding outcomes and involve a significant level of stakeholder engagement (e.g., clinical trial participants, researchers). The remaining characteristics enumerated in Table 2, pertaining to organisational aspects, are consistent with both the classical methodology and the agile methodological approach.

7. Conclusions

The analysis conducted in this article clearly demonstrates that, among the available project planning methods, particularly those employed in R&D project planning, it is not possible to unequivocally identify a single method that exhibits the identified characteristics. Instead, it is possible to search for an alternative method that can be significantly characterised by the required key features.

The absence of universally applicable methodologies, coupled with the ongoing endeavours to cultivate proprietary standards to facilitate the planning of clinical trial projects, underscores the necessity to discern the anticipated characteristics of a methodology for planning such endeavours. This may, in turn, enable the formulation of a sought-after proprietary approach to addressing the planning challenge.

In clinical research project management processes, traditional approaches and previously identified life-cycle stages are not always conducive to success. Consequently, new solutions must be sought and research in this area developed. Integrative projects, combining traditional project management methodologies with solutions inspired by different types of concepts, are worthy of consideration.

A significant limitation of the present study is the focus on non-commercial projects, which limits the generalisability of the findings. Analogous analyses should be undertaken for commercial clinical trial projects. Given the theoretical nature of this study, it would be beneficial to carry out a series of empirical studies to verify the postulated features of the NCT project planning method in practical settings. It is possible that the set of features presented in the article may be incomplete. It would be advisable to conduct further research into areas that are relevant to NCT project management and to consider other features of the planning method.

It is evident that the issue under discussion is of interest to researchers worldwide. However, it is important to note the acute lack of methods to support the efficient planning of NCT projects. Such methods would need to take into account the specifics of NCT projects and the needs of experts and project managers. In view of the rapidly expanding discipline of clinical trial project management, particularly in the domain of non-commercial research, there is a compelling rationale for the continuation of research focused on the identification of novel management methodologies or the refinement of extant universal methods.

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