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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 35 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about: smart city, innovation management, economics, business management, finances, virtual reality in management, artificial intelligence in management, public management, healthcare management, outsourcing, green investment, tourist management, entrepreneurship, competitiveness, impact of COVID-19 pandemic on management, supply chain management and marketing.

*Bożena Skotnicka-Zasadzień
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ASSOCIATION BETWEEN GENDER AND OPINION ABOUT SMART CITY

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Purpose: The paper aims to provide new insights into the opinions of women and men about selected smart city areas.

Design/methodology/approach: The study was conducted using CATI and CAWI methods, involving respondents from two Polish cities — Szczecin and Koszalin. The survey assessed participants' opinions of various aspects of smart cities through the analysis of four chosen areas. The analysis is based on quantitative data, where Chi-square test for independence was utilised.

Findings: In Szczecin, the first hypothesis yielded significant relationships, indicating that the opinions of specific smart city areas are indeed influenced by residents' gender. In contrast, the data from Koszalin revealed two significant relationships, indicating that opinions may be more susceptible to gender-based variations.

Research limitations/implications: A limitation of the study is that it is based solely on respondents from two cities, which may restrict its generalizability to other regions. The study is a pilot study. Future research could consider diverse locations, additional demographic factors, and an in-depth analysis of the relationship between gender and subjective opinions on various areas of smart cities.

Practical implications: The findings of the study may be utilized by city managers in designing urban spaces that more effectively meet the diverse needs of women and men. Such an approach can contribute to increased acceptance of initiatives and greater resident satisfaction.

Social implications: Incorporating a gender perspective into urban planning promotes more inclusive and informed decision-making, contributing to the development of spaces that meet the needs of all residents, thereby strengthening social cohesion and supporting sustainable development.

Originality/value: The study provides an innovative perspective on the diverse perceptions of urban innovations by women and men, contributing to the literature on urban space management from a gender perspective and residents' quality of life.

Keywords: smart city, citizens, gender.

Category of the paper: research paper.

1. Introduction

It is projected that in the coming decades, global cities will become the primary place of residence for the majority of the world's population, which has traditionally inhabited rural areas (Beyer, 2020; Tumwesigye et al., 2021; Wen et al., 2020). According to the UN report *World Urbanization Prospects: The 2018 Highlights*, by 2050 approximately 70% of the global population will reside in urban areas, indicating an increase in migration from rural to urban regions (World..., 2019). Such transformations necessitate rethinking how contemporary cities can meet the diverse needs of their residents. Jacobs noted as early as 1958 that a city must be designed with people in mind, not just buildings. Her approach emphasized the importance of accounting for differences in the experience of urban space by its users, including from a gender perspective (Jacobs, 1992).

The concept of a smart city, though lacking a unified definition, has gained recognition as a modern approach to addressing the challenges of contemporary urban areas. In literature, this concept is the subject of extensive discussion, influenced by geopolitical context and researchers' specific areas of interest. A smart city can be understood as a space that leverages modern technologies and data analytics to sustainably meet residents' needs, respond to social challenges, and support urban development (Albino et al., 2015; Mora et al., 2017; Nam, Pardo, 2011; Schaffers et al., 2012). Currently, this concept is widely applied worldwide, including in Polish cities that are actively implementing smart solutions to improve the quality of life for their citizens (Alaverdyan et al., 2018; Alshamaila et al., 2024; Bitkowska, Łabędzki, 2021; Boichuk, 2021; Caprotti, 2019; Caragliu et al., 2009; Krasowska et al., 2023; Mikucki, 2021; *Smart City Observatory*, 2024; Winkowska, 2021). Three key phases of smart city development are distinguished, starting from Smart City 1.0 and progressing through subsequent stages up to Smart City 4.0 (Cohen, 2015; University of Opole, Kauf, 2020).

The creation and development of smart cities pursues various objectives. However, a contemporary priority is to ensure equal conditions for all residents to participate in decision-making processes. This is particularly crucial in cities marked by spatial segregation and inequalities (Bastos et al., 2022; Leclercq, Rijshouwer, 2022; Tran Thi Hoang et al., 2019).

While technology-related goals are an essential component of smart city development, the primary focus today is on creating human-centered environments that meet residents' needs. A successful smart city requires not only technological contributions from officials and companies but also active engagement from the community (Leclercq, Rijshouwer, 2022; Tran Thi Hoang et al., 2019).

For city administrators, citizen participation provides valuable support, driving economic growth in a way that respects residents' needs while promoting sustainable urban development. The opportunity for residents to express their views enhances their awareness of co-creation (Capdevila, Zarlenga, 2015; Sikora-Fernandez et al., 2012; Wiścicka-Fernando, 2024).

Urban spaces are inhabited by diverse communities with varying social and demographic characteristics, such as age, education, social status, physical attributes, and gender. Analyzing residents in terms of gender is particularly valuable, as it serves as a key factor differentiating urban populations. Examining the city from a gender perspective reveals significant differences between men and women, particularly in how they perceive and evaluate the functionality of smart cities. Researchers focusing on gender differences indicate that these distinctions may manifest, for example, in cognitive abilities and life preferences (Fine, 2010; Meyers-Levy, Loken, 2014).

An analysis of women's and men's preferences in utilizing urban space reveals that, despite similarities in economic activities, their differences in space usage can and should inform urban planning decisions made by city authorities (Jo et al., 2020).

Diverse expectations of women and men regarding urban space can shape their perceptions of their living environment, engagement in decision-making processes, and opinions on the implementation of modern urban technologies. This, in turn, influences residents' evaluations of these solutions' effectiveness. In introducing innovative technologies aimed at improving residents' quality of life, city managers should consider the varied needs and preferences of both genders. Possessing such data enables the adaptation of public space enhancements to be equally effective and satisfactory for both women and men. Therefore, it seems essential to undertake research that provides insights into the similarities and differences in opinions held by women and men, which is the primary objective of this paper.

2. Methods

A pilot survey was conducted in 2021 by the authors, who employed CATI and CAWI interview methods to gather data from a random sample of 427 residents of Szczecin and Koszalin, the largest cities in Poland's West Pomeranian region. The data were analyzed using the Chi-square test for independence, which was employed to assess the relationships between variables. The primary data were collected through a structured questionnaire designed to capture various aspects of the participants' opinions about selected smart city areas.

Participants were invited to indicate their level of agreement or disagreement with the statements presented to them on a five-point Likert scale. The scale ranged from 1 (strongly disagree) to 5 (strongly agree), with 2 (disagree), 3 (neutral), and 4 (agree) representing intermediate positions. This format allowed respondents to express varying degrees of agreement or disagreement with specific statements.

The survey assessed participants' opinions of various aspects of smart cities through the analysis of four specific areas. Firstly, the integration of modern technologies within the intelligent city (m1) was evaluated, with a particular focus on the contribution these

advancements make to urban life. Secondly, respondents were invited to share their opinions on the capacity of intelligent cities to enhance the quality of life for residents in response to their evolving needs (m2). Thirdly, the utilization of data technologies (m3) to address social challenges within the intelligent city framework was explored, with a particular focus on the proactive role of technology in problem-solving. Finally, the survey addressed the smart city's commitment to working for the benefit of future generations (m4), emphasizing the importance of sustainable practices in urban planning.

To guide the study, a conceptual framework was created (Figure 1).

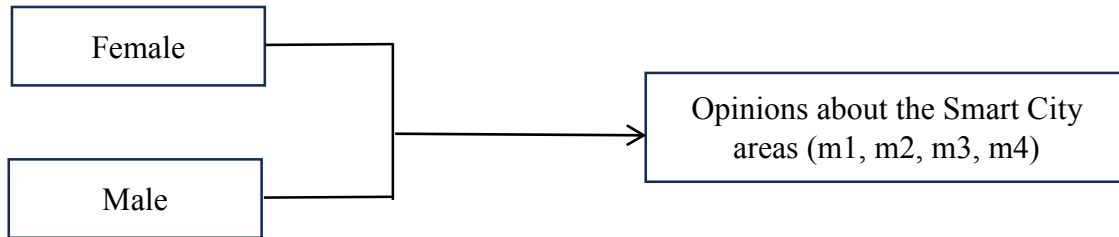


Figure 1. Conceptual framework of the study.

Source: own study.

The Chi-square test was used to assess the relationship between gender and the four areas of a smart city, where H_{0x} represents the null hypothesis, and H_{ax} is the alternative hypothesis. Hypotheses 1 to 4 pertain to the city of Szczecin, while hypotheses 5 to 8 relate to the city of Koszalin. The formulated statistical hypotheses are as follows:

- H_{01} : There is no association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city uses modern technologies’.
- H_{a1} : there is an association between the gender of residents of Szczecin and their opinion about the area ‘the smart city uses modern technologies’.
- H_{02} : There is no association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city improves the quality of life of the residents according to their changing needs’.
- H_{a2} : There is an association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city improves the quality of life of the residents according to their changing needs’.
- H_{03} : There is no association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city’s capacity for analyzing, monitoring and utilizing data’.
- H_{a3} : There is an association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city’s capacity for analyzing, monitoring and utilizing data’.
- H_{04} : There is no association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city’s commitment to working for the benefit of future generations’.

- H_{a4}: There is an association between the gender of the residents of Szczecin and their opinion about the area ‘the smart city’s commitment to working for the benefit of future generations’.
- H₀₅: There is no association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city uses modern technologies’.
- H_{a5}: there is an association between the gender of residents of Koszalin and their opinion about the area ‘the smart city uses modern technologies’.
- H₀₆: There is no association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city improves the quality of life of the residents according to their changing needs’.
- H_{a6}: There is an association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city improves the quality of life of the residents according to their changing needs’.
- H₀₇: There is no association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city’s capacity for analyzing, monitoring and utilizing data’.
- H_{a7}: There is an association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city’s capacity for analyzing, monitoring and utilizing data’.
- H₀₈: There is no association between the gender of the residents of Koszalin and their opinion about the area ‘the smart city’s commitment to working for the benefit of future generations’.
- H_{a8}: there is an association between the gender of residents of Koszalin and their opinion about the area ‘the smart city’s commitment to working for the benefit of future generations’.

3. Results

The pilot study comprised a sample of 427 participants, with 225 individuals from Szczecin and 202 from Koszalin. In Szczecin, the gender distribution was 118 females and 107 males, while in Koszalin, there were 129 females and 73 males. This demographic breakdown enabled an analysis of opinions on smart city areas across various gender and regional contexts. The approach taken in the regional survey was designed to ensure that the sample accurately reflected the demographics of the West Pomeranian population. By employing rigorous sampling techniques, the study aimed to enhance the validity of its findings and ensure that the results are generalizable to the wider community. This methodological framework is critical for understanding the opinions of residents in this particular region (Bazarnik et al., 1992).

The Chi-square test is a statistical method used to determine whether there is a significant association between categorical variables. In this study, Chi-square tests were used to assess the relationships between the responses of residents in Szczecin and Koszalin regarding different smart city areas. The researchers wanted to understand how gender and location might influence opinions about smart city areas. The results are presented in Table 1 (Szczecin) and Table 2 (Koszalin).

Table 1.
Chi-Square test summary - Szczecin

Sample	Hypotheses	Chi-square test statistic	df	α	p-value	Observation	Decision
Szczecin (n = 225)	H ₀₁	11.04	4	0.05	0.026	p-value < α	Reject the null hypothesis
	H _{a1}						
	H ₀₂	5.12	4	0.05	0.275	p-value > α	Fail to reject the null hypothesis
	H _{a2}						
	H ₀₃	6.92	4	0.05	0.140	p-value > α	Fail to reject the null hypothesis
	H _{a3}						
	H ₀₄	1.86	4	0.05	0.762	p-value > α	Fail to reject the null hypothesis
	H _{a4}						

Source: Field survey 2021.

A Chi-square test of independence showed that there was no association between the gender of the residents of Szczecin and their opinion about the area ‘the intelligent city improves the quality of life of the residents according to their changing needs’ (m2), χ^2 (4, N = 225) = 5.12, $p > .05$. There was no association between the gender of the residents of Szczecin and their opinion about the area ‘the intelligent city uses data technologies to solve social problems’ (m3), χ^2 (4, N = 225) = 6.92, $p > .05$. There was no an association between the gender of the residents of Szczecin and their opinion about the area ‘the intelligent city works for future generations’ (m4), χ^2 (4, N = 225) = 1.86, $p > .05$. However, there is an association between the gender of residents of Szczecin and their opinion about the area ‘the intelligent city use of modern technologies’ (m1), χ^2 (4, N = 225) = 11.04, $p < .05$.

The next step was to analyze the results of the study for the city of Koszalin.

Table 2.
Chi-Square test summary - Koszalin

Sample	Hypotheses	Chi-square test statistic	df	α	p-value	Observation	Decision
Koszalin (n = 202)	H ₀₅	4.87	4	0.05	0.301	p-value > α	Fail to reject the null hypothesis
	H _{a5}						
	H ₀₆	8.51	4	0.05	0.075	p-value > α	Fail to reject the null hypothesis
	H _{a6}						
	H ₀₇	14.54	4	0.05	0.006	p-value < α	Reject the null hypothesis
	H _{a7}						
	H ₀₈	18.81	4	0.05	0.001	p-value < α	Reject the null hypothesis
	H _{a8}						

Source: Field survey 2021.

There is no association between the gender of residents of Koszalin and their opinion about the area 'the intelligent city use of modern technologies' (m1), $\chi^2(4, N = 202) = 4.87, p > .05$. There was no association between the gender of the residents of Koszalin and their opinion about the area 'the intelligent city improves the quality of life of the residents according to their changing needs' (m2), $\chi^2(4, N = 202) = 8.51, p > .05$. Nevertheless, there was an association between the gender of the residents of Koszalin and their opinion about the area 'the intelligent city uses data technologies to solve social problems' (m3), $\chi^2(4, N = 202) = 14.54, p < .05$. Finally, there was an association between the gender of residents of Koszalin and their opinion about the area 'the intelligent city works for future generations' (m4), $\chi^2(4, N = 202) = 18.81, p < .05$.

4. Discussion

The survey examined participants' opinions of smart cities by analyzing four key areas. Firstly, the integration of modern technologies (m1) was evaluated, with a particular focus on the extent to which these innovations contribute to the enhancement of urban living. The analysis reveals a statistically significant association in Szczecin between residents' gender and their opinions on the use of modern technologies within the intelligent city framework. This suggests that gender plays a crucial role in shaping residents' opinions on technological advancements. In contrast, no such association was found in Koszalin, where the Chi-square test result indicates that gender does not significantly impact residents' views on this aspect of the intelligent city. Thus, while gender influences opinions on technological integration in Szczecin, it appears to be a neutral factor in Koszalin. This discrepancy between the two cities may reflect varying socio-cultural contexts or levels of technological engagement among residents. Research by Aguirre-Urreta and Marakas supports the notion that gender differences in technology use may diminish over time, particularly as younger generations grow up in increasingly technology-pervasive environments (Aguirre-Urreta, Marakas, 2010). This indicates that while gender may influence technology perceptions in some contexts, it may not hold the same weight universally, as seen in the case of Koszalin. No relationship between gender and attitudes towards modern technology was also confirmed by research on mobile usage. No relationship between gender and attitudes towards modern technology was also confirmed by research on mobile usage (Fernando, Misiak-Kwit, 2023).

For the area assessing whether the smart city improves residents' quality of life according to their changing needs (m2), the Chi-square test of independence indicated no association between residents' gender and their opinions in both cities. These findings resonate with existing literature that emphasizes the multifaceted nature of smart city initiatives and their varying impacts on different demographic groups. Moreover, Lytras and Visvizi argue for

an interdisciplinary approach to smart city research, suggesting that understanding the diverse needs of residents is crucial for effective policy-making (Visvizi, Lytras, 2018). This perspective reinforces the notion that while individual characteristics, such as gender, may play a role in technology adoption, they do not necessarily dictate perceptions of quality-of-life improvements in the context of smart cities.

For the area assessing the smart city's capacity for analyzing, monitoring, and utilizing data to address social issues (m3), results differed between Szczecin and Koszalin regarding the association with residents' gender. In Szczecin, the Chi-square test showed no significant association between gender and residents' opinions on the smart city's use of data technologies for social problem-solving, indicating that gender does not impact these views. However, in Koszalin, there was a significant association between gender and opinions on this topic, suggesting that in Koszalin, gender plays a role in shaping perspectives on the smart city's application of data technologies to address social challenges. These findings are consistent with the literature on smart cities and public perceptions of technology. Rijshouwer et al. emphasize the importance of understanding public views on smart cities, noting that perceptions can be influenced by local socioeconomic contexts and how technology is integrated into governance (Rijshouwer et al., 2022). This aligns with the results from Koszalin, where gender differences may reflect deeper societal attitudes toward technology and governance. Furthermore, Istanbul and Abinowi highlight the necessity of effective information technology governance in smart city applications, suggesting that the success of such initiatives depends not only on technology but also on how well they are perceived and accepted by the community (Istanbul, Abinowi, 2019). This is particularly relevant in Koszalin, where gender appears to influence opinions on the smart city's data utilization, suggesting that governance structures may need to be more inclusive to address diverse perspectives.

In examining the smart city's commitment to benefiting future generations through sustainable urban planning (m4), the results varied between Szczecin and Koszalin in terms of gender influence on residents' opinions. In Szczecin, no association was found between gender and opinions on the smart city's use of data technologies for sustainable planning, indicating that gender does not impact residents' views in this area. This finding aligns with the notion that effective urban planning can create inclusive environments where both men and women feel equally represented and engaged in the planning process (Buyana, Shuaib, 2014). The participatory approach in urban planning, as highlighted by Buyana and Shuaib, emphasizes the importance of involving both genders as partners in shaping urban agendas, which can enhance community ownership and livability (Buyana, Shuaib, 2014). Conversely, in Koszalin, there was a significant association between gender and opinions on this topic, suggesting that in Koszalin, gender influences how residents perceive the smart city's dedication to sustainable practices for future generations. This aligns with the findings of Basbas et al., who argue that gender differences in mobility and urban experiences can influence how individuals perceive urban policies and initiatives (Basbas et al., 2023). In Koszalin,

the differing views may stem from local social dynamics that affect how men and women engage with urban planning processes. Rivera's research on grassroots movements in Medellín illustrates how women's perspectives can be marginalized in urban renewal projects, reinforcing the need for gender-sensitive approaches in urban planning (Rivera, 2020). Moreover, the importance of gender-sensitive planning is further supported by the work of Mela, who emphasizes that addressing safety and inclusivity in public spaces from a gender perspective is vital for enhancing the quality of urban life (Mela, Tousi, 2023). This suggests that in Koszalin, the differing opinions may reflect broader societal issues related to gender equity in urban environments. The findings underscore the necessity for urban planners to consider gender dynamics in their strategies to ensure that sustainable urban development benefits all residents equitably. In summary, the contrasting results from Szczecin and Koszalin highlight the complex interplay between gender and perceptions of sustainable urban planning.

5. Summary

The aim of the paper was to provide new insights into the opinions of women and men about selected smart city areas.

A comparison of the results from Szczecin and Koszalin reveals the presence of distinct patterns. The results from Szczecin showed a single significant association between the hypotheses, while those from Koszalin demonstrated two significant associations. This indicates that the perceptions of the smart city areas may diverge considerably between the two urban populations, reflecting the varying impacts of the implemented innovations and urban policies. The results underscore the necessity for bespoke strategies to address the distinctive requirements of residents in each city.

A limitation of this study is its reliance solely on respondents from these two cities Szczecin and Koszalin, which may restrict the generalizability of the findings to other regions. Due to its pilot nature, this study serves as an initial exploration of the issue. Future research could benefit from incorporating a broader range of locations, additional demographic variables, and a more comprehensive analysis of the relationship between gender and subjective perceptions of various aspects of smart cities.

The findings of this study provide valuable insights into how smart city areas are perceived by residents of both genders, offering practical guidance for city administrators in designing urban spaces that better account for the diverse needs of women and men. Such an approach can enhance the acceptance of innovative urban initiatives and overall satisfaction among residents of both genders. Incorporating a gender perspective into urban planning supports more inclusive and informed decision-making, contributing to the development of spaces that meet the needs of all residents, thereby strengthening social cohesion and promoting sustainable

development. This study offers an innovative perspective on the differentiated perceptions of smart cities by women and men, making a valuable contribution to the literature on urban space management from a gender-sensitive perspective and enhancing our understanding of the quality of life in urban settings.

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CITIZENS' ENGAGEMENT IN A SOCIAL VALUE CO-CREATION WITHIN A SMART CITY – AN EMPIRICAL STUDY

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Purpose: This paper aims to present citizens' opinion on the severity of existing social problems such as exclusion of individuals with disabilities, poverty or discrimination. Further, the relationship between citizens' engagement in solving social problems and their demographic factors such as gender, age and level of education is examined. Engagement was defined as the experience of solving local social problems and the willingness to be involved in solving them in the future.

Design/methodology/approach: The pilot survey was carried out in 2021 using the CATI, CAWI interview method on a random sample of 420 citizens in the West Pomeranian region in the Republic of Poland. The Chi-square test for independence was conducted.

Findings: A Chi-square test of independence showed that there was no significant association between gender, level of education, marital status and experience in solving social problems. However, χ^2 showed that there was a significant association between generation and experience in solving social problems. A Chi-square test of independence showed that there was no significant association between, gender, level of education, marital status, generation, and willingness to involve in solving social problems.

Research limitations/implications: The pilot study has several limitations. First, the study's regional focus limits the generalizability of its conclusions. Secondly, the small sample size constrains the statistical power and robustness of the results. Future research should consider a comparative approach across multiple regions, enabling the examination of how local contexts influence perceptions and involvement in social problem-solving.

Practical implications: Presented research results can lead to making sustainable decisions by policy-makers interested in social value co-creation with citizens in order to build a smart city for current and future generations.

Social implications: This paper indicates which social problems are considered as most severe by citizens and in solution of which they want to engage.

Originality/value: The added value of the paper is gained knowledge on citizen's commitment to social value co-creation.

Keywords: social value co-creation, smart city, sustainability, citizen, citizens engagement.

Category of the paper: Research paper.

1. Introduction

Social value co-creation and smart city development are significant and up-to-date research areas. Smart city is a complex issue and can be defined as a city that places people at the center of development, invests in human and social capital, wisely manages resources thinking about future generations, integrates modern information and communication technologies into city management and emphasizes joint planning and citizen participation (Angelidou, 2015; Trinidad et al., 2017). Although the smart city concept has been the subject of much research, there is still no verified universal definition. One reason for this is multifaceted nature of the phenomenon under study, in which researchers and practitioners from many different fields are interested (Masik, Sagan, Scott, 2021; Yigitcanlar, Dur, Dizdaroglu, 2015). Depending on the area, different definitions highlight the importance of different areas of smart city creation (Yigitcanlar, Dizdaroglu, 2015; Mitchell, 2007).

Assuming that the goal of a smart city is to promote sustainable development and improve the quality of life of citizens through ongoing initiatives supporting innovation, competitiveness and attractiveness of the city, it should be noted that designing smart city requires taking into consideration current and future needs of all citizens (Joss, 2015; Berner, Amos, Morse, 2011). Thus, citizens should not only benefit from being a part of a smart city, but also engage in co-creation of social values by solving society's most acute problems (Meijer, Rodriguez Bolivar, 2016; Yamashita, 2018; Prahalad, Ramaswamy, 2004). Within this paper, co-creation is defined as undertaking activities with various market participants to implement better solutions (Misiak-Kwit, Wiścicka-Fernando, Fernando, 2021; Abhari, Davidson, Xiao, 2019). Such civic participation is regarded as a key mechanism for reshaping governance to ensure it becomes more transparent and aligned with citizens' needs, particularly within the framework of smart cities (Gil-Garcia, Pardo, Nam, 2016; Bovaird, 2007). The collaborative process of guiding urban societies toward shared objectives should be emphasized, as public value is generated through the citizens engagement (Hossain, Markony, Ahamed, 2016; Bull, Dooley, Mazhar, 2019). According to the literature value is collaboratively generated through the involvement of various actors (Farguhar et al., 2024). While building social value and implementing social innovations, citizens contribute to the creation of material and immaterial things considered socially desirable (Abubakar, Jahwari, Bakheet, 2024; Hamidi, Gharneh, Khajeheian, 2020; Satar, 2024). Social values, in turn, can be considered as common values for the whole society and beliefs considered important in a given society and resulting from behavioral norms (Dixit, Moid, 2022; Pati, Sutter, Garud, 2024).

Firstly, this paper aims to present citizens' opinion on the severity of existing local social problems. The social issues evaluated in the study included disability-related challenges, violence, criminality, poverty, unemployment, addictions (such as alcoholism or drug dependency), social exclusion (such as lack of access to resources), discrimination (including

age, gender, ethnicity, and religion), and homelessness (Khan, 2021; Phills, Deiglmeier, Miller, 2008; Szluz, Bozacka, 2017). The second aim of this paper is to examine the relationship between citizens' engagement in solving local social problems and their demographic factors such as gender, age and level of education.

2. Methods

The anonymous survey was carried out in 2021 using the CATI, CAWI interview method on a random sample of 427 citizens in the West Pomeranian region in the Republic of Poland. In light of the fact that this is a regional survey, it can be posited that the sample is representative (Bazarnik, Grabiński, Kąciak, 1992). The research frame was the Flow Research Centre database. The data obtained represented both nominal and ratio scales. Chosen sampling technic was cluster sampling.

In order to ascertain whether there is a relationship between citizens' engagement and their demographic factors, eight Chi-square tests for independence were conducted. Engagement was defined as both, the experience in solving local social problems and the willingness to be involved in solving them in the future. It is presumed that through their engagement, residents co-create social values.

In order to achieve the aim of the paper, two research questions were posed: Is there a relationship between citizens' experiences in solving local social problems and their demographic factors? Is there a relationship between citizens' willingness to be involved in solving local social problems and their demographic factors? The study considered four demographic factors, namely gender, level of education, marital status and age, which was categorized according to generational cohort. For each demographic factor, null (H_0) and alternative hypotheses (H_1) were formulated to test the hypothesis that these factors are independent of residents' engagement in social problem-solving. The following research hypotheses were proposed.

Test I

H_0 : Gender and Experience in solving local social problems are independent.

H_1 : Gender and Experience in solving local social problems are not independent.

Test II

H_0 : Level of education and Experience in solving local social problems are independent.

H_1 : Level of education and Experience in solving local social problems are not independent.

Test III

H_0 : Marital status and Experience in solving local social problems are independent.

H_1 : Marital status and Experience in solving local social problems are not independent.

Test IV

H₀: Generation and Experience in solving local social problems are independent.

H₁: Generation and Experience in solving local social problems are not independent.

Test V

H₀: Gender and Willingness to be involved in solving local social problems are independent.

H₁: Gender and Willingness to be involved in solving local social problems are not independent.

Test VI

H₀: Level of education and Willingness to be involved in solving local social problems are independent.

H₁: Level of education and Willingness to be involved in solving local social problems are not independent.

Test VII

H₀: Marital status and Willingness to be involved in solving local social problems are independent.

H₁: Marital status and Willingness to be involved in solving local social problems are not independent.

Test VIII

H₀: Generation and Willingness to be involved in solving local social problems are independent.

H₁: Generation and Willingness to be involved in solving local social problems are not independent.

The research sample comprised 247 women (58%) and 180 men (42%). In terms of educational attainment, the majority of respondents had obtained a tertiary qualification (52%), or a secondary qualification (40%), with 6% having completed basic vocational education, 1% having completed lower secondary education, and 1% having completed primary education. The structure of residents by marital status was as follows - 26% were unmarried, 49% were formally married, 5% were divorced, 3% were widowed, and 17% were in a civil partnership. The survey sample by age was represented by 1% from the Silent Generation, 16% from the Baby Boomers, 31% from Generation X, 50% from Generation Y, and 2% from Generation Z.

3. Results

Figure 1 presents the findings of a survey that sought to ascertain residents' perceptions of the severity of various social issues in the West Pomeranian region. Participants were requested to assign a rating to the intensity of each issue on a scale from 0 to 100, with 0 indicating the absence of the problem and 100 representing a very serious problem. This data provides insights

into public perceptions of the social challenges facing West Pomeranian region, highlighting which issues are viewed as more or less significant by local residents.

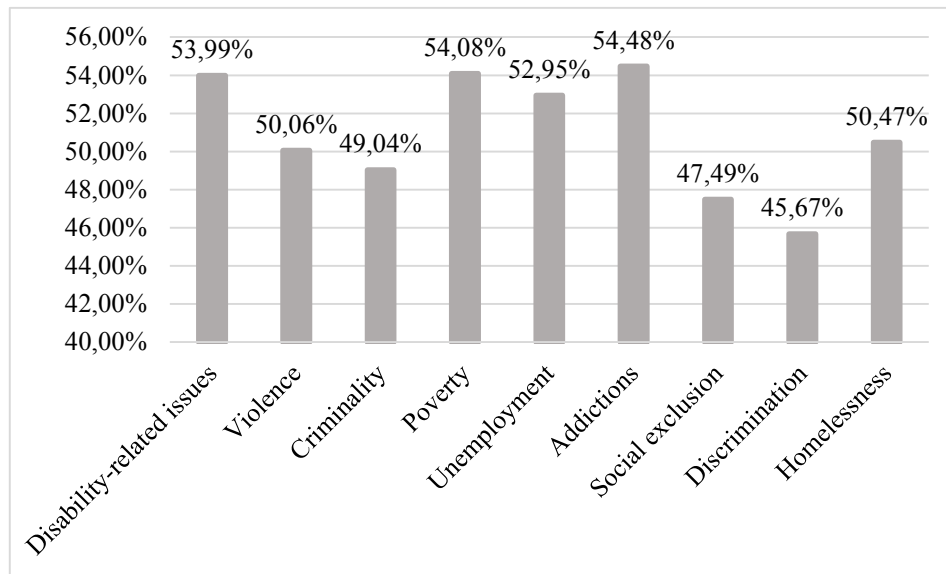


Figure 1. Severity of existing social problems.

Source: own study based on the survey.

The results indicate a moderate level of concern across all social issues, with perceptions of problem severity ranging from approximately 45% to 55%. The issue perceived to be the most significant was that of addiction, with a rating of 54,48%. This was followed closely by poverty (54,08%) and disability-related issues (53,99%). Additionally, unemployment was identified as a significant concern, with a rating of 52,95%. Other issues with ratings approaching the mean include homelessness (50,47%), violence (50,06%), and criminality (49,04%). Social exclusion and discrimination were rated slightly lower, at 47,49% and 45,67%, respectively, indicating that these are perceived as somewhat less severe in comparison to other issues. Overall, while all listed problems are perceived as present to a moderate extent, addictions, poverty, and disability-related issues are viewed as the most pressing concerns in the West Pomeranian region.

The following question was posed in order to ascertain the extent to which residents have engaged in addressing local social issues. Respondents were queried as to whether they had ever participated in initiatives or activities with the aim of solving local social problems. This question offers insight into the level of civic engagement within the region, particularly in the context of addressing social challenges at the community level. The results of the survey indicate that a minority of residents in the West Pomeranian region have participated in efforts to address local social issues. Indeed, only 19,91% of respondents reported experience in this area. This relatively low level of involvement suggests limited direct engagement with community-based social problem-solving initiatives among residents. Consequently, these findings may reflect either a lack of opportunities or motivations for civic participation in social issues within the region.

Furthermore, the findings of a survey investigating respondents' levels of engagement with addressing various social issues are presented (Figure 2). Participants were requested to indicate their level of engagement with specific social problems on a scale from 0 to 100, with 0 representing no involvement and 100 indicating a high level of involvement. The results provide an overview of the areas where residents have contributed efforts toward social problem-solving within their communities.

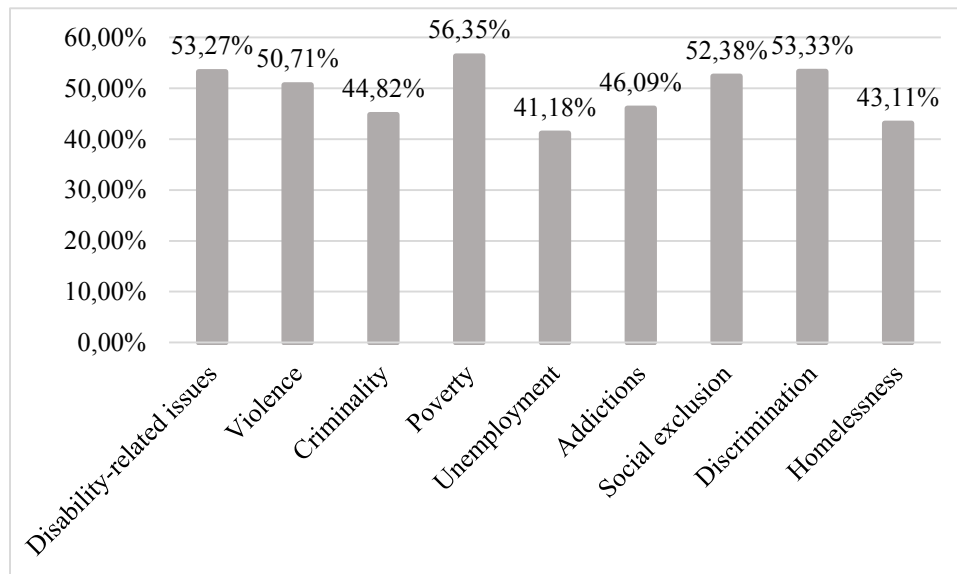


Figure 2. Experience in solving local social problems.

Source: own study based on the survey.

The findings demonstrate a range of degrees of involvement across the various social issues. The highest levels of reported engagement were observed in the areas of poverty (56,35%) and discrimination (53,33%), indicating that these issues were the focus of the most active participation from respondents. Additionally, relatively high levels of involvement were observed with regard to disability-related issues (53,27%) and social exclusion (52,38%). Moderate engagement was reported for violence (50,71%) and addictions (46,09%), indicating a notable but less intense focus on these areas. The lowest levels of engagement were reported for criminality (44,82%), homelessness (43,11%), and unemployment (41,18%). This indicates that respondents were less likely to have been involved in initiatives addressing these issues. Overall, the data highlight that poverty, discrimination, and disability-related issues are among the social problems where residents have been most actively engaged, while issues like unemployment and homelessness received comparatively lower levels of involvement.

Table 1 presents the findings of Chi-square tests conducted to investigate the relationship between citizens' experience in addressing local social issues and their demographic characteristics. The objective of the analysis is to ascertain whether there is a relationship between residents' experiences in addressing social issues and factors such as gender, level of education, marital status, and generation.

Table 1.*Summary of the Chi-square test of independence – Experience*

Test ID	Chi-square test Statistic	df	α	p-value	Observation	Decision
Test I Gender	0	1	0,05	1	p-value > α	Fail to reject the null hypothesis
Test II Level of education	6,43	4	0,05	0,17	p-value > α	Fail to reject the null hypothesis
Test III Marital status	3,49	4	0,05	0,48	p-value > α	Fail to reject the null hypothesis
Test IV Generation	12,08	4	0,05	0,017	p-value < α	To reject the null hypothesis

Source: own study based on the survey.

The results demonstrate that, with regard to the majority of demographic variables, no statistically significant relationship exists between experience in addressing local social issues and the aforementioned factors. Specifically, no statistically significant association was found between gender ($\chi^2 = 0$, $N = 427$, $df = 1$, $p > ,05$), level of education ($\chi^2 = 6,43$, $N = 427$, $df = 4$, $p > ,05$), marital status ($\chi^2 = 3,49$, $N = 427$, $df = 4$, $p > ,05$) and citizens' experience in solving local social problems. Therefore, the null hypotheses are not rejected, indicating that these factors are independent of experience in addressing social issues. Nevertheless, a notable association was identified between generation and experience in addressing social issues ($\chi^2 = 12,08$, $N = 427$, $df = 4$, $p < ,05$). This result leads to the rejection of the null hypothesis, indicating that generation is related to citizens' involvement in local social issues. In summary, while gender, education level, and marital status do not appear to influence social problem-solving engagement, generational differences do play a role, with varying levels of involvement across age groups.

It is therefore valuable to present data on the experience of citizens in solving social problems, categorized by generational cohort. Table 2 illustrates the number and percentage of individuals from each generation who reported involvement in local social issues, thereby offering insights into the relationship between generational identity and civic engagement. The generational groups are as follows: the Silent Generation (1928-1945), the Baby Boomers (1946-1964), Generation X (1965-1980), Generation Y (1981-1996), and Generation Z (1997-2012).

Table 2.*Generation and experience in solving local social problems*

Generation	Experience in solving local social problems			
	Yes		No	
Silent Generation	1	50%	1	50%
Baby Boomers	22	31,88%	47	68,12%
Generation X	23	23,71%	74	76,29%
Generation Y	30	15,31%	166	84,69%
Generation Z	9	14,29%	54	85,71%

Source: own study based on the survey.

The data reveal notable differences in engagement levels across generations. The Silent Generation has the highest percentage of involvement, with 50% (1 out of 2 respondents) indicating experience in addressing social issues, though the small sample size should be considered. Baby Boomers show a lower level of involvement, with 31,88% (22 out of 69) reporting experience in social problem-solving. Generation X follows with 23,71% (23 out of 97) engaged in such efforts. Generation Y shows even less engagement, with only 15,31% (30 out of 196) reporting experience in social issue resolution. Finally, Generation Z has the lowest level of involvement, with 14,29% (9 out of 63) having participated in solving local social problems. Overall, these results indicate a generational trend in which older cohorts, particularly the Silent Generation and Baby Boomers, demonstrate higher levels of civic engagement in social problem-solving, while younger generations, including Generation Y and Generation Z, report lower levels of involvement. This trend may reflect generational differences in attitudes toward community involvement or access to opportunities for civic engagement.

Given the level of commitment demonstrated by respondents, it is beneficial to compare these results with their stated intentions. Accordingly, the study investigates the interest of residents to engage in the resolution of local social issues within their community. The term 'interest' is employed to signify the degree to which a problem is regarded as significant and the extent to which activities pertaining to this problem are planned to be undertaken. The initial stage of the study involved the administration of a general question to ascertain the participants' general readiness to engage in the resolution of local social issues. These issues included the promotion of positive changes for vulnerable groups, such as the elderly, children, and impoverished individuals. As evidenced by the preliminary results, 37,7% of respondents indicated a willingness to engage in these community efforts. Subsequently, participants were asked to indicate their level of potential involvement across specific social issues, rating each on a scale from 0 to 100, where 0 indicated no willingness to engage and 100 represented a very strong willingness. The results are presented in Figure 3.

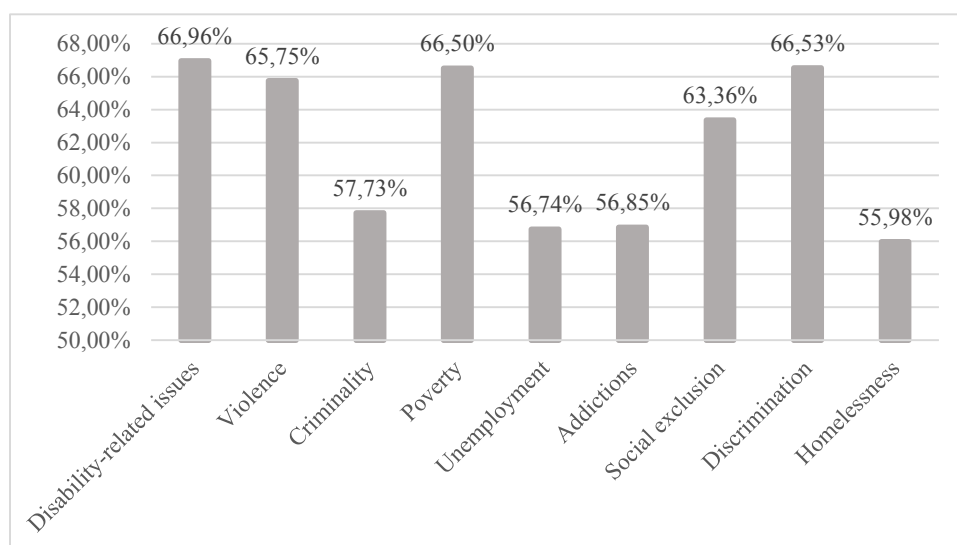


Figure 3. Willingness to be involved in solving local social problems.

Source: own study based on the survey.

The data reveal varied levels of willingness to engage in solving specific social issues. The highest willingness was shown for disability-related issues (66,96%), discrimination (66,53%), and poverty (66,50%), indicating a strong commitment among respondents to support these areas. Violence also received a high level of potential engagement (65,75%), suggesting that safety-related concerns are a priority for residents. Moderate willingness was reported for social exclusion (63,36%) and criminality (57,73%), demonstrating that respondents are relatively open to addressing these issues, though with slightly less intensity. Lower but notable levels of willingness were observed for addictions (56,85%), unemployment (56,74%), and homelessness (55,98%), indicating that while these issues are of interest, they may be perceived as requiring more specialized or complex solutions.

Overall, the results suggest that residents are most inclined to engage in areas affecting vulnerable populations directly, such as disability, discrimination, and poverty, while issues like unemployment and homelessness, although acknowledged, elicit slightly less readiness for involvement. This distribution reflects residents' prioritization of certain social problems within the community, with a greater emphasis on inclusivity and direct support for marginalized groups.

Table 3 summarizes the results of chi-square tests conducted to examine the relationship between citizens' willingness to engage in solving local social problems and their demographic characteristics.

Table 3.

Summary of the Chi-square test of independence – Willingness

Test ID	Chi-square test Statistic	df	α	p-value	Observation	Decision
Test I Gender	1,4	1	0,05	0,24	p-value > α	Fail to reject the null hypothesis
Test II Level of education	6,47	4	0,05	0,15	p-value > α	Fail to reject the null hypothesis
Test III Marital status	3,13	4	0,05	0,54	p-value > α	Fail to reject the null hypothesis
Test IV Generation	5,33	4	0,05	0,25	p-value > α	Fail to reject the null hypothesis

Source: own study based on the survey.

The Chi-square test of independence results show no statistically significant association between willingness to engage in social problem-solving and any of the demographic factors studied. Specifically, for gender ($\chi^2 = 1,4$, $N = 427$, $df = 1$, $p > ,05$), level of education ($\chi^2 = 6,74$, $N = 427$, $df = 4$, $p > ,05$), marital status ($\chi^2 = 3,13$, $N = 427$, $df = 4$, $p > ,05$), and generation ($\chi^2 = 5,33$, $N = 427$, $df = 4$, $p > ,05$), the p-values are all greater than the alpha level of 0,05. As a result, the null hypotheses cannot be rejected, indicating that each of these demographic factors is independent of the willingness to engage in solving local social problems. In summary, the analysis suggests that demographic characteristics such as gender, educational attainment, marital status, and generational cohort do not significantly influence residents' interest in engaging with social problem-solving efforts. This finding implies that

willingness to contribute to community-oriented social initiatives is distributed relatively evenly across different demographic groups in the population studied.

4. Discussion

The studies conducted in the West Pomeranian Voivodeship offer a comprehensive insight into the perceptions of social problems held by residents, their prior involvement in addressing these issues, and their willingness to participate in future solutions. The respondents generally perceived social issues such as poverty, disability-related challenges, discrimination, and homelessness as being of moderate severity, with scores ranging from 45% to 55%. Additionally, issues such as addiction and unemployment were also perceived as significant, though to a somewhat lesser extent.

These perceptions indicate that residents are aware of the existence of a range of social challenges within their community, with particular concern for vulnerable populations and economic stability. This aligns with previous studies that highlight the awareness of social challenges among urban populations in Poland, where similar sentiments regarding social issues have been documented. Kebza (2018) discusses the socio-economic dynamics in the West Pomeranian region, emphasizing the disparities that contribute to social challenges, which resonates with the findings of the current study regarding residents' perceptions of social problems.

The willingness to become involved in the resolution of local social issues was also examined. Notwithstanding the historically low levels of engagement, a greater proportion of residents (37,7%) indicated a willingness to participate in addressing local social issues. This interest was particularly strong in areas related to disability, poverty, and discrimination, with ratings above 65%. Lower, yet notable, willingness was also expressed for tackling homelessness and unemployment. These results indicate a latent potential for civic engagement, especially in areas affecting vulnerable groups, if opportunities and support mechanisms are put in place. This finding is consistent with broader trends observed in urban studies, where community engagement is often linked to the perceived severity of social issues. In the literature, the importance of community involvement in addressing socio-economic conditions is noted, suggesting that increased awareness can lead to greater civic participation (Bąk et al., 2021).

Upon examination of actual engagement, the results indicate relatively low involvement, with only 19,91% of respondents reporting experience in activities aimed at solving local social problems. This limited engagement suggests the existence of potential barriers to participation, such as a lack of access to initiatives, an insufficient level of support for civic involvement, or other social factors that may inhibit active community participation. Similarly, according to

research results from Canada, where the implementation of smart city initiatives in small, rural, and remote communities was discussed, the actual participation rates were low, indicating a need for more structured support systems to facilitate engagement (Spicer et al., 2019). They emphasize the importance of collaboration between municipalities to enhance control over the smart city development process and ensure that data is managed according to local needs. Moreover, the integration of technology in facilitating citizen engagement can serve as a bridge to overcome these barriers, fostering a more inclusive environment for participation (Bolivar, 2018).

The findings from the West Pomeranian Voivodeship serve to illustrate the potential for social value co-creation to be an integral element of smart city development. The concept of social value co-creation suggests that residents can collectively influence the development of solutions that address the needs of their communities, thereby creating value not only for themselves but also for the wider population (Zwick, 2023). In the context of smart cities, this engagement contributes to the creation of a dynamic and responsive urban environment that prioritizes inclusivity and addresses a range of social challenges, including poverty and discrimination.

The study revealed that residents were acutely aware of the gravity of local social issues and demonstrated a notable inclination to engage in efforts to address these challenges, particularly in domains affecting vulnerable communities, such as disability, poverty, and discrimination. This interest reflects a readiness to contribute to initiatives that align with the principles of social value co-creation, which suggests that residents view themselves as stakeholders in their community's well-being. However, the low actual engagement rate indicates that this potential remains largely untapped. This reflects a broader trend in urban studies where the potential for civic engagement is often underutilized due to systemic barriers. Fostering an inclusive environment that encourages participation is essential for the successful implementation of smart city initiatives (Baran et al., 2022).

It is of the utmost importance to bridge the gap between willingness and actual engagement if smart city development is to be effective (Preston et al., 2020). The concept of a smart city is not merely an advanced technological one; it is also grounded in principles of participatory governance and social inclusivity. In this context, the willingness of residents to engage represents a valuable, yet underutilized, resource for driving socially responsive urban development. The effectiveness of smart city initiatives can be significantly influenced by regulatory environments, with the important role of policy framework in facilitating citizen engagement (Pratama, 2018). By creating more accessible, visible, and supportive pathways for residents to participate in social problem-solving, municipalities could better harness this civic energy. This approach would align with the concept of a smart city as a collaborative ecosystem, where technological and social resources are mobilized to meet the needs of all citizens, both current and future.

5. Summary

A Chi-square test of independence showed that there was no significant association between gender, level of education, marital status and experience in solving social problems. However, χ^2 showed that there was a significant association between generation and experience in solving social problems. A Chi-square test of independence showed that there was no significant association between, gender, level of education, marital status, generation, and willingness to involve in solving social problems.

This study examines social problem perceptions, involvement, and interest in the West Pomeranian Voivodeship. It employs a comparative analysis to elucidate the relationships between these variables. These findings collectively indicate a discrepancy between the perceived gravity of social issues, actual involvement, and the expressed intention to engage in community initiatives. Although residents are aware of the existence and severity of social challenges, their low levels of past involvement are at odds with their stated interest in future engagement. This discrepancy suggests that, although residents are aware of social issues and are open to contributing to solutions, more targeted efforts are required to translate this willingness into action. Providing accessible engagement opportunities and addressing barriers to participation could help bridge this gap, enabling the community to more effectively address social problems in the West Pomeranian Voivodeship.

The added value is gained knowledge on citizen's commitment to social value co-creation. Problems, that are considered as most severe by citizens, are addictions, poverty, disability-related issues and unemployment. Among social problems that have highest engagement (analyzed as involvement and willingness to involve) are poverty, disability-related issues and discrimination. In contrast, least level of engagement was noted for homelessness, unemployment, addictions and criminality.

Thus, results can lead to making sustainable decisions by policy-makers interested in social value co-creation with citizens in order to build a smart city for current and future generations. The findings indicate a potential avenue for the West Pomeranian Voivodeship to cultivate a more engaged community through the implementation of initiatives that facilitate social value co-creation. Reinforcing the support for resident involvement in social problem-solving would not only address the current issues but also promote the development of a sustainable, inclusive smart city environment that is continuously responsive to the evolving needs of its population.

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SMART SPECIALISATIONS AS FACTORS OF INNOVATION DEVELOPMENT IN THE REGIONS OF EASTERN POLAND

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Purpose: The purpose of the article is to identify and to assess the essence of the concept of regional smart specializations in the context of innovation development, with particular emphasis on the regions of Eastern Poland. Additionally, it aims to highlight the role of EU funds in financing activities related to the creation of smart specializations in these regions.

Design/methodology/approach: In collecting empirical material for the article, the method of economic and general statistics was used. The time frame of the research covers the years 2014-2023. The justification for the research location lies in the significant innovation potential of the regions of Eastern Poland and the EU funds directed at improving their competitiveness and investment attractiveness. The question arises whether this has been successfully achieved.

Findings: The research showed that in all five voivodeships of Eastern Poland, regional smart specializations included issues related to improving innovation. The regions of Eastern Poland received more funding from EU funds and programs per capita compared to the national average. This is also confirmed by the absorption rate. However, the analyzed voivodeships still have the lowest GDP per capita in the country. Therefore, they should continue to invest in the development of technical and social infrastructure, as well as innovation in enterprises.

Originality/value: The article presents the utilization of EU financial resources supporting cohesion policy by the local governments of the voivodeships in Eastern Poland, as well as the effects of this support based on selected indicators, including the author's absorption indicator.

Keywords: smart specializations, innovations, regional development, EU funds, Eastern Poland.

Category of the paper: research paper.

1. Introduction

The priority of the EU's cohesion policy is to support development in a way that reduces developmental disparities between member states, their regions, and local communities, with the intended effect being an increase in regional and local economic competitiveness (Grzebyk et al., 2019, p. 9). New key elements of the reform of the EU's cohesion policy highlight the need to improve quality of life by supporting local and regional development,

with a particular emphasis on the role of entrepreneurship and smart specializations (Fiaschi et al., 2018, pp. 386-423; McCann, Ortega-Argilés, 2016, pp. 537-552). Smart specializations refer to identifying the unique characteristics and endogenous resources of each country or region, highlighting their competitive advantages, and focusing the attention of local partners on a future-oriented perspective for development (Kalinowski, Głodek, 2024, p. 464). Their goal is to strengthen regional innovation systems, to promote them, to facilitate knowledge transfer, and to capitalize on the regions' potential. In the economies of EU countries, smart specializations are a means of promoting regional innovation policy (Oleksiuk, 2015, p. 10). Regional smart specializations embody the idea of building the innovative capacities of regions and serve as a tool for creating a unique position on the international stage. They require complex and complementary actions, starting from identifying resources and technological advantages, assessing existing collaboration networks, and ending with selecting the most critical specializations and defining a comprehensive and individualized regional policy (Nowakowska, 2015, p. 316). The concept of smart specializations emerged as a response to challenges in designing innovation policy in the European context. It takes into account issues such as innovation systems, entrepreneurship development, and the problem of rising transaction costs. Regions should select areas where they have the most well-developed resources and concentrate their research and innovation efforts in those areas. This concept introduces the idea of diversifying regional policy based on the level of innovation capabilities (McCann, Ortega-Argilés, 2015, p. 1292). The new regional policy based on smart specializations offers an opportunity for the peripheral regions of Eastern Poland, which are characterized by a low level of socio-economic development not only compared to the rest of the country but also in relation to the entire European Union. These regions have a traditional economic structure and generally low levels of innovation (Dziemianowicz, Peszat, 2016, p. 281).

From the perspective of cohesion policy, smart specializations are extremely important. Securing and properly allocating European Union funds is fundamental to improving the competitiveness of peripheral and underdeveloped regions, such as the regions of Eastern Poland. In this context, it is justified to conduct research assessing the utilization of EU funds in these regions for financing the development of smart specializations related to innovation. Therefore, the aim of the article is to identify and assess the significance of regional smart specializations in the development of innovation in the regions of Eastern Poland, as well as to highlight the role of EU funds in financing activities related to their implementation.

2. Methods

The empirical material used in the research pertains to the five voivodeships of Eastern Poland, namely: lubelskie, podkarpackie, podlaskie, świętokrzyskie and warmińsko-mazurskie. The study employed the documentation method in order to compile and to compare empirical material and to explain the essence and specificity of smart specializations in the analyzed regions. Experts' opinions and financial reports from the Ministry of Funds and Regional Policy were used for this purpose. The study also applied the comparative analysis method, i.e. benchmarking, general statistical methods (including data from the Central Statistical Office in Warsaw), and descriptive methods.

The substantive scope of the article is both theoretical and empirical. It presents the issue of smart specializations from a theoretical perspective, including their essence and types, and identifies those that focus on innovation development.

The spatial scope of the study covers the regions of Eastern Poland, chosen due to their significant innovation potential and the EU funds directed at their development and the enhancement of their competitiveness, leveraging their investment attractiveness. The question arises whether this goal has been achieved.

The time frame focuses on the 2014-2020 programming period (including the n+3 rule, extending to 2023). However, due to the lack of statistical data from the Local Data Bank (BDL) of the Central Statistical Office (GUS), some issues are presented for the years 2014-2022.

To assess the use of EU funds by the regions of Eastern Poland in implementing cohesion policy in the area of smart specializations, the following indicators were applied:

- GDP per capita – to evaluate the level of regional development, as this is the key indicator considered by the European Commission in assessing the socio-economic situation of a region and determining the need for funding.
- Expenditure on innovation activities in enterprises per active working person (in PLN).
- Amount of EU funds per capita (in PLN).
- Expenditure on R&D activities per capita (in PLN).
- Average share of innovative enterprises in the total number of enterprises (as a percentage).
- Innovation index according to the Regional Innovation Scoreboard.
- Change dynamics indicators and the author's absorption index.

The article proposes an indirect measure for assessing the added value created by EU funds, namely the absorption index. This index shows the actual share of a given region in absorbing financial resources, reflecting the amount of support relative to the total funds allocated to the entire region. It indicates the local government's engagement in securing financial resources for initiatives aimed at improving the quality of life for residents, including efforts to mobilize endogenous human and natural resources, as well as infrastructure, social, and ecological

investments covered by regional smart specializations. The index values should exceed 1; if they fall below 1, this suggests that the region's absorption of funds is less than expected based on its potential, indicating underutilization of opportunities for improving the socio-economic situation as outlined in the smart specializations.

Research by Dziemianowicz and Peszat (2016, p. 289), conducted during the 2007-2013 programming period, suggests that in Eastern Poland, there is a strong likelihood that, in the near future, companies and clusters will emerge that have improved their innovation and competitiveness through EU financial support (Dziemianowicz, Peszat, 2016, p. 289). Therefore, this article aims to examine whether this outcome was achieved in the 2014-2020 programming period.

3. Results

All voivodeships have characterized their smart specializations using a list of elements from the Regional Smart Specializations (RIS). In the case of RIS for Eastern Poland, each of the five voivodeships has identified its own areas.¹ In the Lubelskie Voivodeship, five smart specializations were selected, including: high-quality food, green economy, healthy society, digital society, and materials technology, production processes, and logistics. The Podkarpackie Voivodeship has four smart specializations: aeronautics and space technology, information and communication technologies, quality of life, and automotive industry. The Podlaskie Voivodeship includes the following smart specializations: agricultural and food industry, metal and machinery industry, shipbuilding, medical sector, life sciences, and related sectors, particularly ICT and eco-innovation, as well as environmental sciences. In the Świętokrzyskie Voivodeship, four main smart specializations were identified, including: resource-efficient construction, metal and foundry industry, health and wellness tourism, modern agriculture and agri-food processing, as well as three horizontal areas covering: information and communication technologies (ICT), sustainable energy development, and the trade and congress industry. In Warmia and Mazury, three smart specializations were established: water economy, high-quality food, and wood and furniture manufacturing. For the purposes of this article, the area encompassing innovative activities across all regions of Eastern Poland has been highlighted (see Table 1).

¹ Ekspertyza MFIPR (2002): Analiza logiki interwencji programu Fundusze Europejskie dla Polski Wschodniej 2021-2027 w zakresie Celu Polityki 1 Bardziej konkurencyjna i inteligentna Europa, Policy & Action Group Uniconsult Sp. z o.o., Warszawa [Expert Analysis by MFIPR (2002): Analysis of the Intervention Logic of the European Funds for Eastern Poland 2021-2027 Program in the Scope of Policy Objective 1 - A More Competitive and Intelligent Europe, Policy & Action Group Uniconsult Ltd., Warsaw].

Table 1.

The most important regional smart specializations that align with the areas of innovative activities in the regions of Eastern Poland

Voivodeships	The most important features of innovative activity
Lubelskie	High-quality food innovative systems and software, smart methods and tools for managing and monitoring the production process, and assessing the quality of raw materials and finished products; developing tools and modern research techniques and food markers; innovative systems for agricultural and food applications. Healthy Society innovative systems for medical applications, medical robotics and simulation technologies, and IT tools for collecting and analyzing medical data. Digital society digitization of resources, cloud computing, smart telecommunication and information technology systems, e-shopping platforms, telemarketing, e-commerce, innovative products and technologies applied in education, culture, and sports, as well as technologies related to artificial intelligence, etc. Materials technologies, production processes, and logistics innovative load-bearing structures, innovative VR technologies for applications in production and construction processes, smart packaging enabling quality monitoring, smart warehouses, etc.
Podkarpackie	Aeronautics and space technology technologies for processing data acquired from spacecraft and their application in economic and social practices. Information and communication industry development, commercialization, and enhancement of solutions in the areas of artificial intelligence, machine learning, robotics, and digital security; activities related to ICT infrastructure; creation of new data centers; etc.
Podlaskie	Medical sector, life sciences, and related sectors, particularly ICT medical engineering technologies, biotechnology/bioinformatics, sensor technologies, as well as robotics and the Internet in medicine.
Świętokrzyskie	Resource-efficient construction the application of digital data and artificial intelligence algorithms, the use of control systems, monitoring, and visual technology for threat identification. Information and communication technologies the application of ICT technologies in all areas of life and production activities. Trade and congress industry modern communication methods in business, utilizing ICT technologies.
Warmińsko-mazurskie	1. Water economy: science and business environment institutions (BEI), universities, institutes, laboratories, etc. 2. High-quality food: science and business environment institutions (BEI), universities, institutes, laboratories, etc.

Source: MFiPR (2015). Common areas of smart specializations in the regions of Eastern Poland. Annex No. 5 to the Project Selection Regulations, Warszawa, pp. 13-15.

Research by Miś (2021) indicates that in the voivodeships of Eastern Poland, the total investment expenditures per capita and the GDP per capita index values from 2004 to 2020 did not exceed the national average. However, the amounts of contracts for EU funding per capita in the regions of Eastern Poland during the 2014-2020 period were higher than the national average. This is confirmed by the latest data from the Central Statistical Office (GUS) from July 2024, which encompasses the entire 2014-2020 programming period under the n+3 rule, covering the years 2014-2023 (see Table 2).

Table 2.

The value of EU co-financing agreements per capita under the Cohesion Policy for 2014-2023 (as of the end of 2023) and the absorption rate

Voivodeships	The value of EU co-financing agreements per capita		Absorption rate
	in PLN	in %	
Dolnośląskie	13 468.55	85.3	0.85
Kujawsko-pomorskie	13 894.09	87.9	0.88
Lubelskie	16 921.20	107.1	1.07
Lubuskie	13 495.83	85.4	0.85
Łódzkie	14 973.02	94.8	0.95
Małopolskie	13 670.26	86.5	0.85
Mazowieckie	13 290.07	84.1	0.87
Opolskie	14 217.17	90.0	0.82
Podkarpackie	15 098.21	95.6	0.90
Podlaskie	16 341.55	103.4	1.03
Pomorskie	13 897.90	88.0	0.88
Śląskie	12 924.66	81.8	0.82
Świętokrzyskie	15 394.92	97.4	0.97
Warmińsko-mazurskie	20 672.13	130.9	1.31
Wielkopolskie	10 612.49	67.2	0.68
Zachodniopomorskie	18 817.75	119.1	1.19
Eastern Poland	16 885.00	106.9	1.07
Poland	15 797.90	100.0	-

Source: own elaboration on the basis of the data from Statistics Poland in Warsaw (updated on 25.07.2024).

For the voivodeships of Eastern Poland, cohesion policy represents a unique opportunity for development, as its priorities in the financial perspective 2014-2020 were: smart development, sustainable development, and inclusive growth. Among the voivodeships in Eastern Poland, according to data from GUS in Warsaw (as of the end of 2023), the highest EU funding per capita was recorded in the Warmińsko-mazurskie Voivodeship, which was 39% higher than the national average, 22.4% higher than in all regions of Eastern Poland, and 94.8% higher than in the Śląskie Voivodeship (see Table 2). The article proposes an indirect measure for assessing the added value created by EU funds, known as the absorption index. This index illustrates the actual share of individual regions in Poland in absorbing financial resources, reflecting the amount of support relative to the total funds allocated to the region. The highest level of EU fund absorption occurred in the Warmińsko-mazurskie Voivodeship (see Table 2). It is important to note that this voivodeship recorded the highest amounts of funding per capita. This is a positive phenomenon, indicating that the authorities in this region are actively working to improve the quality of life for residents by undertaking initiatives related to investments funded under the cohesion policy. A high level of EU fund absorption is also observed in the Podlaskie Lubelskie and Zachodniopomorskie Voivodeships. Values of the index below 1 indicate that the absorption of funds to improve the socio-economic situation is lower than what the region's potential would suggest. The absorption index for the regions of Eastern Poland was greater than 1, which is a favorable sign indicating that Eastern Poland is effectively utilizing EU funding and the regions' potential by implementing projects within the framework of smart specializations. Among the regions of Eastern Poland, only two voivodeships, the Podkarpackie and Świętokrzyskie Voivodeships, obtained indices close to

but below 1, to be precise 0.90 and 0.97, respectively. The local authorities in those voivodeships should strengthen their efforts to secure funding for projects from EU funds in the current programming period 2021-2027. Considering the GDP per capita, it is evident that both in 2014 and 2022, the values for the country were higher than those for Eastern Poland (see Table 3). This indicates that despite Eastern Poland's two decades of receiving EU funding, the quality of life, as expressed by GDP per capita, falls short of the national average, even though the growth dynamics for all voivodeships in Eastern Poland were high. According to GUS data, in 2022, the GDP per capita in Eastern Poland was more than twice as low as the national average and that of the Mazowieckie Voivodeship. The lowest GDP per capita in both 2014 and 2022 was observed in the Podkarpackie Voivodeship, which is one of the regions in Eastern Poland.

Despite significant investments, substantial disparities still exist between countries and their regions. This imbalance is particularly visible within EU member states, where the gap between the least and most developed regions continues to widen (Świstak, 2018, p. 34), even with the utilization of EU funds.

In addition to GDP per capita, a very important indicator is the expenditure on innovative activities in enterprises per active person, which has more than doubled in Eastern Poland over the past eight years (see Table 3), while in the country as a whole, it has nearly tripled.

Table 3.

Expenditures on innovation activities in enterprises and Gross Domestic Product per capita in Eastern Poland compared to the national average from 2014 to 2022

Voivodeships	Expenditures on innovation activities in enterprises per 1 professionally active person (in PLN)			Gross Domestic Product per capita (in PLN)		
	2014	2022	Dynamics, year 2014 = 100	2014	2022	Dynamics, year 2014 = 100
Dolnośląskie	3 016	3 110	103.1	49 717	90 980	183.0
Kujawsko-pomorskie	1 466	1 319	90.0	36 232	66 547	183.7
Lubelskie	610	1 235	202.5	31 186	55 182	176.9
Lubuskie	656	827	126.1	37 644	66 313	176.2
Łódzkie	2 517	1 287	51.1	41 751	76 228	182.6
Małopolskie	1 562	3 582	229.3	39 568	72 004	182.0
Mazowieckie	4 500	8 090	179.8	71 125	127 791	179.7
Opolskie	682	1 107	162.3	36 182	64 383	177.9
Podkarpackie	2 841	2 850	100.3	31 576	55 125	174.6
Podlaskie	540	1 042	193.0	32 461	59 818	184.3
Pomorskie	1 957	3 287	168.0	42 346	81 149	191.6
Śląskie	2 078	2 864	137.8	46 167	85 131	184.4
Świętokrzyskie	404	492	121.8	32 613	56 507	173.3
Warmińsko-mazurskie	538	1 314	244.2	31 958	56 368	176.4
Wielkopolskie	2 204	2 250	102.1	47 679	85 867	180.1
Zachodniopomorskie	1 664	1 406	84.5	37 423	66 443	177.5
Eastern Poland	987	1 387	140.5	31 959	56 600	177.1
Poland	2 210	3 136	141.9	44 466	81 093	182.4

Source: own elaboration on the basis of the data from Statistics Poland in Warsaw (updated on 5.09.2024).

An important indicator in assessing issues related to innovation development within the framework of smart specializations is the amount of financial expenditure on R&D per capita. Data in Table 4 indicates that in 2022, these expenditures were highest in the Mazowieckie Voivodeship, being nearly 2.5 times higher than the national average and almost 5.5 times higher compared to the average for Eastern Poland. Analyzing R&D expenditures per capita among the voivodeships of Eastern Poland, it was noted that the lowest expenditures in 2022 occurred in the Świętokrzyskie Voivodeship. In the whole country, these expenditures in 2022 were five times higher than those in the Świętokrzyskie Voivodeship, while in the Mazowieckie Voivodeship, they were twelve times higher than in the Świętokrzyskie region. Another indicator considered for this article was the average share of innovative enterprises in the total number of enterprises. This share was, on average, lower in Eastern Poland compared to the national average (by 0.4% in 2014 and by 2.7% in 2022; see Table 4). Among the voivodeships of Eastern Poland, the lowest average share of innovative enterprises in the total number of enterprises in 2022 was recorded in the Warmińsko-mazurskie Voivodeship (20.9%), while the highest was in the Podkarpackie Voivodeship (39.0%). It is noteworthy that in the Podkarpackie region, this indicator reached its highest values in 2022 – 6.8% above the national average, 9.5% above the average for Eastern Poland, and 18.1% higher than in the Warmińsko-mazurskie region. This can be attributed to Rzeszów, the capital of Podkarpacie, being recognized as the capital of innovation, and to the fact that one of the significant smart specializations of Podkarpacie is aviation and aerospace, which has significantly influenced the development of enterprises in the Dworzysko zone around Jasionka airport, where many innovative enterprises with foreign capital and startups have emerged. The second smart specialization of Podkarpacie, the automotive industry, also invests in the development of innovative enterprises, along with other RIS sectors in Podkarpacie, such as ICT, which established an IT cluster, and quality of life, linked to the agri-food cluster and the production of high-quality food. This raises the question about the smart specializations in the Warmińsko-mazurskie region, which invest to a lesser extent in the development of innovative enterprises. Research by Słodowa-Helpa (2013) confirms that the driving force of economy of the Podkarpackie region is the Aviation Valley cluster, where there has been a concentration of aerospace industry firms, research centers, and educational and training facilities that stimulate economic development and improve regional innovation (Słodowa-Helpa, 2013, p. 101).

Table 4.

Expenditures on R&D activities per capita and the share of innovative enterprises in the total number of enterprises in Eastern Poland compared to the national average from 2014 to 2022

Voivodeships	Internal expenditures on R&D activities per capita (in PLN)			The average share of innovative enterprises in the total number of enterprises (in %)	
	2014	2022	Dynamics, year 2014 = 100	2014	2022
Dolnośląskie	367.9	1 348.8	366.6	16.3	37.6
Kujawsko-pomorskie	122.9	605.5	492.7	12.4	29.9
Lubelskie	321.0	648.4	202.0	19.4	25.4
Lubuskie	66.7	255.0	382.3	10.5	20.4
Łódzkie	280.5	791.0	282.0	13.5	24.3
Małopolskie	550.0	1 840.9	334.8	13.5	29.4
Mazowieckie	1 218.4	2 842.4	233.3	17.1	36.6
Opolskie	122.0	516.2	423.1	17.6	30.3
Podkarpackie	437.4	652.9	149.3	14.6	39.0
Podlaskie	195.6	496.8	254.0	14.7	33.1
Pomorskie	448.8	1 510.6	336.6	12.3	36.1
Śląskie	265.2	795.0	300.0	15.7	37.5
Świętokrzyskie	111.0	238.0	214.4	11.1	29.2
Warmińsko-mazurskie	87.3	577.6	661.6	10.9	20.9
Wielkopolskie	305.3	824.2	270.0	11.3	25.5
Zachodniopomorskie	104.7	456.9	436.4	14.1	29.9
Eastern Poland	230.5	522.7	226.8	14.1	29.5
Poland	420.1	1181.7	281.3	14.5	32.2

Source: own elaboration on the basis of the data from Statistics Poland in Warsaw (updated on 5.09.2024).

The final indicator considered for assessing the level of innovation in the regions of Eastern Poland is the innovation index (Table 5). Analyzing the data presented in Table 5, it was found that the innovation index for the regions of Eastern Poland is lower than the national average. Over four years, it increased by 18% for the regions of Eastern Poland and 27% for the country. A decline in the innovation index was noted for three voivodeships, including two that are part of Eastern Poland: Podkarpace and Świętokrzyskie.

Table 5.

Innovation in Polish regions based on the innovation index (EU = 100)

Voivodeships	Innovation index (UE = 100))		
	2019	2023	Dynamika, year 2019 = 100
Dolnośląskie	57,0	69,4	121,8
Kujawsko-pomorskie	46,0	55,6	120,9
Lubelskie	46,2	58,9	127,5
Lubuskie	41,0	46,1	112,4
Łódzkie	52,4	58,9	112,4
Małopolskie	70,1	80,2	114,5
Mazowieckie	47,0	37,2	79,1
Opolskie	41,2	47,3	114,8
Podkarpackie	58,3	56,7	97,3
Podlaskie	43,3	58,3	134,6
Pomorskie	57,7	66,8	115,8
Śląskie	51,4	57,7	112,3
Świętokrzyskie	46,1	45,2	98,0

Warmińsko-mazurskie	37,0	54,2	146,5
Wielkopolskie	53,0	56,3	106,2
Zachodniopomorskie	43,1	50,7	117,6
Eastern Poland	46,2	54,7	118,3
Poland	49,4	62,8	127,1

Source: Regional Innovation Scoreboard 2023.

Over the four-year period, the largest increase in the innovation index (nearly 50%) occurred in the Warmińsko-mazurskie Voivodeship. This indicates that the local government of the Warmińsko-mazurskie Voivodeship has made efforts to enhance the innovation of its region, which is a positive development.

4. Discussion

The foundation of the new regional policy has become the concept of smart specializations, whose main assumption is to build competitive advantages for regions and improve the efficiency of innovation processes in the EU. The value of this concept also lies in establishing sustainable regional cooperation networks (Dziemianowicz, Peszat, 2016, pp. 278, 279). Today, the competitiveness of regions, especially those facing developmental challenges, such as the regions of Eastern Poland, depends on the proper acquisition of funding from EU funds and programs (Grzebyk et al., 2019, p. 206). Smart specializations represent a new paradigm for building competitive advantage in regions. They also constitute a new way of shaping regional innovation policy aimed at eliminating existing barriers and uncertainties in building the innovative capacity of regions (Nowakowska, 2015, p. 310). The Entrepreneurial Discovery Process (EDP) is a central element of this new approach – a strategy for research and innovation towards smart specializations. Each Voivodeship in Poland prepares its own Regional Innovation Strategy, which outlines the opportunities and needs of the region.

Smart specializations in highly developed regions are more often based on innovative industries and on enhancing their competitiveness through increased innovation than in poorer regions with traditional industries. Local governments should play the role of active leaders, both in initiating new solutions and in fostering a culture of innovation within the region (Słodowa-Helpa, 2013, pp. 109, 114).

5. Summary

In conclusion, it should be noted that in all the regions of Eastern Poland, regional smart specializations encompassed issues related to improving the regions' innovation. A unique opportunity for implementing the objectives outlined in the regional smart specializations of

Eastern Poland is the EU funds and programs within the framework of cohesion policy aimed at enhancing the competitiveness and innovativeness of these regions. This is confirmed by the absorption rate, the average value of which for all regions of Eastern Poland has exceeded 1, indicating a very positive trend, which demonstrates that these regions have correctly identified the potential of their voivodeships for regional smart specializations and have effectively utilized the opportunities created by the programming period of 2014-2020. It is worth recalling that the five voivodeships in Eastern Poland had the lowest GDP per capita in the country in 2022, not exceeding 57 thousand PLN, while in the Mazowieckie voivodeship, this indicator was higher than 127 thousand PLN. The highest funding per capita, over 20% more than in other regions of Eastern Poland, as well as the highest absorption rate in the country, was recorded in the Warmińsko-mazurskie Voivodeship. For other indicators, including expenditures on innovation activities and R&D, the regions of Eastern Poland achieved values that were half lower than the national average. The average share of innovative enterprises in the total number of enterprises and the innovation index in the regions of Eastern Poland were also lower than the national average. Only in the case of funding from EU funds and programs per capita and the absorption rate did the analyzed regions achieve more favorable values compared to the national average. Therefore, it is essential to continue financially supporting the regions of Eastern Poland with EU funds and programs to enhance their innovativeness and competitiveness and to utilize the potential of these regions within the framework of regional smart specializations.

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AGE AND THE ASSESSMENT OF THE IMPACT OF SELECTED ORGANISATIONAL FACTORS ON THE ADOPTION OF INNOVATIONS

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Purpose: The purpose of this research was to determine the relationship between the age of the respondents and their perception of the impact of selected organisational factors in terms of adoption of innovation.

Design/methodology/approach: In the study a proprietary survey questionnaire was used. Factors were selected for the questionnaire based on literature research, desk research, opinions of panel participants (experts), and pilot studies conducted in IT companies.

Findings: The age of the respondents influenced their perception of the influence of multiple factors at different stages of the innovation process in terms of adoption, as well as their assessment of the shape of this influence. Younger people tended to perceive the influence of individual factors more frequently than older people. At the same time, younger people tended to attribute less influence on the adoption of innovations to individual factors than older age groups (there was often a trend of gradual increase in the above-mentioned evaluations with the age of the respondents).

Research limitations/implications: The research presented in this article has some limitations. Firstly, it was conducted only in Poland, secondly only in the IT sector, and thirdly, the age of the respondents was considered in the context of their perception of the influence of only selected factors related to internal and external communication and organisational culture on the adoption of innovation.

Practical implications: Demonstrate the approach of diverse age groups of IT employees to the adaptation of innovations in the context of the impact that communication and organisational culture have on the different stages of this process. This will be helpful in verifying which factors need to be improved to have a greater impact on respondents' perception of the topic at hand.

Social implications: The results of the research show that companies should focus on creating a coherent communication system, familiar to all participants in the organisation, which will be an integral part of the organisational culture. Then there is a chance that the trend presented in

the research will change and increasingly younger employees will recognise the significant impact of both communication and the culture on the adoption of innovations.

Originality/value: Determine the relationship between the age of the respondents and their perception of the influence of various factors related to communication (both internal and external) and organisational culture on the adoption of innovations.

Keywords: innovation, adoption of innovation, communication, organisational culture.

Category of the paper: Research paper.

1. Introduction

The current huge competition in the market is an extremely important determinant directing the activities of enterprises not only to the implementation of innovative solutions in key areas of their business but also related adaptation processes. Enterprises that can undertake such challenges can efficiently and effectively operate on it (Litwa, 2017). As M. Romanowska emphasises, "innovation-mature enterprises carry out multifaceted, systematic activities, focused on many aspects of the company's functioning, and innovation activities are an important element of their development and competition strategies and an important factor of financial success" (Romanowska, 2016, p. 30). Thus, the introduction of new technologies into the organisational setting, for example, is a very positive aspect (Kuzior, Arefiev, Poberezhna, 2023), considering, among other things, digital technologies that are helpful in creating new business processes (Łobejko, 2020).

Business innovation "defined, among other things, as the ability of an organisation to develop projects and to implement and disseminate innovations, is largely determined by inter-organisational relationships and networks of these relationships that form the relational potential of the organisation" (Zakrzewska-Bielawska, 2016, p. 4). According to E. Michalski, "it results from fierce competition on the market, continuous improvement of product quality, strong fluctuation of demand, needs, and preferences of buyers" (Michalski, 2014, p. 85). Innovation, in turn, is measured by the number of innovations implemented (Wojtowicz, Mikos, Karaś, 2018) as well as the benefits derived from them (Brzóska, Cierkosz, 2016).

Innovation (Baregheh, Rowley, Sambrook, 2009) can be defined as "an idea based on a new, valuable, and useful idea" (Dyduch, 2015, p. 19). They should also be equated with change (Altındağ, Köseadağı, 2015) or process or product improvement (Tohidi, Jabbari, 2012). They affect time, cost, and product savings (Kogabayev, Maziliauskas, 2017). Furthermore, innovations "mitigate climate change, support sustainable development, and promote social cohesion" (Gault, 2018, p. 617). A broad view of innovation implies creative changes that occur in technology, the social system, the economic structure, and even nature (Sopinska, Wachowiak, 2016). A narrow view of innovation, on the other hand, boils down to changes in manufacturing methods and products, based on new or hitherto unused knowledge (Sopińska,

Wachowiak, 2016). It should be noted at this point that the basis for the creation of any innovation process is intellectual capital (Sokolowski, 2018) while the development of innovations should take place through direct cooperation of enterprises with both scientific and research and development units (Blazlak, 2016; Szuper, 2021).

In the literature on the subject, their diverse division is apparent. It is worth noting here technological innovations (which can include product and process innovations) and nontechnological innovations (which include organisational and marketing innovations) (Mazur-Wierzbicka, 2015). S. Lachiewicz, in turn, when conducting a literature review, draws attention to "innovations in the sphere of workplace organisation, structural innovations and those concerning organisational relations with the environment" (Lachiewicz, 2014, p. 155). Open eco-innovations are also becoming extremely important (Siwiec et al., 2025).

When analysing the concept of innovation, one should not forget the key issue of its adaptation to the organisation, especially as this process is crucial for the survival of the company (van Oorschot, Hofman, Halman, 2018). Therefore, it is important to prepare for it well, also considering the "reluctance of employees to change" mentioned by J. Ober (Ober, 2022, p. 54). This can be overcome with an emphasis on building a stable and innovative organisational culture of which a coherent and extensive communication system will be an integral part. This is also pointed out by F. Mroczko, stating that "the importance of culture and pro-innovation climate is important, as these two categories determine the creative capabilities of an organisation" (Mroczko, 2016, p. 27).

Given these considerations, the aim of this research was to determine the relationship between the age of the respondents and their perception of the impact of various factors related to internal communication, external communication, and the company's organisational culture in terms of innovation adoption and to assess the shape of this impact.

2. Materials and Methods

The study used a proprietary questionnaire developed specifically for this work. The survey was conducted between January and June 2019. The present analysis assessed the relationship between the sociodemographic factor of the respondents' age and the respondents' perceptions of the influence of various factors related to internal communication, external communication, and the company's organisational culture in terms of innovation adoption, as well as their assessment of the shape of this influence. This was to verify whether the personal characteristic of the respondents, such as age, was relevant to their opinions on the influence of the factors mentioned above at different moments of innovation adoption.

When comparing the different age groups of the respondents in terms of perceived influence of individual factors on the adoption of innovations, the nonparametric Mann-Whitney U-test was used, and Glass's rank biserial correlation coefficient (r_g) was used as a measure of effect size, respectively. For comparisons of the groups in terms of assessing the shape of the effect of individual factors on innovation adoption, the nonparametric Spearman rank order correlation was used.

A total of 400 people participated in the survey, from 310 companies, including 72 women ($M_{Age} = 32.02$; $SD_{Age} = 9.83$) and 328 men ($M_{Age} = 29.28$; $SD_{Age} = 9.86$). The significant male predominance is related to the characteristics of the IT industry in Poland, where more men than women are employed, especially in the case of programmer positions. The survey questionnaire was distributed by email, in the form of separate links to complete the survey for each company, through the *interankiety.pl* programme.

In estimating the minimum sample size, the sample size formula for qualitative characteristics (with a finite sample) was applied (Mynarski, 2000):

$$n = \frac{p(p-1)}{\frac{E^2}{t_\alpha^2} + \frac{p(p-1)}{N}}$$

where:

p – the size of the estimated fraction with the distinguished feature,

E – the permissible maximum error of the estimate of proportion p ,

N – the size of the general population,

t_α – number of standard deviations to be read from the normal distribution table for the confidence level $1 - \alpha$ (Mynarski, 2000).

Thus, the minimum sample size was estimated to be 300 companies and 383 employees.

3. Results and Discussion

3.1. Age and perceptions of the impact of individual factors related to internal communication on the adoption of innovations

The impact of training and meetings on improving internal communication at the initiation stage of an innovation in terms of its subsequent adoption was perceived by the majority of respondents in each age group; however, when analysing the percentage distributions of such cases, it can be observed that among younger age groups in total, the above-mentioned impact was perceived more frequently (18-24 years: 90.17%; 25-34 years: 77.88%) than among older ones (45-54 years: 62.50%; over 54 years: 90.00%). These differences were shown to be statistically significant, as shown by analysis with the Mann-Whitney U-test, $Z = -3.64$;

$p < 0.001$; $r_g = -0.27$. There were no significant differences between the aforementioned groups in terms of perceiving the influence of the aforementioned factor at the following two stages.

Perception of the impact of good employee relations at the innovation initiation stage in terms of subsequent adoption was also collectively more prevalent among younger age groups (18-24 years: 92.49%; 25-34 years: 72.57%) compared to older ones (45-54 years: 50.00%; over 54 years: 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -6.1$; $p < 0.001$; $r_g = -0.42$. For the two subsequent stages of the innovation process, there were no differences between groups in assessing the impact of the factor.

The situation was analogous to another factor related to internal communication, i.e. improving internal communication by adapting its tools. The influence of the aforementioned factor at the innovation initiation stage in terms of its subsequent adoption was perceived by the majority of respondents in each group. However, taking into account the exact percentage distributions of such cases, it can be observed that among the younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 93.06%; 25-34 years: 75.22%) than among the older age groups (45-54 years: 54.17%; over 54 years: 80.00%). As shown by the analysis of the Mann-Whitney U-test, these differences are statistically significant, $Z = -5.42$; $p < 0.001$; $r_g = -0.40$. There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

On the other hand, perceiving the influence of the factor of providing access to information at any stage of the innovation process (i.e. the innovation initiation stage, the stage of deciding to adopt the innovation, and the innovation implementation stage) did not differ, as the Mann-Whitney U-test analysis showed, statistically significantly between the different age groups of respondents. The vast majority of respondents or all of the above groups perceived the influence of the above factor at each stage.

There were also no differences between the age groups of the respondents in terms of the perceived impact of ensuring a rapid flow of information at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of respondents or all of the age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis showed no statistically significant intergroup differences in this respect.

In addition, analysis using the Mann-Whitney U-test showed no statistically significant differences between the age groups of respondents in terms of perceiving the impact of obtaining the necessary information at any of the stages of the innovation process (i.e. the innovation initiation stage, the innovation adoption decision stage, and the innovation implementation stage) in terms of subsequent adoption. An overwhelming majority of respondents in the above groups or all perceived the impact of the above factor at each stage.

On the contrary, perceiving the impact of knowledge sharing within a team or organisation at the innovation initiation stage in terms of subsequent adoption was more common among younger age groups (18-24 years: 95.38%; 25-34 years: 76.11%) compared to older ones (45-54 years: 70.83%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -5.19$; $p < 0.001$; $r_g = -0.40$. For the next two stages of the innovation process, there were no differences between groups in the assessment of the impact of the factor mentioned above (Table 1).

Table 1.

Relationship between respondents' age and perceived impact of knowledge sharing within a team or organisation on the adoption of an innovation at different stages of its introduction

Knowledge sharing within the team/ organisation		Age										Mann-Whitney U-test	Glass's r _g
		18-24 years (n = 173)		25-34 years (n = 113)		35-44 years (n = 80)		45-54 years (n = 24)		Over 54 years old (n = 10)			
		n	%	n	%	n	%	n	%	n	%		
Innovation initiation stage	Yes	165	95,38%	86	76,11%	53	66,25%	17	70,83%	10	100,00%	Z = -5,19; p < 0,001	-0,40
	Not	8	4,62%	27	23,89%	27	33,75%	7	29,17%	0	0,00%		
Stage of decision to adopt innovations	Yes	169	97,69%	108	95,58%	79	98,75%	23	95,83%	10	100,00%	Z = 0,01; p = 0,996	0,00
	Not	4	2,31%	5	4,42%	1	1,25%	1	4,17%	0	0,00%		
Innovation implement ation phase	Yes	171	98,84%	111	98,23%	80	100,00%	24	100,00%	10	100,00%	Z = 0,73; p = 0,481	0,21
	Not	2	1,16%	2	1,77%	0	0,00%	0	0,00%	0	0,00%		

The vast majority or all of the respondents perceived obtaining a large amount of information at each stage of the innovation process in terms of influencing adoption, regardless of age. Analysis with the Mann-Whitney U-test did not show statistically significant differences between groups in this respect at any stage of innovation introduction.

Also, perceiving the influence of the factor of clear and effective communication of information at any stage of the innovation process (i.e. the stage of innovation initiation, the stage of decision to adopt the innovation and the stage of innovation implementation) did not differ, as the Mann-Whitney U-test analysis showed, statistically significantly between the different age groups of respondents. The vast majority of respondents or all of the above groups perceived the influence of the above factor at each stage.

However, the majority of respondents from each age group perceived the impact of superior communication skills at the innovation initiation stage in terms of subsequent adoption. However, when analysing the percentage distributions of the aforementioned cases, it can be noted that among the younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 91.91%; 25-34 years: 75.22%) than among the older age groups (45-54 years: 66.67%; over 54 years: 90.00%). These differences were shown to be statistically significant, as shown by analysis with the Mann-Whitney U-test, $Z = -4.3$; $p < 0.001$; $r_g = -0.32$.

There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

The same was true for the communication skills of the other employees of the company, where the majority of the respondents perceived the influence of the aforementioned factor in the innovation initiation stage in terms of its subsequent adoption. However, taking into account the exact percentage distributions of such cases, it can be observed that among younger age groups in total, the influence mentioned above was perceived slightly less frequently (18-24 years: 88.44%; 25-34 years: 73.45%) than among older ones (45-54 years: 62.50%; over 54 years: 100.00%). As the analysis with the Mann-Whitney U-test showed, these differences are statistically significant, $Z = -3.58$; $p < 0.001$; $r_g = -0.25$. For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the aforementioned factor.

Furthermore, perceiving the impact of the flattening of the organisational structure at the innovation initiation stage in terms of subsequent adoption was more common among younger age groups (18-24 years: 96.53%; 25-34 years: 75.22%) compared to older ones (45-54 years: 58.33%; over 54 years: 90.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -5.33$; $p < 0.001$; $r_g = -0.42$. For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the above-mentioned factor.

3.2. Age and perceived impact of individual external communication factors on the adoption of innovations

The age groups surveyed differed in their perceptions of the impact of shaping and maintaining a good corporate image at each stage of the innovation process in terms of adoption. When analysing the share of people perceiving the above-mentioned influence in individual age groups, it can be noted that among younger age groups, the influence of the above-mentioned factor was perceived more frequently, compared to older ones, both at the stage of innovation initiation (the innovation initiation stage) and at the stage of innovation adoption stage. The analysis of the proportion of people perceiving the above-mentioned impact by age group shows that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the stage of initiating an innovation (groups aged up to 34: 88.44% and 65.49%, groups aged 45 and over: 50.00% and 100.00%) and at the stage of implementing an innovation (groups aged up to 34: 89.60% and 69.03%, groups aged 45 and over: 54.17% and 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: $Z = -4.88$; $p < 0.001$; $r_g = -0.32$; Innovation adoption decision stage: $Z = -4.99$; $p < 0.001$; $r_g = -0.33$; Innovation implementation stage: $Z = -4.82$; $p < 0.001$; $r_g = -0.33$) (Table 2).

Table 2.

Relationship between the age of the respondents and the perception of the impact of shaping and maintaining a good corporate image on the adoption of innovations at different stages of their introduction

Shaping and maintaining a good corporate image		Age										Mann-Whitney U-test	Glass's r _g
		18-24 years (n = 173)		25-34 years (n = 113)		35-44 years (n = 80)		45-54 years (n = 24)		Over 54 years old (n = 10)			
		n	%	n	%	n	%	n	%	n	%		
Innovation initiation stage	Yes	153	88,44%	74	65,49%	49	61,25%	12	50,00%	10	100,00%	Z = -4,88; p < 0,001	-0,32
	Not	20	11,56%	39	34,51%	31	38,75%	12	50,00%	0	0,00%		
Stage of decision to adopt innovations	Yes	154	89,02%	76	67,26%	49	61,25%	12	50,00%	10	100,00%	Z = -4,99; p < 0,001	-0,33
	Not	19	10,98%	37	32,74%	31	38,75%	12	50,00%	0	0,00%		
Innovation implementation stage	Yes	155	89,60%	78	69,03%	50	62,50%	13	54,17%	10	100,00%	Z = -4,82; p < 0,001	-0,33
	Not	18	10,40%	35	30,97%	30	37,50%	11	45,83%	0	0,00%		

There were also differences between the age groups in terms of perceiving the impact of information on the company's mission and achievements presented to customers and suppliers at each stage of the innovation process in terms of adoption. In terms of the proportion of people perceiving the above-mentioned impact by age group, it can be noted that the younger age groups were more likely to perceive the impact of the above-mentioned factor compared to the older ones, both at the stage of the innovation process and at the stage of its adoption. In terms of the proportion of people perceiving the above-mentioned impact by age group, it can be noted that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the innovation initiation stage (groups up to 34 years of age: 89.60% and 65.49%, groups aged 45 and over: 50.00% and 80.00%) and at the innovation implementation stage (groups up to 34 years of age: 90.17% and 65.50%, groups aged 45 and over: 50.00% and 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: Z = -4.95; p < 0.001; r_g = -0.33; Innovation adoption decision stage: Z = -5.43; p < 0.001; r_g = -0.37; Innovation implementation stage: Z = -5.09; p < 0.001; r_g = -0.34)

Furthermore, perceiving the impact of a good relationship between company and/or service representatives and customers at the stage of the decision to adopt an innovation in terms of subsequent adoption was less frequent overall among younger age groups (18-24 years: 91.33%; 25-34 years: 95.58%) compared to older ones (45-54 years: 91.67%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, Z = 1.99; p < 0.05; r_g = 0.25. For the other stages of the innovation process, there were no differences between groups in the assessment of the impact of the factor mentioned above.

In contrast, there were no differences between the age groups of respondents in terms of perceiving the impact of identifying customers' requirements and needs for products and services at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of respondents or all of the age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis showed no statistically significant intergroup differences in this respect.

Furthermore, perceiving the influence of the factor of analysing and interpreting public opinion about the company and its products or services at any stage of the innovation process (i.e. the innovation initiation stage, the stage of deciding to adopt the innovation, and the stage of implementing the innovation) did not differ - as shown by the Mann-Whitney U-test analysis - statistically significantly between the different age groups of respondents. The overwhelming majority of respondents from the above groups perceived the influence of the above factor at each stage.

3.3. Age and perceived impact of individual organisational culture factors on innovation adoption

Analysis using the Mann-Whitney U-test revealed statistically significant differences between the age groups of respondents in terms of perceived giving employees the opportunity to question existing solutions at the innovation implementation stage with a view to their subsequent adoption. It turned out that among younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 95.38%; 25-34 years: 99.12%) compared to older age groups (45-54 years: 100.00%; over 54 years: 100.00%), and these differences are statistically significant, $Z = 2.08$; $p < 0.05$; $r_g = 0.39$. For the first two stages of the innovation implementation process, there were no differences between groups in the assessment of the influence of the factor mentioned above (Table 3).

Table 3.

Relationship between age of the respondents and perceived impact of giving employees the opportunity to challenge existing solutions on adoption of innovation at different stages of its introduction

Giving employees the opportunity to challenge existing arrangements		Age										Mann-Whitney U-test	Glass's r _g
		18-24 years (n = 173)		25-34 years (n = 113)		35-44 years (n = 80)		45-54 years (n = 24)		Over 54 years old (n = 10)			
		n	%	n	%	n	%	n	%	n	%		
Innovation initiation stage	Yes	169	97,69%	110	97,35%	80	100,00%	23	95,83%	10	100,00%	Z = 0,58; p = 0,569	0,12
	Not	4	2,31%	3	2,65%	0	0,00%	1	4,17%	0	0,00%		
Stage of decision to adopt innovations	Yes	167	96,53%	109	96,46%	80	100,00%	24	100,00%	10	100,00%	Z = 1,56; p = 0,12	0,29
	Not	6	3,47%	4	3,54%	0	0,00%	0	0,00%	0	0,00%		
Innovation implement ation phase	Yes	165	95,38%	112	99,12%	79	98,75%	24	100,00%	10	100,00%	Z = 2,08; p < 0,05	0,39
	Not	8	4,62%	1	0,88%	1	1,25%	0	0,00%	0	0,00%		

Differences were also observed between age groups in terms of perceiving the impact of ergonomics of the workplace, this time at each stage of the innovation process in terms of adoption. When analysing the share of people perceiving the above-mentioned impact in individual age groups, it can be noted that among younger age groups, the impact of the above-mentioned factor was perceived more frequently than among older ones, both at the stage of innovation initiation (groups of one or two) and at the stage of innovation adoption. The analysis of the proportion of people perceiving the above-mentioned impact by age group shows that younger age groups were more likely to perceive the impact of the above-mentioned factor compared to older age groups, both at the innovation initiation stage (groups under 34: 87.86% and 63.72%, groups aged 45 and over: 50.00% and 80.00%) and at the innovation implementation stage (groups under 34: 89.60% and 64.60%, groups aged 45 and over: 50.00% and 80.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (innovation initiation stage: $Z = -5.14$; $p < 0.001$; $r_g = -0.34$; Innovation adoption decision stage: $Z = -4.9$; $p < 0.001$; $r_g = -0.32$; Innovation implementation stage: $Z = -5.29$; $p < 0.001$; $r_g = -0.35$).

Perception of the impact of the company's creation of favourable conditions for the development of employees' competencies at the innovation initiation stage in terms of subsequent adoption was slightly less common among younger age groups (18-24 years: 95.38%; 25-34 years: 87.61%) compared to older age groups (45-54 years: 83.33%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -3.29$; $p < 0.001$; $r_g = -0.31$. For the next two stages of the innovation process, there were no intergroup differences in the assessment of the impact of the above-mentioned factor.

Analysis using the Mann-Whitney U-test also revealed statistically significant differences between the age groups of the respondents in terms of perceived autonomy provision to employees at the innovation initiation stage in terms of subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 94.22%; 25-34 years: 81.42%) compared to the older ones (45-54 years: 79.17%; over 54 years: 100.00%), and these differences are statistically significant, $Z = -3.61$; $p < 0.001$; $r_g = -0.30$. For the two subsequent stages of the innovation process, there were no differences between groups in the assessment of the influence of the factor mentioned above.

The age groups studied differed in terms of perceiving the influence of a sense of shared ownership and control over one's own work at the innovation initiation stage in terms of adoption. Analysing the proportion of people perceiving the influence mentioned above in the different age groups, it can be seen that the younger age groups were more likely to perceive the influence of the mentioned factor (18-24 years: 94.80%; 25-34 years: 80.53%) compared to the older ones (45-54 years: 66.67%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -4.48$; $p < 0.001$;

$r_g = -0.36$. For the next two stages of the innovation process, there were no differences between groups in the assessment of the impact of the aforementioned factor.

An analogous situation was in the case of encouraging employees to continue learning. The influence of the aforementioned factor at the innovation initiation stage in terms of subsequent adoption was perceived by most or all respondents in each group. However, taking into account the exact percentage distributions of such cases, it can be observed that among younger age groups in total, the influence mentioned above was perceived more frequently (18-24 years: 95.95%; 25-34 years: 82.30%) than among older age groups (45-54 years: 66.67%; over 54 years: 100.00%). As shown by analysis with the Mann-Whitney U-test, these differences are statistically significant, $Z = -4.32$; $p < 0.001$; $r_g = -0.37$. There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the following two stages.

In contrast, perceiving the influence of the factor of freedom to experiment and take risks at work at any stage of the innovation process (i.e., the innovation initiation stage, the stage of deciding to adopt an innovation, and the innovation implementation stage) did not differ - as the Mann-Whitney U-test analysis showed - statistically significantly between the different age groups of respondents. The overwhelming majority of the respondents from the above groups or all perceived the influence of the above factor at each stage.

However, the analysis of the Mann-Whitney U-test showed statistically significant differences between the age groups of the respondents in terms of perceived knowledge exchange between different company departments at the initial stage of innovation in terms of subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 95.95%; 25-34 years: 78.76%) compared to the older ones (45-54 years: 66.67%; over 54 years: 100.00%), and these differences are statistically significant, $Z = -4.94$; $p < 0.001$; $r_g = -0.40$. In the case of the two subsequent stages of the innovation process, no differences between groups were observed in the evaluation of the influence of the aforementioned factor.

Perception of the impact of a shared commitment towards the implementation of a specific project was also slightly less frequent at the innovation initiation stage in terms of subsequent adoption among younger age groups (18-24 years: 92.49%; 25-34 years: 69.03%) compared to older age groups (45-54 years: 62.50%; over 54 years: 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant, $Z = -5.07$; $p < 0.001$; $r_g = -0.36$. For the next two stages of the innovation process, there were no differences between groups in assessing the impact of the factor mentioned above.

The age groups surveyed also differed in their perceptions of the impact of managers' promotion of the values of dialogue, collaboration, and partnership at the innovation initiation stage in terms of adoption. Analysing the proportion of those perceiving the above-mentioned influence by age group, it can be seen that among younger age groups, the influence of the above-mentioned factor was slightly more frequently perceived (18-24 years: 92.49%;

25-34 years: 75.22%) compared to older age groups (45-54 years: 70.83%; over 54 years: 90.00%). Analysis by Mann-Whitney U-test showed that these differences were statistically significant, $Z = -4.85$; $p < 0.001$; $r_g = -0.35$. There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor in the following two stages.

Differences were also observed between age groups in terms of the perceived impact of encouraging employees to discuss the ideas of others at the first stage of innovation initiation in terms of adoption. As can be inferred from the percentage distribution of those perceiving the above-mentioned influence by age group, the younger age groups were more likely to perceive the influence of the above-mentioned factor (18-24 years: 98.28%; 25-34 years: 84.07%) compared to older age groups (45-54 years: 75.00%; over 54 years: 100.00%). As shown by analysis with the Mann-Whitney U-test, these differences are statistically significant, $Z = -5.07$; $p < 0.001$; $r_g = -0.46$. There were no significant differences between the aforementioned groups in terms of perceived influence of the aforementioned factor at the next two stages.

Analysis with the Mann-Whitney U-test also showed statistically significant differences between the age groups of the respondents in terms of perceiving regular brainstorming at the implementation stage of an innovation in terms of its subsequent adoption. It turned out that among the younger age groups, the influence mentioned above was perceived less frequently (18-24 years: 97.11%; 25-34 years: 87.61%) compared to the older ones (45-54 years: 70.83%; over 54 years: 100.00%), and these differences are statistically significant, $Z = -4.12$; $p < 0.001$; $r_g = -0.40$. For the two earlier stages of the innovation implementation process, there were no differences between groups in the assessment of the influence of the factor mentioned above.

However, there were no differences between the age groups of the respondents in terms of perceived impact of openness to new solutions and flexibility in solving problems at any stage of the innovation process in terms of subsequent adoption. An overwhelming majority of the respondents or all age groups perceived the above-mentioned impact. The Mann-Whitney U-test analysis did not show statistically significant differences between groups in this respect.

In contrast, perceiving the influence of mutual trust within a team or organisation at the initiation stage of an innovation in terms of its subsequent adoption was more common among younger age groups (18-24 years: 93.64%; 25-34 years: 72.57%) compared to older age groups (45-54 years: 54.17%; over 54 years: 90.00%). Analysis with the Mann-Whitney U-test showed that these differences are statistically significant, $Z = -5.62$; $p < 0.001$; $r_g = -0.40$. There were no significant differences between the aforementioned groups in terms of perceived impact of the aforementioned factor at the next two stages.

Furthermore, differences were observed between age groups in terms of perceiving the impact of appropriate appreciation and motivation of employees, this time at each stage of the innovation process in terms of adoption. When analysing the share of those perceiving the above-mentioned influence in the different age groups, it can be noted that among the younger

age groups, the influence of the above-mentioned factor was perceived slightly less frequently compared to the older ones, both at the innovation initiation stage and at the innovation adoption stage. When analysing the share of people perceiving the above-mentioned influence by age group, it can be noted that among younger age groups, the influence of the above-mentioned factor was perceived slightly less frequently than among older ones, both at the stage of initiating the innovation (groups aged up to 34: 95.38% and 98.23%, groups aged 45 and over: 100.00% and 100.00%) and at the stage of implementing the innovation (groups aged up to 34: 94.80% and 98.23%, groups aged 45 and over: 100.00% and 100.00%). Analysis with the Mann-Whitney U-test showed that these differences were statistically significant (Innovation initiation stage: $Z = 2.35$; $p < 0.05$; $r_g = 0.44$; Innovation adoption decision stage: $Z = 2.73$; $p < 0.01$; $r_g = 0.43$; Innovation implementation stage: $Z = 2.44$; $p < 0.01$; $r_g = -0.45$).

3.4. Age and shape assessment of the influence of individual factors related to internal communication on the adoption of innovations

The evaluation of the shape of the impact of training and meetings on improving internal communication at the innovation adoption decision stage and the implementation stage in terms of innovation adoption was significantly related to the age of the respondents. It turned out that the older the respondents, the greater the influence they attributed to the above mentioned factor, both at the stage of the decision to adopt the innovation (18-24 years: $M = 3.75$; $SD = 0.88$; older than 54 years: $M = 4.5$; $SD = 0.76$) and its implementation (18-24 years: $M = 3.9$; $SD = 0.93$; older than 54 years: $M = 4.33$; $SD = 0.71$). These correlations proved to be statistically significant (stage of decision to adopt the innovation: $R = 0.15$; $t(N-2) = 2.85$; $p < 0.01$; implementation stage: $R = 0.12$; $t(N-2) = 2.24$; $p < 0.05$). There was no significant relationship between age and impact shape rating of the factor mentioned above in the innovation initiation stage.

There was also a relationship between the age of the respondents and their assessment of the shape of the impact of good employee relations at the two stages of the innovation process in terms of subsequent adoption. In the case of the stage of the decision to adopt the innovation, it can be noted that the impacts ratings of the aforementioned factor increased with age, but there was no simple trend here. The youngest age groups (18-24 years: $M = 4$; $SD = 0.8$ and 25-34 years: $M = 3.93$; $SD = 0.86$) attributed the lowest impact to the aforementioned factor; a slightly higher impact was observed in the two older age groups (35-44 years: $M = 4.15$; $SD = 0.72$ and 45-54 years: $M = 4.1$; $SD = 0.91$), while the oldest age group, viz. over 54 years of age, rated the influence of the aforementioned factor as the highest ($M = 4.75$; $SD = 0.46$). On the other hand, in the stage of innovation implementation, there was a simple tendency for ratings of the influence of the above factor to increase with the age of the respondents (18-24 years: $M = 4.09$; $SD = 0.79$; older than 54 years: $M = 4.67$; $SD = 0.5$). These correlations were found to be statistically significant (stage of decision to adopt the innovation: $R = 0.1$; $t(N-2) = 1.96$; $p < 0.05$; implementation stage: $R = 0.13$; $t(N-2) = 2.62$; $p < 0.01$). In the case of

the first stage of the innovation process, there was no significant relationship between age and the evaluation of the shape of the impact of the above-mentioned factor.

Age was also important in terms of assessing the impact of improving internal communication by adapting its tools at the stage of the decision to adopt an innovation and the stage of implementation in terms of adoption. The older the respondents, the greater the impact they attributed to the above-mentioned factor (with a slight deviation in the 45-54-year group), both at the decision-making stage of innovation adoption (18-24 years: $M = 3.87$; $SD = 0.83$; over 54 years: $M = 4.63$; $SD = 0.52$) and at the implementation stage (18-24 years: $M = 3.94$; $SD = 0.87$; over 54 years: $M = 4.75$; $SD = 0.46$). These correlations were found to be statistically significant (stage of decision to adopt the innovation: $R = 0.13$; $t(N-2) = 2.6$; $p < 0.01$; implementation stage: $R = 0.15$; $t(N-2) = 2.84$; $p < 0.01$). There was no significant relationship between age and the assessment of the shape of the impact of the aforementioned factor at the initiation stage of innovation (Table 4).

Table 4.

Relationship between the age of the respondents and the shape rating of the impact of improving internal communication by adapting its tools on the adoption of innovations at different stages of its introduction

Improving internal communication by adapting its tools	Age	Descriptive statistics						Spearman rank order correlation
		Mean ± Standard deviation	Median [Q25 - Q75]	Min. - Max.	Confidence interval		Stand error.	
					-95%	+95%		
Innovation initiation stage	18-24 years (n = 161)	3,96 ± 0,79	4 [4 - 4]	1 - 5	3,83	4,08	0,06	R = -0,01; t(N-2) = -0.21; p = 0,837
	25-34 years (n = 85)	3,79 ± 0,77	4 [3 - 4]	2 - 5	3,62	3,95	0,08	
	35-44 years (n = 55)	3,93 ± 0,81	4 [3 - 5]	2 - 5	3,71	4,15	0,11	
	45-54 years (n = 13)	4 ± 0,71	4 [4 - 4]	3 - 5	3,57	4,43	0,20	
	Over 54 years old (n = 8)	4,5 ± 0,53	4,5 [4 - 5]	4 - 5	4,05	4,95	0,19	
Stage of decision to adopt innovations	18-24 years (n = 163)	3,87 ± 0,83	4 [3 - 4]	1 - 5	3,74	4,00	0,07	R = 0,13; t(N-2) = 2.6; p < 0,01
	25-34 years (n = 108)	3,97 ± 0,81	4 [4 - 5]	1 - 5	3,82	4,13	0,08	
	35-44 years (n = 76)	4,08 ± 0,93	4 [3 - 5]	1 - 5	3,87	4,29	0,11	
	45-54 years (n = 20)	4,05 ± 0,83	4 [4 - 5]	2 - 5	3,66	4,44	0,18	
	Over 54 years old (n = 8)	4,63 ± 0,52	5 [4 - 5]	4 - 5	4,19	5,06	0,18	

Cont. table 4.

Innovation Implementation Stage	18-24 years (n = 163)	3,94 ± 0,87	4 [3 - 5]	1 - 5	3,80	4,07	0,07	R = 0,15; t(N-2) = 2.84; p < 0,01
	25-34 years (n = 109)	4 ± 0,85	4 [4 - 5]	2 - 5	3,84	4,16	0,08	
	35-44 years (n = 76)	4,21 ± 0,81	4 [4 - 5]	3 - 5	4,03	4,39	0,09	
	45-54 years (n = 20)	4,15 ± 0,99	4 [4 - 5]	2 - 5	3,69	4,61	0,22	
	Over 54 years of age (n = 8)	4,75 ± 0,46	5 [4,5 - 5]	4 - 5	4,36	5,14	0,16	

There was also a relationship between the age of the respondents and their assessment of the shape of the impact of providing access to information at each stage of the innovation process in terms of adoption. At the innovation initiation stage, it appeared that the older the respondents were, the greater the influence they attributed to the above-mentioned factor (18-24 years: $M = 3.78$; $SD = 1.06$; over 54 years: $M = 4.4$; $SD = 0.97$). In the case of the stage of the decision to adopt the innovation, there was a gradual increase in the influence ratings of the above factor with age among respondents aged up to 54 years (18-24 years: $M = 3.67$; $SD = 0.98$; 45-54 years: $M = 4.33$; $SD = 0.97$). On the contrary, at the innovation implementation stage, those up to 34 years of age attributed less influence to the above mentioned factor (18-24 years: $M = 3.72$; $SD = 0.98$ and 25-34 years: $M = 3.89$; $SD = 1.14$) than those older than them (from $M = 4$; $SD = 1.05$ in the group over 54 years to $M = 4.14$; $SD = 1.02$ in the group 35-44 years). The correlations were found to be statistically significant (innovation initiation stage: $R = 0.13$; $t(N-2) = 2.63$; $p < 0.01$; innovation adoption decision stage: $R = 0.18$; $t(N-2) = 3.52$; $p < 0.001$; implementation stage: $R = 0.16$; $t(N-2) = 3.27$; $p < 0.01$).

Assessments of the shape of the impact of ensuring a rapid flow of information at each stage of the innovation process in terms of innovation adoption were significantly related to the age of the respondents. In the case of the innovation initiation stage, it can be seen that the impact rating of the aforementioned factor increased with age, but there was no simple trend here. The youngest age group, i.e. 18-24 years ($M = 4.09$; $SD = 0.83$), attributed the lowest impact to the aforementioned factor, while a slightly higher impact was observed in the two older age groups (25-34 years: $M = 4.33$; $SD = 0.91$ and 35-44 years: $M = 4.24$; $SD = 0.9$), while the two oldest age groups rated the impact of the aforementioned factor highest (45-54 years: $M = 4.67$; $SD = 0.66$ and older than 54 years: $M = 4.5$; $SD = 0.53$). In contrast, in the next two stages, the older the respondents were, the greater the influence they attributed to the aforementioned factor (with a slight deviation in the 35-44-year group at the stage of the decision to adopt the innovation), both at the stage of the decision to adopt the innovation (18-24 years: $M = 4.13$; $SD = 0.83$; over 54 years: $M = 4.7$; $SD = 0.48$) and its implementation (18-24 years: $M = 4.25$; $SD = 0.79$; over 54 years: $M = 4.7$; $SD = 0.48$). These correlations were found to be statistically significant (innovation initiation stage: $R = 0.18$; $t(N-2) = 3.5$; $p < 0.001$; innovation adoption

decision stage: $R = 0.17$; $t(N-2) = 3.36$; $p < 0.001$; implementation stage: $R = 0.14$; $t(N-2) = 2.83$; $p < 0.01$).

Age was also important in terms of assessing the impact of obtaining the necessary information at each stage of the innovation process in terms of adoption. It turned out that the older the respondents were, the greater the impact they attributed to the above-mentioned factor (with a slight deviation in the 35-44 age group at the innovation implementation stage), both at the innovation initiation stage (18-24 years: $M = 4.09$; $SD = 0.92$; over 54 years: $M = 4.7$; $SD = 0.48$), and the decision to adopt it (18-24 years: $M = 4.15$; $SD = 0.83$; over 54 years: $M = 4.9$; $SD = 0.32$), and its implementation (18-24 years: $M = 4.11$; $SD = 0.92$; over 54 years: $M = 4.8$; $SD = 0.42$). The correlations were statistically significant (innovation initiation stage: $R = 0.17$; $t(N-2) = 3.46$; $p < 0.001$; innovation adoption decision stage: $R = 0.18$; $t(N-2) = 3.64$; $p < 0.001$; implementation stage: $R = 0.21$; $t(N-2) = 4.22$; $p < 0.001$).

However, there was no relationship between age and the shape of the impact of knowledge sharing within the team or the organisation at particular stages of innovation introduction on its adoption. Ratings of the impact of the aforementioned factor were at a similar level between age groups and the correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

There was a correlation between age and shape rating of the impact of obtaining a lot of information at each stage of the innovation process in terms of adoption. Among those aged up to 54 years, less and less influence was attributed to the factor mentioned above with increasing age. This was true both at the stage of initiating the innovation (18-24 years: $M = 3.68$; $SD = 1.19$; 45-54 years: $M = 2.87$; $SD = 1.29$), deciding to adopt it (18-24 years: $M = 3.78$; $SD = 1.05$; 45-54 years: $M = 2.91$; $SD = 1.15$) and implementing it (18-24 years: $M = 3.8$; $SD = 1.07$; 45-54 years: $M = 2.54$; $SD = 1.25$). The oldest age group (more than 54 years) attributed more influence to the above-mentioned factor for each of the above-mentioned stages than all other groups. These correlations were found to be statistically significant (innovation initiation stage: $R = -0.19$; $t(N-2) = -3.76$; $p < 0.001$; innovation adoption decision stage: $R = -0.23$; $t(N-2) = -4.63$; $p < 0.001$; implementation stage: $R = -0.25$; $t(N-2) = -5.02$; $p < 0.001$).

The assessment of the shape of the impact of clear and effective communication at each stage of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. In the case of the innovation initiation stage, the youngest people (18-24 years) attributed less influence to the above-mentioned factor ($M = 4.24$; $SD = 0.82$) compared to the older age groups (from $M = 4.4$; $SD = 0.7$ in the group above 54 years to $M = 4.48$; $SD = 0.67$ in the group 45-54 years). At the next stage, among those aged up to 54 years, an increasing influence was attributed to the aforementioned factor with increasing age (18-24 years: $M = 4.28$; $SD = 0.78$; 45-54 years: $M = 4.67$; $SD = 0.64$). In contrast, at the final stage of innovation, the older the respondents were, the more influence they attributed to the aforementioned factor (with a slight deviation in the 35-44 years group) (18-24 years:

M = 4.32; SD = 0.81; over 54 years: M = 4.6; SD = 0.52). These correlations were found to be statistically significant (innovation initiation stage: $R = 0.1$; $t(N-2) = 1.98$; $p < 0.05$; innovation adoption decision stage: $R = 0.1$; $t(N-2) = 2.07$; $p < 0.05$; implementation stage: $R = 0.11$; $t(N-2) = 2.16$; $p < 0.05$).

In contrast, supervisors' communication skills were similarly rated in terms of their impact on innovation adoption at each stage of the innovation process, regardless of age. Correlations between the aforementioned ratings at each stage (i.e. the innovation initiation stage, the innovation adoption decision stage and the innovation implementation stage) and age were found to be statistically insignificant.

There was also no correlation between age and shape rating of impact of communication skills of other employees of the company in different stages of adoption of innovation. Ratings of the impact of the aforementioned factor were at a similar level across age groups, and correlations between the aforementioned factors were not statistically significant at any stage of the innovation process.

In contrast, the evaluation of the shape of the impact of the flattening of the organisational structure at the two stages of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. Among those up to 54 years old, as age increased, more influence was attributed to the factor mentioned above at the stage of the decision to adopt the innovation (18-24 years: M = 3.56; SD = 1.01; 45-54 years: M = 4.63; SD = 0.65) and at the stage of its implementation (18-24 years: M = 3.59; SD = 1.04; 45-54 years: M = 4.58; SD = 0.83). These correlations were found to be statistically significant (innovation adoption decision stage: $R = 0.25$; $t(N-2) = 5.1$; $p < 0.001$; innovation implementation stage: $R = 0.2$; $t(N-2) = 4.12$; $p < 0.001$). There was no correlation between age and the assessment of the shape of the impact of the aforementioned factor in the innovation initiation stage.

3.5. Age and shape assessment of the influence of individual external communication factors on the adoption of innovations

Shaping and maintaining a good corporate image was rated similarly across age groups in terms of its impact on innovation adoption at each stage of the innovation process. Correlations between the aforementioned ratings at individual stages (i.e. innovation initiation stage, innovation adoption decision stage, and innovation implementation stage) and age proved to be statistically insignificant.

The impact of information about the company's mission and achievements presented to customers and suppliers was also rated similarly across age groups for each stage of the innovation process. There was no statistically significant relationship between the above variables at any stage.

In contrast, the assessment of the shape of the influence of good relations between company and/or service representatives and customers at each stage of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those up to 54 years old, with increasing age, an increasing influence was attributed to the above-mentioned factor in the innovation initiation stage (18-24 years: $M = 4.02$; $SD = 0.85$; 45-54 years: $M = 4.38$; $SD = 1.07$) and the stage of the decision to adopt the innovation (18-24 years: $M = 4.1$; $SD = 0.81$; 45-54 years: $M = 4.41$; $SD = 0.7$). On the contrary, at the final stage of innovation adoption, the youngest (18-24 years) attributed less influence to the aforementioned factor ($M = 4.09$; $SD = 0.84$) compared to the older age groups (from $M = 4.29$; $SD = 0.89$ in the 35-44 year group to $M = 4.5$; $SD = 0.8$ in the 45-54 year group). The correlations were found to be statistically significant (innovation initiation stage: $R = 0.17$; $t(N-2) = 3.28$; $p < 0.01$; innovation adoption decision stage: $R = 0.15$; $t(N-2) = 2.89$; $p < 0.01$; implementation stage: $R = 0.15$; $t(N-2) = 2.86$; $p < 0.01$) (Table 5).

Table 5.

Relationship between the age of the respondents and their assessment of the shape of the impact of good relations between company and/or service representatives and customers on the adoption of innovations at different stages of their introduction

Good relations between company and/or service representatives and customers	Age	Descriptive statistics						Spearman rank order correlation
		Mean ± Standard deviation	Median [Q25 - Q75]	Min. - Max.	Confidence interval		Stand error.	
					-95%	+95%		
Innovation initiation stage	18-24 years (n = 158)	4,02 ± 0,85	4 [3 - 5]	1 - 5	3,89	4,15	0,07	R = 0,17; t(N-2) = 3.28; p < 0,01
	25-34 years (n = 110)	4,25 ± 0,92	4 [4 - 5]	1 - 5	4,07	4,42	0,09	
	35-44 years (n = 77)	4,26 ± 0,94	5 [3 - 5]	1 - 5	4,05	4,47	0,11	
	45-54 years (n = 21)	4,38 ± 1,07	5 [4 - 5]	1 - 5	3,89	4,87	0,23	
	Over 54 years old (n = 10)	4,3 ± 0,67	4 [4 - 5]	3 - 5	3,82	4,78	0,21	
Stage of decision to adopt innovations	18-24 years (n = 158)	4,1 ± 0,81	4 [4 - 5]	1 - 5	3,97	4,23	0,06	R = 0,15; t(N-2) = 2.89; p < 0,01
	25-34 years (n = 108)	4,25 ± 0,87	4 [4 - 5]	1 - 5	4,08	4,42	0,08	
	35-44 years (n = 79)	4,32 ± 0,87	5 [4 - 5]	2 - 5	4,12	4,51	0,10	
	45-54 years (n = 22)	4,41 ± 0,85	5 [4 - 5]	2 - 5	4,03	4,79	0,18	
	Over 54 years old (n = 10)	4,4 ± 0,7	4,5 [4 - 5]	3 - 5	3,90	4,90	0,22	

Cont. table 5.

Innovation implementation phase	18-24 years (n = 159)	4,09 ± 0,84	4 [4 - 5]	1 - 5	3,96	4,22	0,07	R = 0,15; t(N-2) = 2.86; p < 0,01
	25-34 years (n = 108)	4,3 ± 0,82	4,5 [4 - 5]	2 - 5	4,14	4,45	0,08	
	35-44 years (n = 79)	4,29 ± 0,89	5 [4 - 5]	2 - 5	4,09	4,49	0,10	
	45-54 years (n = 22)	4,5 ± 0,8	5 [4 - 5]	3 - 5	4,14	4,86	0,17	
	Over 54 years old (n = 10)	4,3 ± 0,67	4 [4 - 5]	3 - 5	3,82	4,78	0,21	

Age was also important in terms of assessing the impact of identifying customers' requirements and needs for products and services at the two stages of the innovation process in terms of adoption. It turned out that the older the respondents were, the more influence they attributed to the above-mentioned factor, at the stage of the decision to adopt the innovation (18-24 years: M = 4.12; SD = 0.88; above 54 years: M = 4.5; SD = 0.71) and its implementation (18-24 years: M = 4.02; SD = 0.89; above 54 years: M = 4.6; SD = 0.7) (with a slight deviation in the 35-44 years group at the last stage). The correlations were statistically significant (stage of decision to adopt the innovation: R = 0.15; t(N-2) = 2.96; p < 0.01; implementation stage: R = 0.17; t(N-2) = 3.45; p < 0.001). For the innovation initiation stage, there was no significant relationship between the above variables.

There was also a relationship between the age of the respondents and the evaluation of the shape of the impact of the analysis and the interpretation of public opinion about the company and its products or services at the stage of the decision to adopt the innovation in the context of its subsequent adoption. The youngest subjects (18-24 years) attributed less influence to the factor mentioned above (M = 3.89; SD = 0.86) compared to the older age groups (from M = 4; SD = 0.87 in the 54-year-old group to M = 4.11; SD = 0.97 in the 35-44-year group), and this correlation was statistically significant, R = 0.11; t(N-2) = 2.11; p < 0.05. For the other two stages, there was no significant association of the assessment of the impact of the aforementioned factor with the age of the subjects.

3.6. Age versus shape assessment of the impact of individual organisational culture factors on innovation adoption

Assessing the shape of the impact of giving employees the opportunity to question existing solutions in the two stages of the innovation process in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those up to 54 years of age, as they grew older, more and more influence was attributed to the above-mentioned factor in the innovation initiation stage (18-24 years: M = 3.73; SD = 1.13; 45-54 years: M = 4.17; SD = 1.34). In contrast, at the final stage of innovation initiation, the older the respondents were, the less influence they attributed to the aforementioned factor (18-24 years: M = 3.61; SD = 1.09; over 54 years: M = 2.9; SD = 1.45). These correlations were shown to be

statistically significant (innovation initiation stage: $R = 0.16$; $t(N-2) = 3.11$; $p < 0.01$; implementation stage: $R = -0.2$; $t(N-2) = -3.93$; $p < 0.001$). There was no statistically significant relationship between the aforementioned variables for the innovation adoption decision stage (Table 6).

Table 6.

Relationship between the age of the respondents and the shape rating of the impact of giving employees the opportunity to question existing solutions on the adoption of innovation at different stages of its introduction

Giving employees the opportunity to challenge existing arrangements	Age	Descriptive statistics						Spearman rank-order correlation
		Mean ± Standard deviation	Median [Q25 - Q75]	Min. - Max.	Confidence interval		Stand error.	
					-95%	+95%		
Innovation initiation stage	18-24 years (n = 169)	3,73 ± 1,13	4 [3 - 5]	1 - 5	3,56	3,91	0,09	R = 0,16; t(N-2) = 3.11; p < 0,01
	25-34 years (n = 110)	3,96 ± 1,24	4 [3 - 5]	1 - 5	3,73	4,20	0,12	
	35-44 years (n = 80)	4,08 ± 1,11	4,5 [3 - 5]	1 - 5	3,83	4,32	0,12	
	45-54 years (n = 23)	4,17 ± 1,34	5 [3 - 5]	1 - 5	3,60	4,75	0,28	
	Over 54 years old (n = 10)	3,9 ± 1,1	4 [4 - 4]	1 - 5	3,11	4,69	0,35	
Stage of the decision to adopt innovations	18-24 years (n = 167)	3,69 ± 1,08	4 [3 - 5]	1 - 5	3,52	3,85	0,08	R = -0,03; t(N-2) = -0.54; p = 0,59
	25-34 years (n = 109)	3,71 ± 1,07	4 [3 - 4]	1 - 5	3,50	3,91	0,10	
	35-44 years (n = 80)	3,66 ± 1,03	4 [3 - 4]	1 - 5	3,43	3,89	0,12	
	45-54 years (n = 24)	3,54 ± 1,22	4 [3 - 4]	1 - 5	3,03	4,05	0,25	
	Over 54 years old (n = 10)	3,4 ± 1,07	4 [3 - 4]	1 - 4	2,63	4,17	0,34	
Innovation Implementation Phase	18-24 years old (n = 165)	3,61 ± 1,09	4 [3 - 4]	1 - 5	3,45	3,78	0,08	R = -0,2; t(N-2) = -3.93; p < 0,001
	25-34 years (n = 112)	3,29 ± 1,16	3 [2 - 4]	1 - 5	3,08	3,51	0,11	
	35-44 years (n = 79)	3,13 ± 1,09	3 [2 - 4]	1 - 5	2,88	3,37	0,12	
	45-54 years (n = 24)	3,04 ± 1,3	3 [2 - 4]	1 - 5	2,49	3,59	0,27	
	Over 54 years of age (n = 10)	2,9 ± 1,45	3 [2 - 4]	1 - 5	1,86	3,94	0,46	

The ergonomics of the workstations was rated similarly across age groups in terms of its impact on the adoption of innovation at each stage of the innovation process. Correlations between the aforementioned ratings at the different stages (i.e., the innovation initiation stage, the innovation adoption decision stage and the innovation implementation stage) and age were found to be statistically insignificant.

In addition, the shape of the impact of the company's creation of favourable conditions for the development of employees' competencies was also rated similarly across age groups for each stage of the innovation process. There was no statistically significant relationship between the aforementioned variables at any stage.

On the other hand, there was a correlation between the age of the respondents and the assessment of the shape of the impact of providing autonomy to employees at the decision stage of adopting an innovation in the context of its subsequent adoption. The youngest subjects (18-24 years) attributed less influence to the factor mentioned above ($M = 3.37$; $SD = 1.04$) compared to the older age groups (from $M = 3.59$; $SD = 1.14$ in the 45-54-year group to $M = 4.8$; $SD = 1.14$ in the group over 54 years), and this correlation was statistically significant, $R = 0.16$; $t(N-2) = 3.2$; $p < 0.01$. For the other two stages, there was no significant association of the evaluation of the impact of the aforementioned factor with the age of the subjects.

In contrast, there was no relationship between age and ratings of the shape of the impact of a sense of shared ownership and control over one's own work at the different stages of innovation adoption. Ratings of the impact of the aforementioned factor were at similar levels across age groups, and correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

Encouragement of employees to continue learning was also rated similarly between age groups in terms of its impact on the adoption of innovation at each stage of the innovation process. Correlations between the aforementioned ratings at each stage (i.e., innovation initiation stage, innovation adoption decision stage and innovation implementation stage) and age were found to be statistically insignificant.

Assessing the shape of the influence of freedom to experiment and take risks at work at the innovation initiation stage in terms of adoption of innovation was significantly related to the age of the respondents. It turned out that among those up to 54 years of age, an increasing influence was attributed to the above-mentioned factor with increasing age (18-24 years: $M = 3.77$; $SD = 1.02$; 45-54 years: $M = 4.05$; $SD = 1.05$). This correlation was statistically significant, $R = 0.11$; $t(N-2) = 2.11$; $p < 0.05$. For the other two stages, there was no significant association between the above-mentioned variables.

There was also a correlation between the age of the respondents and the evaluation of the shape of the impact of knowledge exchange between the different departments of the company in the decision-making stage and the implementation stage in terms of adoption of the innovation. In the case of the first of the above-mentioned stages, there was no simple trend. The lowest ratings for the impact of the aforementioned factor were assigned by those in the 45-54 age groups ($M = 3.96$; $SD = 0.95$) and the 18-24 age groups ($M = 4.01$; $SD = 0.83$), while the highest ratings were assigned by those in the 35-44 age groups ($M = 4.28$; $SD = 0.73$) and more than 54 age groups ($M = 4.4$; $SD = 0.7$). On the other hand, at the innovation implementation stage, it can be noted that younger people attributed less influence to the above mentioned factor than older people. The lowest scores were recorded in the 18-24 year old

group ($M = 4.01$; $SD = 0.88$), a slightly higher impact was attributed to the aforementioned factor among the respondents between 25 and 44 years of age (from $M = 4.25$; $SD = 0.94$ in the 45-54 year group to $M = 4.33$; $SD = 0.81$ in the 25-34 year group), while the highest scores were recorded in the group over 54 years of age ($M = 4.4$; $SD = 0.7$). These correlations were found to be statistically significant (stage of decision to adopt innovation: $R = 0.11$; $t(N-2) = 2.26$; $p < 0.05$; implementation stage: $R = 0.17$; $t(N-2) = 3.36$; $p < 0.001$). There was no statistically significant relationship between the above variables for the innovation initiation stage.

There was a significant relationship between age and ratings of the shape of the impact of a joint commitment to a specific project in the innovation implementation stage in terms of adoption. The lowest impact ratings for the aforementioned factor were attributed to those in the age groups 45-54 ($M = 3.7$; $SD = 0.95$) and 45-54 ($M = 3.79$; $SD = 1.22$), and the highest to those in the age groups 25-34 ($M = 4.17$; $SD = 0.87$) and 35-44 ($M = 4.3$; $SD = 0.85$). This correlation was found to be statistically significant, $R = 0.22$; $t(N-2) = 4.37$; $p < 0.001$. For the other stages of the innovation process, there was no significant relationship between age and the shape rating of the impact of the above-mentioned factor on innovation adoption.

In contrast, there was no relationship between age and shape ratings of the impact of managers' promotion of the values of dialogue, collaboration, and partnership at different stages of innovation introduction on innovation adoption. The impacts of the aforementioned factor were at similar levels between age groups, and the correlations between the aforementioned variables were not statistically significant at any stage of the innovation process.

Encourage employees to discuss the ideas of others was also rated similarly across age groups in terms of its impact on innovation adoption at each stage of the innovation process. Correlations between the aforementioned ratings at each stage (i.e., the innovation initiation stage, the innovation adoption decision stage, and the innovation implementation stage) and age were found to be statistically insignificant.

Evaluation of the shape of the impact of regular brainstorming at the innovation initiation stage in terms of innovation adoption was significantly related to the age of the respondents. It turned out that among those aged up to 54 years, the above-mentioned ratings increased with age (with a slight deviation in the group 35-44 years) (18-24 years: $M = 4.15$; $SD = 0.89$; 45-54 years: $M = 4.39$; $SD = 0.89$). The correlation was statistically significant, $R = 0.11$; $t(N-2) = 2.18$; $p < 0.05$. For the other two stages, there was no significant association between the variables mentioned above.

There was also a relationship between the age of the respondents, and the assessment of the shape of the impact of openness to new solutions and flexibility in problem solving at the innovation initiation stage in terms of innovation adoption was significantly related to the age of the respondents. The older the respondents, the greater the influence they attributed to the above-mentioned factor (18-24 years: $M = 4.2$; $SD = 0.94$; over 54 years: $M = 4.7$; $SD = 0.48$), and this correlation was statistically significant, $R = 0.15$; $t(N-2) = 2.95$; $p < 0.01$. There was

no statistically significant relationship between the above mentioned variables for the other two stages of the innovation process.

Ratings of the shape of the impact of mutual trust within a team or organisation at the innovation implementation stage in terms of innovation adoption were significantly related to the age of the respondents. It appeared that the above-mentioned ratings increased with age (with some deviation in the 45-54 years group) (18-24 years: $M = 4.16$; $SD = 0.8982$; 45-54 years: $M = 4.56$; $SD = 0.53$). The correlation was statistically significant, $R = 0.2$; $t(N-2) = 3.89$; $p < 0.001$. For the previous two stages, there was no significant association between the above variables.

Additionally, there was a relationship between the age of the respondents and the assessment of the shape of the influence of appropriate appreciation and motivation of employees at the different stages of the innovation process on the adoption of the innovation. It turned out that the older the respondents, the greater the influence attributed to the factor mentioned above at the innovation initiation stage (18-24 years: $M = 4.19$; $SD = 0.89$; older than 54 years: $M = 4.6$; $SD = 0.52$) and its implementation (18-24 years: $M = 4.23$; $SD = 0.88$; older than 54 years: $M = 4.7$; $SD = 0.48$). A similar trend was observed for the stage of the decision to adopt the innovation, but only for those aged up to 54 years (18-24 years: $M = 4.17$; $SD = 0.88$ and 45-54 years: $M = 4.58$; $SD = 0.83$). The reported correlations, as the analysis showed, were statistically significant (innovation initiation stage: $R = 0.16$; $t(N-2) = 3.19$; $p < 0.01$; innovation adoption decision stage $R = 0.17$; $t(N-2) = 3.48$; $p < 0.001$; implementation stage: $R = 0.15$; $t(N-2) = 2.93$; $p < 0.01$).

There are interesting examples in the literature of research on innovation adaptation. One noteworthy example is a Delphi study conducted among 264 experts with diverse professional and academic backgrounds. It made it possible to examine the importance of a wide range of factors for different stages of the innovation adoption process. The results of the analysis show that the aforementioned factors do not affect the innovation adoption process with the same strength but have different effects on the subsequent stages (Pichlak, 2016).

4. Conclusions

The age of the respondents influenced their perception of the influence of multiple factors at different stages of the innovation process in terms of adoption, as well as their assessment of the shape of this influence. Younger people tended to perceive the influence of individual factors more frequently than older people. At the same time, younger people tended to attribute less influence on the adoption of innovations to individual factors than did older age groups (there was often a trend of gradual increase in the above-mentioned assessments with the age of the respondents).

The presented research results may be useful for managers to improve the adaptation of innovations in their companies.

The research presented in this article has some limitations. Firstly, it was carried out only in Poland, secondly, only in the IT sector, and thirdly, the age of the respondents was considered in the context of their perception of the influence of only selected factors related to internal communication, external communication, and organisational culture on the adoption of innovation.

In the future, they are planned to be carried out on a much larger scale in other industries both domestically and internationally, considering additional factors that may influence the adoption of innovations.

However, based on research to date, it is clear that for the process of adoption of innovation to be successful, companies should focus on creating a coherent communication system that is familiar to all participants in the organisation and that forms an integral part of the organisational culture. Then there is a chance that the trend presented in research will change and that increasingly younger employees will see a significant impact of both communication and the culture on the adoption of innovations.

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REGIONAL SOCIO-ECONOMIC CHANGES IN THE FACE OF DEVELOPMENT CONDITIONS IN THE EUROPEAN UNION

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Purpose: To identify economic development trends in the European Union, the extent of which is driven by new dimensions of security and cohesion in the socio-economic development of regions, and to analyse and assess the impact of new crisis phenomena on changes in public expenditure to finance public investment projects in EU regions.

Design/methodology/approach: The method of critical analysis of the literature on the subject, the method of comparative analysis and the method of time series analysis with the use of selected methods of descriptive statistics in the field of empirical and statistical data in the generic and territorial arrangement by selected categories of regional units were used.

Findings: A group of issues was identified that can be regarded as important directions of investment activity, shaping economic processes and introducing changes in social relations and expectations in the EU. The economic differentiation of European regions at the NUTS 2 level was identified, as well as the directions of changes in the spatial disparities of investment potential in regions in Poland, taking into account changes resulting from crisis phenomena.

Research limitations/implications: The presented research results are limited by the availability of empirical data in detailed territorial arrangements. Due to the currently observed factors of socio-economic instability, it is advisable to continuously update the data and further analyses under conditions of ongoing crisis phenomena.

Practical implications: The practical dimension of the analysis refers to its potential use for the preparation of socio-economic development plans at different levels of public administration.

Social implications: The results of the study may provide informative support in the programming processes of public investments for strengthening socio-economic cohesion, reducing social disparities and improving the living conditions of the population.

Originality/value: The presented analytical results address the implications and challenges of crisis phenomena affecting the EU economy by regions and variations in investment capacity. The applied territorial approach provides new knowledge that can be used in research and for investment policy at EU, national and regional levels.

Keywords: regional development, socio-economic development, public investment.

Category of the paper: research paper.

1. Introduction

The crisis phenomena observed in recent years are practically global in scope, but are also characterised by non-economic and unexpected causes. The occurrence of difficult-to-predict factors of a macroeconomic nature can therefore be expected to lead to direct changes in economic development and the possibility of strengthening social and territorial cohesion. Among the repercussions of the instability of socio-economic processes observed from 2020 onwards, one can point to changes on the expenditure side of both private and public sector investors. In addition, the prolonged military conflict and political tension beyond Poland's eastern border appear to have economic and social implications for the European Union (EU) Member States in the clearly longer perspective. As a consequence of the rise in prices of energy sources, materials and resources, as well as construction works, the necessity to verify previous development assumptions in many sectors of the economy is emerging. It can be expected that the above factors will result in the necessity of significant involvement of public sector entities and organisational units in the field of intervention aimed at inducing or sustaining favourable directions of socio-economic transformations.

The purpose of the study presented in this paper was to identify changing trends in economic development in the EU, the extent of which is driven by new dimensions of security and cohesion in the socio-economic development of regions. The objective of the study also included an analysis and assessment of the impact from emerging crisis phenomena and from increased economic instability on changes in public expenditure for financing public investment projects at the level of selected EU regions.

2. Literature review and methodical approach

Undertaking research on public investment, on the one hand, prompts a focus on identifying appropriate financial sources in order to secure funds for the implementation of these investments, while, on the other hand, it should be concerned with the role of investment outlays, considered as a development impulse on the scale of the national economy of a given country, or the regional dimensions of a given economy (Ocolisanu et al., 2022). Following the accession of new members to the European Union, views on development processes have been changing, especially with regard to the concept of regional and local development and inclusion in the concept of European regionalism (Jarosiński, 2001; Kleer 2014; Jarosiński, Opalka, 2021). The regional context of socio-economic transformations is still relevant due to further differences in the level of economic development in relation to average measures in the system of a given Member State or the EU regions as a whole. Research in this area should take into

account the selected evaluation indicators and changes in their values in terms of variation from measures recorded in development conditions before the crisis caused by the Covid-19 pandemic and by the conflict in Ukraine. A preliminary assessment indicates increasing difficulties in creating sustainable development.

In view of the instability of socio-economic phenomena that emerged in the years 2018-2023 adopted for the analysis, it can be observed that the established mechanisms for supplementing the budgets of public sector units are insufficient. There is a need to identify development problems and prepare financial support mechanisms usually implemented through appropriate government intervention instruments. In an unstable macroeconomic environment, the impact of the main factors on economic development processes at the regional and local level is determined by mechanisms that evolve outside these units and are external in nature (Zbroińska, 2022). One can point to central bank interest rates, inflation, which relates to wages and investment works, as well as changes in the level of employment. In a situation of economic crisis, there are additionally factors that appear, which are of an interventionist nature and are usually generated by the government administration in order to mitigate the negative effects of the impact of the above-mentioned factors on the budget revenues of local government units (Wójtowicz, 2018).

Despite the long-lasting activity of the state and local governments in the processes of strengthening social and economic cohesion, the spatial disparities observed throughout the EU in terms of socio-economic potential are characterised by a significant degree of consolidation, resulting from the persistence of different rates of economic growth between units in different administrative or functional systems (Strahl, Markowska, 2009). Differences can be examined by urban and rural areas, by administrative unit at local, sub-regional or regional level. The uneven capacity of regions to generate growth and development, as well as historical conditions (Gawlikowska-Hueckel, 2002; Proniewski, 2012), imply the emergence of disparities in spatial development. The development process is a cumulative phenomenon, which means that regions that developed dynamically in the past, at the same time have a greater potential to generate growth in the future. Hence, inequalities and processes appear in socio-economic systems, which, on the one hand, result in the consolidation of spatial development patterns and, on the other hand, with the increase in concentration of economic functions, e.g. in agglomerations, create pressure for convergence of wealth levels in wider areas (Nazarczuk, 2015). Referring to the theory of J. Williamson, it can be expected that the level of inter-regional disparities in GDP per capita will dynamically increase as the wealth of the economy increases, with an initial low level of the above indicator. Subsequently, as the level of national development increases, the rate of regional disparities should slow down so that, once a certain level of GDP per capita of the country is exceeded, regional disparities start to decrease with further development of the national economy (Williamson, 1965; López-Bazo, Monastiriotis, Ramos, 2014).

Directions of socio-economic change in the EU at regional level reflect global trends, EU policies and the specific challenges and opportunities of individual regions. These directions include sustainable development, digitalisation, innovation, adaptation to changing demographic circumstances, and social inclusion. Cohesion policy 2021-2027 is implemented in all EU Member States and regions. It implements two Treaty objectives: *Investment for jobs and growth* and *European territorial cooperation* (Interreg). The first objective is implemented in NUTS 2 regions, divided into three categories according to the regions' level of economic prosperity (Ministry of Funds and Regional Policy, 2022).

The overall objective of cohesion policy is defined on the basis of Article 174 of the Treaty on the Functioning of the European Union (European Union, 2016). In the 2021-2027 perspective, five additional policy objectives have been identified, which are formulated in a general way to respond to the development needs of Member States and their regions, regardless of their level of socio-economic development. Four objectives have a sectoral character, i.e. *a more competitive and smarter Europe, a greener, low carbon transitioning towards a net zero carbon economy, a more connected Europe by enhancing mobility, a more social and inclusive Europe*, while the objective of a Europe closer to its citizens has a territorial dimension (Regulation EU, 2021). In addition, cohesion policy pursues the specific objective of 'enabling regions and people to cushion the social, employment, economic and environmental impacts of the transition towards the Union's 2030 energy and climate targets and towards a climate-neutral Union economy by 2050'. This objective is being pursued through the resources of the new Fair Transition Fund (Ministry of Funds and Regional Policy, 2022).

The key planning document guiding the development of the EU Member States is the Strategic Programme 2024-2029, adopted at the European Council on 27 June 2024. The current Strategic Programme can enhance Europe's sovereignty and better prepare it for current and future challenges in the face of changing global realities and increasing instability. The programme identifies three pillars: *A free and democratic Europe, A strong and secure Europe*, and *A prosperous and competitive Europe* (European Council, 2024).

Under the first pillar, the priorities of the European Council are primarily to promote and protect the rule of law, to protect free media and civil society, and to counter external interference and attempts at destabilisation. Under the second pillar, the priorities remain to further supporting Ukraine, including its reconstruction and the pursuit of a just peace, enhancing the defence capabilities of EU members and cooperation with NATO and transatlantic partners, pursuing EU enlargement with incentives, proceeding in parallel with the necessary internal reforms, and putting in place effective border management mechanisms to deal with the problem of migration. Under the third pillar, it is planned to deepen the single market in energy, finance and telecommunications, to strengthen joint public and private investment efforts, in cooperation with the European Investment Bank, to work on the development of key technologies of the future, including green and digital transformation.

It is also planned to maintain and strengthen the agricultural sector, develop training and education, promote entrepreneurship and innovation, and maintain health care services at a competitive level.

To achieve the objective of the study, the critical literature analysis method, the comparative analysis method and time series analysis methods using measures and selected methods of descriptive statistics were used. The desk research method was applied with regard to statistical resources, including in particular databases of the Central Statistical Office, Eurostat, OECD and AMECO, as well as studies and data compilations made available in the resources of public sector units at the central and local government levels in Poland. The analysis of empirical data was carried out on the basis of statistical quantities and indicators aggregating data from local government units of different levels. Due to the diversity of the statistical community, i.e. local government units, the study also applied the cartogram method, using spatial distributions on a regional basis to obtain greater cognitive value in terms of the variability of the intensity of the studied features.

3. Results of empirical research and discussion

With reference to the conditions and perspectives presented above, the submitted article identifies and characterises a group of issues that can be considered as important directions of investment activity, shaping not only economic processes, but also bringing about changes in social relations and the expectations of residents to achieve living conditions that will be considered as favourable.

The first group defining important directions for activities is equality and social inclusion, reflecting the ever-present problem of tackling excessive disparities between regions in the EU, which are manifested in large differences in living standards, access to public services and infrastructure. The challenge for regional policy and support for the weaker regions remains to focus on reducing these inequalities through investment in rural, peripheral and eastern areas.

The second group was identified as demographic change and the ageing of populations in the EU, which is particularly noticeable in the southern and eastern regions, forcing the adaptation of social infrastructure, health care, and the labour market to the changing realities. This requires taking into account in the development objectives of the regions the undertaking of investments covering health and social services, including care for the elderly, as well as the activation of seniors in the labour market.

The next group of issues could be the transition towards a circular economy as a response to climate change and increasing environmental demands. The activities of economic entities are becoming increasingly oriented towards sustainable production and consumption, which means promoting recycling, reducing waste, using renewable energy sources and supporting

sustainable production and consumption patterns. Regions that adopt such principles will be able to attract investment in environmentally friendly technologies.

Another group of issues is digitalization and technological innovation, including transformations towards *smart cities* and *smart regions*. Investment challenges in the economy at the regional level also include the development of digital competences of residents to meet the requirements of the future labour market.

An important group of issues can be the growing importance of innovative economic ecosystems, which are based on the activities of startups and small companies. Such entities need support in the form of technology clusters, business incubators, or enabling cooperation between universities and companies. Regional policies must therefore create favourable conditions for startups, especially in the sectors of advanced technologies, green energy and biotechnology. The development of the high-value-added services sector, such as research and development, financial services, higher education or digital services, should be treated as a key factor driving growth, especially in the more developed regions of the EU.

Sustainable development and tourism were also included as an important group of issues, which entail requirements for EU regions to adapt their tourism strategies in terms of promoting sustainable tourism, which minimises the negative impact on the environment and local communities.

An important group are cross-border and interregional cooperation issues, relating to the possibility of undertaking international cooperation initiatives. In a situation of political instability and introduced restrictions on free movement, it becomes necessary to improve or introduce new forms of support in the border regions of the EU, developing cooperation with neighbouring countries outside the EU in the field of economic exchange, innovation, environmental protection or crisis management. Interregional and cross-border cooperation also requires investment outlays and the construction of infrastructure solutions in the context of global challenges, such as climate change leading to cataclysms, or increasing migration.

The above-mentioned groups of issues therefore define challenges, in terms of which limiting both the causes and consequences of negative economic phenomena in the territorial dimension remains an important element of public administration activities at various levels. The manifestation of the activity of public sector entities will be, on the one hand, the development and implementation of support programs for areas subject to marginalization processes, and on the other hand, also programs aimed at maintaining the growth dynamics of economically strong areas. In accordance with the approach developed within the EU, planning and supporting development at the regional level is of particular importance. It is emphasized in the literature on the subject (Nazarczuk, 2013) that the effects obtained depend to a limited extent on public intervention in terms of investment outlays, while the sustainability of economic development in the regions is conditioned by the investment activity of all economic entities operating in the national economy, although it should also be pointed out that there is spatial disparities in the distribution of private sector entities.

Considering the challenges to the direction of regional development in the European Union, attention should be paid in particular to the NUTS 2 territorial units. At EU level, 242 such units have been identified, which constitute the reference scope of the Union's regional policy as a whole (GUS, 2024). NUTS 2 units are also the main focus of EU public authorities when it comes to allocating cohesion policy support. The categories of regions are similar to those in the 2014-2020 perspective, where as less developed regions, units in which GDP per capita is lower than 75% of the average value of the examined indicator in the whole Union are assumed. Transition regions include those where GDP per capita is between 75% and 100% of the average value, while more developed regions are considered units where GDP per capita is higher than 100% of the average. The difference as compared to 2014-2020 is the increased limit separating the category of transition regions from the category of more developed regions, set at 100% of the Union average, against the level of 90% adopted in the previous perspective (Ministry of Funds and Regional Policy, 2022).

For the purpose of this study, 242 of NUTS 2 units were covered by the research and examined in terms of various macroeconomic indicators. Taking into account the purpose of dynamic presentation of the occurring phenomena, the study involved the division of the analysed community according to selected characteristics, the determination of value ranges of a given characteristic and the determination of the number of NUTS 2 units included in particular groups. It was considered reasonable to detail the research for the years 2018 and 2022, and to present the results obtained.

In the first instance, the regions were examined in terms of the development of per capita GDP. Still, the level of wealth and the economic and social situation determines the extent of a Member State's participation in cohesion policy. The level of GDP per capita at national or regional level determines the size of the national envelope, the category of regions or the support from the Cohesion Fund. This indicator is also crucial in determining the thematic concentration of support and the level of EU funding (Ministry of Funds and Regional Policy, 2022).

Due to the limitations arising from the format of this study, it was not possible to present detailed results of the research concerning all units, however, a comparison of these units in 6 groups was made, which allowed for the identification of specificities, characterising the obtained values of GDP per capita and internal differentiation in the entire community. Table 1 presents the values of the ranges according to which the regions were classified to the groups.

Table 1.*GDP per capita by groups of indicator values*

Specification	Lower value of group range	Upper value of the group range
Group 1	70 000	120 300
Group 2	50 000	69 999
Group 3	30 300	49 999
Group 4	25 000	30 299
Group 5	15 000	24 999
Group 6	5 300	14 999

Source: own study based on Eurostat data, retrieved from: https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en&category=reg.reg_eco10.reg_eco10gdp, 6.11.2024.

The value of the examined indicator in 2022 was at a higher level than in 2018. As can be seen from the information presented in Figure 1, this phenomenon was widespread and should be interpreted as an actual increase in the level of wealth of the European Union Member States, including an increase in economic potential in individual regions. However, it should be pointed out that 2018 was characterised by large disparities in terms of the development of the indicator in question. In the first group, above EUR 70.0 thous. per capita, there were 3 regions with incomes at least at this level or higher. On the other hand, 14 regions were classified in the lower group of indicator values, between EUR 50.0 thous. and EUR 69.9 thous. per capita.

The groups of regions with the highest level of the indicator included basically the same NUTS 2 territorial units, both in 2018 (in order from the highest level of the indicator: Luxembourg, Eastern and Midland (Ireland), Southern (Ireland), Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest and Hovedstaden) and later in 2022 (in order from the highest level of the indicator: Southern (Ireland), Luxembourg, Eastern and Midland (Ireland), Hovedstaden and Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewestzatem). This should be interpreted as maintaining the stable economic position of this group of regions both in 2018 and in the entire period of 2018-2022. The majority of NUTS 2 units were below the average value of the indicator, which amounted to EUR 30.3 thous. in 2018. Moreover, a characteristic feature of the distribution of the GDP per capita value in 2018 was the grouping of a large number of regions directly above the average value, i.e. in the range from EUR 30.3 thous. to EUR 49.9 thous., where there were 88 regions at the NUTS 2 level.

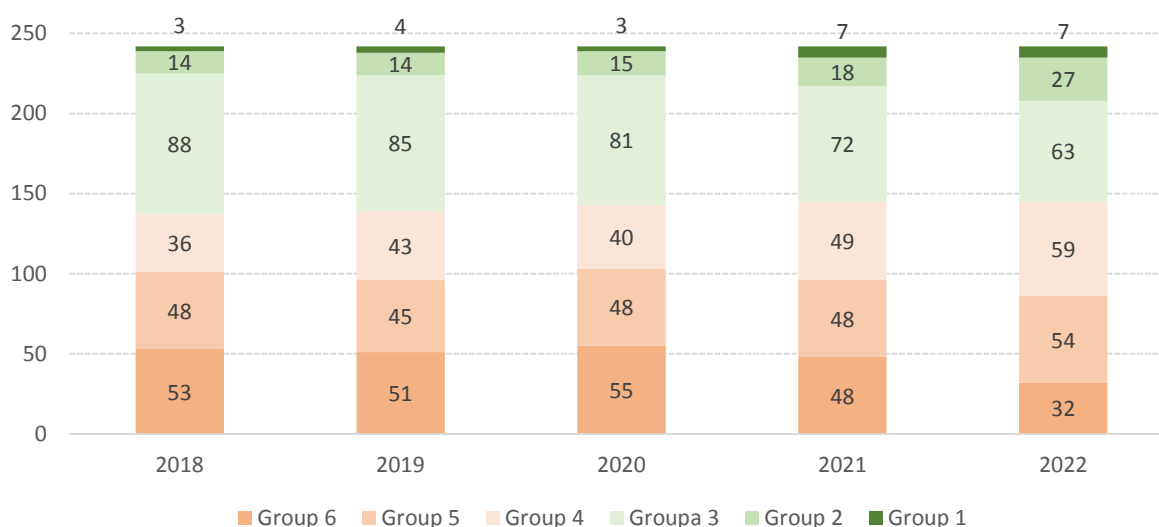


Figure 1. Number of NUTS 2 regions by GDP per capita index value groups in 2018-2022.

Source: own study based on Eurostat data, retrieved from: https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en&category=reg.reg_eco10.reg_eco10gdp, 6.11.2024.

When comparing the data collected for the entire 2018-2022 period, however, it is apparent that the values of the indicator for individual regions were clearly increasing, as well as the average value of the indicator. In Figure 1, the red colour indicates the groups of regions where the values of this indicator were below the EU average value. The green colour indicates groups where the regions showed higher values than the EU average. In terms of the adopted breakdown, a decrease in the number of regions included in the group defined by the lowest value of the ranges in terms of the examined indicator was visible. In 2021 and 2022, the number of regions in the group directly above the average decreased, while the number of regions in the group directly below the EU average increased significantly.

Figure 2 summarises graphically the data obtained during the research, concerning GDP per capita at the level of NUTS 2 regions, and presents it in the form of a series of decreasing values and compares it to the average value of the indicator at the level of the surveyed regions, which amounted to EUR 35.4 thous. in 2022. The figure additionally illustrates the situation in terms of GDP, which is also characteristic of the above year, where, on the one hand, a small set of regions with a high indicator was observed, and, on the other hand, a much larger group of regions with a GDP per capita value below the average for all regions in the European Union.

In the level of socio-economic development of the regions, a clear differentiation was still observed, defined by the value of GDP per capita. In 2022, the dominant value was an indicator expressed in terms of an amount between EUR 35.4 thous. and EUR 49.9 thous. The distribution of GDP per capita values by region revealed that there is a right-sided skewness, so on the one hand, a group of regions at NUTS 2 level characterised by particularly high incomes and GDP per capita is formed, while on the other hand, a much more numerous group characterised by relatively low values of the indicator in question can be distinguished. The measure of skewness calculated for 2018 took on a positive value, but lower than that

calculated for 2022, indicating that during the period under study, there was an increase in the number of regions where GDP per capita values were lower than the EU average. The results can be seen as symptomatic of the cohesion policy that has been in place for several decades, with the aim of reducing disparities and targeting economic territorial and social cohesion. The data prove that this process is still not complete. Figure 2 shows a flattening of the values of the indicator, but if the results obtained for the economically weakest regions are analysed and compared with the results recorded in the rich regions, differences of several or even more than a dozen times emerge.

These phenomena had already been observed earlier, e.g. in Smętkowski's research on Central and Eastern European regions, where it was indicated that the rate of regional divergence after accession to the EU in 2004 or 2007 in most countries decreased or at least lowered its dynamics. This can be seen as a sign of ongoing processes of diffusion of economic development, which also extended to non-capital regions. A decrease in investment risk as a result of EU membership and increasing interest in the less developed regions of individual countries on the part of foreign investors have been pointed to as the likely economic background to this phenomenon. Undoubtedly, the use of EU funds within the framework of the cohesion policy and the Common Agricultural Policy, which, as a rule, were greater in regions with a lower level of development, could also have been significant in shaping the above phenomena (Smętkowski, 2015). Conclusions relating to the above European countries indicated that the level of regional disparities is clearly linked to the level of wealth of national economies. Thus, efforts to eliminate or significantly reduce the level of regional disparities in the medium or even long term may be difficult to achieve for many countries. Poland is also pointed out as an example of a country where there has been a further increase in regional disparities in the medium term, especially in view of the development policy applied for many years based on a polarisation-diffusion model supporting the development of territorially selected areas (Nazarczuk, 2015).

Searching for a solution to the problem related to the directions of socio-economic changes at the regional level in the European Union, it should be emphasised that despite the consistent cohesion policy, the basic measure of cohesion, i.e. GDP per capita, still clearly differentiates the socio-economic situation in the regions. According to the results of the research carried out on the basis of all territorial breakdown units at the NUTS 2 level, an increase in average values observed in all EU regions should be indicated for the period 2018-2022. At the same time, the persistence of disparities in the level of the indicator in question between the regions considered as prosperous and those characterised by relatively low economic development indicators was observed. In 2018, the situation could be considered as quite favourable, when 137 regions below the average value of the indicator were recorded. As the study showed, in 2022, the number of regions that were below the average for the EU increased to 145. This occurred in line with an overall increase in the level of the indicator value, also in the least developed regions, and therefore there was a situation of increasing incomes with an increase in the stratification of these incomes between the different regions at NUTS 2 level.

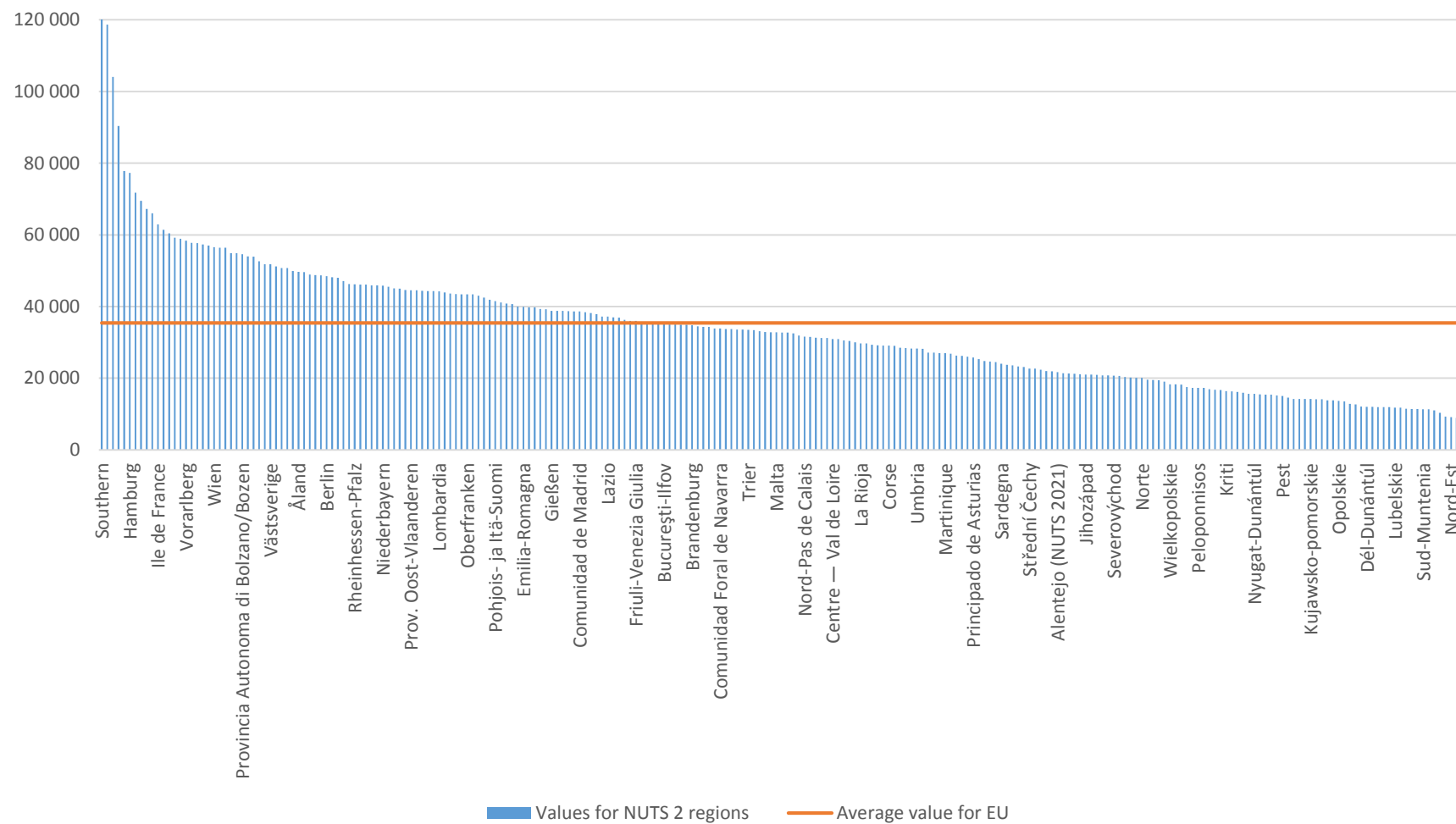


Figure 2. GDP per capita in NUTS 2 regions of EU in 2022 (in EUR thous.)

Source: own study based on Eurostat data, retrieved from: https://ec.europa.eu/eurostat/databrowser/view/nama_10r_2gdp/default/table?lang=en&category=reg.reg_eco10.reg_eco10gdp, 6.11.2024.

Reducing both the causes and consequences of negative social and economic phenomena in the territorial dimension remains an important element in the activities of public administration at various levels. A manifestation of this activity is, on the one hand, the development and implementation of programmes to support areas subject to marginalisation processes and, on the other hand, also programmes aimed at sustaining the growth dynamics of economically strong areas. In line with the approach developed within the EU, planning and supporting development at regional level is of particular importance.

Regardless of the autonomous development conditions of the regions, the financing of investments takes the first position. The primary source of investment financing for public sector units is usually own funds collected and spent within the budgets of the appropriate units (Gubernat-Ulatowski, 2016; Dworakowska, 2015). The study of the budgets of public sector units is adopted as an important instrument for identifying the factors shaping investment opportunities, due to the direct dependence of the sources of budget revenues on the state of the economy in different territorial approaches, on previously shaped development processes, often having a regional or even local dimension, as well as on the possibility of obtaining external funding under programmes financed or co-financed by EU funds.

Based on previous research, it can be concluded that there has been a persistent shortage of budget funds in Poland that could be spent by public sector units to finance development tasks (Kostecki, 2020; Cenkier, 2016; Opalka, 2023). Based on the analyses of investment needs and the streams of budget funds allocated for investment by the above units, it can be concluded that the public sector units at both national and regional levels encounter numerous difficulties in financing and implementing their statutory own tasks.

During the period under review, investment expenditures in the public sector were at a relatively high level in Poland, with the share of these expenditures in total investment expenditures in the national economy in Poland gradually decreasing. In 2018-2020, the analysed indicator of the share of public sector investment expenditures began to increase compared to the situation in earlier years. The highest share in the last years of the analysed period was reached in 2020. (36.9%), and the following years saw a decrease and a return to 33.5% in 2022.

The volume of investment expenditures in the public sector, including the government and local government sub-sectors, in individual regions, districts and municipalities depends on diverse factors. These factors may not be easily quantified due to the large variation in the parameters shaping investment processes, as well as the wide range of investment financing paths available to public sector entities and organisational units. It is a characteristic phenomenon that, under conditions of crisis in the public sector, differential changes concerning investment financing occur, while the effects of the occurrence of crisis factors reveal themselves in investment budgets with a certain delay, which may be related to the necessity of completing already started investments even under crisis conditions.

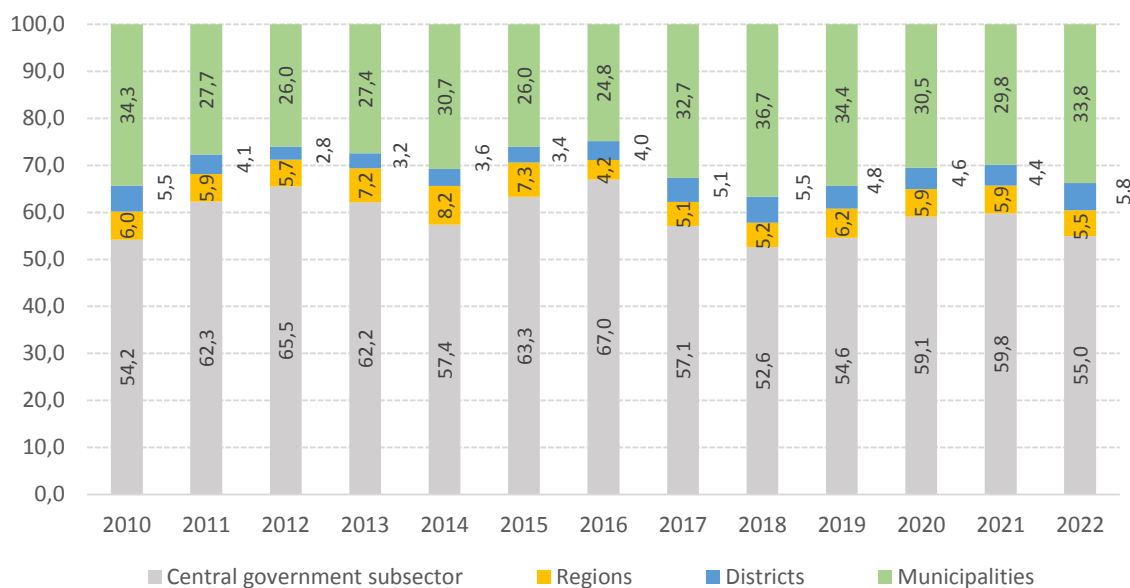


Figure 3. Structure of investment expenditure in the public sector in Poland in 2010-2022 (in %).

Source: own study based on data from the Local Data Bank, retrieved from <https://bdl.stat.gov.pl/bdl/dane/podgrup/temat>, 12.11.2024 and the Macroeconomic Data Bank, retrieved from <https://bdm.stat.gov.pl/>, 12.11.2024.

The graphical interpretation of the results of the research on the volume and structure of investment expenditure in the public sector, presented in Figure 3, shows the variability of individual groups of expenditure by groups of entities distinguished in the public sector. When the overall volume of public investment expenditure was decreasing, as was the case in 2019-2021, the share of government subsector expenditure was increasing at the same time. The maximum share of investment expenditure by the government subsector occurred in 2016, when the overall volume of public investment took on the smallest value during the period under review. In 2020, in view of the already noticeable symptoms of the crisis, a renewed increase in the share of investment expenditures realised by the government sub-sector could be observed and this phenomenon continued in 2021, while already in 2022 the share of investments financed within the budgets of mainly municipalities increased significantly.

Investment expenditures related to the financing of the tasks of the government sub-sector are of a specific nature and are associated with the implementation of functions that are aimed at the provision of public services managed at the state level, and thus may be expenditures of a public purpose, relating to internal security, external security, health care, social policy, or other purposes, the implementation of which takes place in individual regions and is financed at the government level. In the period 2010-2022, the government sub-sector was undertaking differentiated investment activity in particular regions. The changes recorded between 2010 and 2022 in the level of investment expenditures within government funds are illustrated in figure 1, where the results of calculations covering investment expenditures in 2020 and 2022 are presented. The graphical illustration indicates changes in the directions of investment funding at the government level in the territorial distribution mentioned and one can see a clear

increase in investment expenditures in regions with high dynamics of economic development, such as Małopolskie, Dolnośląskie and Pomorskie. It is worth noting that in 2022 a noticeable increase in the examined category was recorded in Zachodniopomorskie region. The dominant position in terms of the level of government sub-sector expenditures was invariably held by the Mazowieckie and Śląskie regions.

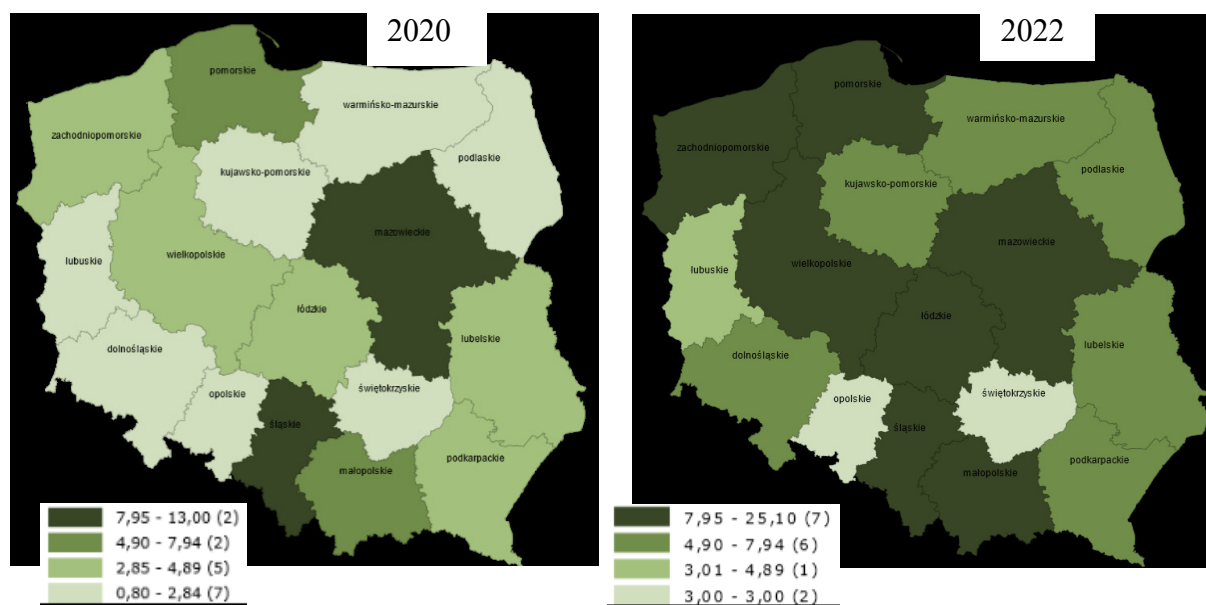


Figure 1. Total investment expenditure in the government subsector by regions in 2020 and 2022 (in PLN billion).

Source: own study based on data from the Local Data Bank, retrieved from <https://bdl.stat.gov.pl/bdl/dane/podgrup/temat>, 20.11.2024.

The largest amount of funds was spent in the Mazowieckie region, where in 2010-2022 the level of expenditure varied between PLN 8.0 billion and PLN 25.1 billion. The volume of investment expenditures of the government subsector in Mazowieckie was significantly shaped by financing investments in road and rail transport, which to a large extent related to the spatial functions of the capital city of Warsaw and resulted from the geographical location of the Warsaw agglomeration and transport accessibility in relation to the diverse economic and administrative tasks performed by the capital city in the context of the needs of the entire country.

Due to the previously indicated developmental diversity, it was important to examine investment expenditure in the economy in a relativised form, per capita, by regions. The partial results of the research are illustrated graphically in figure 2 for the selected years.

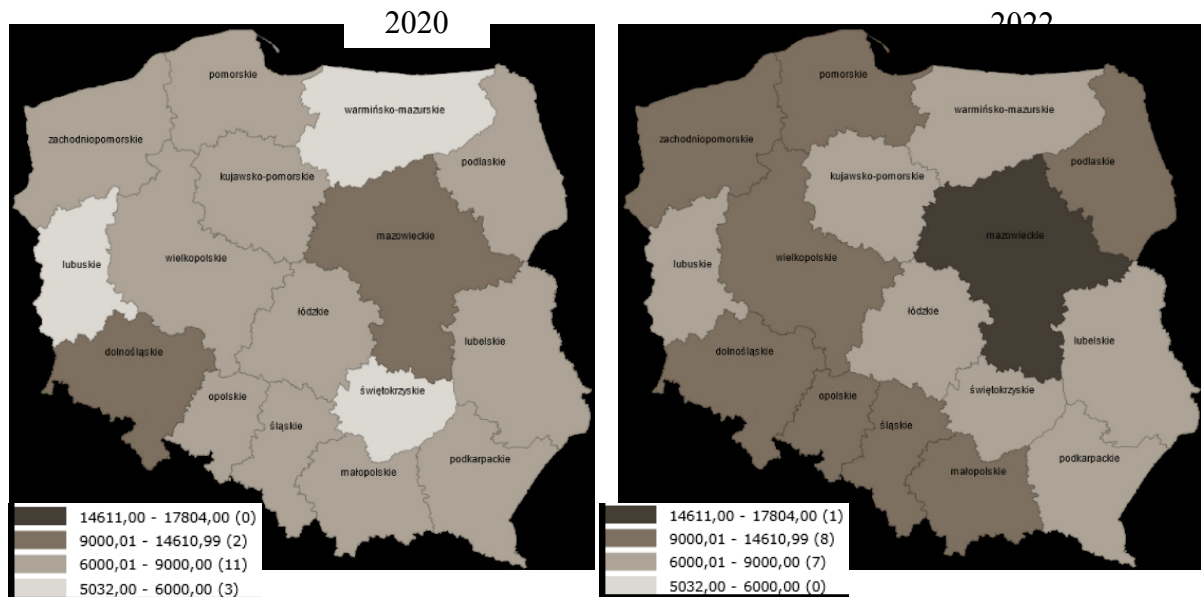


Figure 2. Investment expenditure in the national economy per capita by regions in Poland in 2020 and 2022 (in PLN).

Source: own study based on data from the Local Data Bank, retrieved from <https://bdl.stat.gov.pl/bdl/dane/podgrup/temat>, 20.11.2024.

The highest level of total investment expenditure per capita both in 2020 and 2022 was recorded in the Mazowieckie region, with PLN 13.0 thous. and PLN 17.8 thous. respectively. The results of the Mazowieckie are related to the administrative system used in the analysis, in which including the capital city of Warsaw significantly increases the discussed expenditure indicator. The leading economic function of the main urban or metropolitan centre can be observed in most regions (Tarkowski, 2015), but not as strong as in the case of Warsaw's position. In breakdown of the years presented in the figure, an increase in the level of the indicator can be seen in the western and southern regions, where the level of the indicator exceeded the value of PLN 9.0 thous. in 2022. The Lubelskie, Podkarpackie, Kujawsko-Pomorskie and Łódzkie regions remain relatively weakest in terms of GDP per capita growth rate.

The results of the study indicate that in the areas of the studied regions, although with variable intensity, activities were carried out to support economic development and reduce development barriers in changing economic conditions. Investment outlays on public tasks should be assessed as a result of planning activities and investment programmes initiated beforehand, as well as the developing adaptability to changes in the external environment and exploiting endogenous development potential. The conditions of the modern market economy create the expectation that, despite changing macroeconomic conditions, public investments should meet a defined range of availability and an accepted level of quality. The commitment to meet social needs has a permanent character, even during economic crises. That requires the adaptation of management methods in the public sector at the state level as well as in the regional and local economy, including the search for solutions to improve the efficiency of the even more limited investment resources.

4. Summary

With regard to the existing differences in the level of GDP per capita, it seems that the economic conditions resulting from crisis phenomena, as well as political instability in the global system, may cause the necessity of launching new development impulses, which would accelerate economic development and, simultaneously, meet the conditions of striving to reduce differences in the level of socio-economic development of countries and regions. The proper identification of key development threats and challenges is important here, but equally important seems to be the necessity to monitor the possibilities of their implementation, including particularly the ability to finance investments in an unstable political and economic situation, and the ability to adjust development plans in order to provide security and stability of socio-economic development.

On a regional basis, the survey indicated differences in the pace of economic change and the level of investment in the public sector. The number of NUTS 2 regions with GDP per capita levels below the Union average was increasing. While around 56% of regions were ranked below the EU average in 2018, by 2022 the number of regions remaining beneath the EU average had already reached almost 60% of the total number.

In Poland, in provinces with a higher level of development, the investment outlays financed with public resources were at a relatively high level. However, they were characterised by a significantly lower growth rate in the period 2019-2021. Significantly higher growth rates were only recorded in all regions in 2022. An important role in the financing of public tasks was played by funds from the state budget. This mechanism of financing tasks from government funds can be considered an element of cohesion policy. Between 2020 and 2022, public spending had a significant role in terms of maintaining the stability of the economy in the face of the economic downturn.

Public expenditure may continue to maintain a relatively high growth rate in the following years, which is due not only to the need to stabilise the economy, but also to Poland's socio-economic position and the need to undertake further public investments related to the clearly noticeable development gap. There is a continuing need to consider the threats and new development challenges in the EU Member States, on a significant scale requiring consistent further financing of the components of the socio-economic infrastructure, which in the longer term may contribute to ensuring stable economic growth, although there are already visible future limits to the possibility of increasing the level of public expenditure.

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THE ROLE OF BPM IN ESG ADOPTION: TOWARD GREENER BUSINESS PROCESSES IN POLAND

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Purpose: The primary aim of this paper is to explore the integration of Business Process Management (BPM) with ESG principles, focusing on the role of BPM maturity (BPM M) in enhancing sustainability practices.

Design/methodology/approach: The article employs methods such as a literature review based on Web of Science and Scopus databases, as well as the desk research method focusing on Green BPM research.

Findings: The study revealed that organizations with higher BPM M levels integrate ESG principles more effectively, demonstrating greater environmental awareness, process monitoring, and use of green performance indicators. Integrating BPM with ESG requirements addresses growing regulatory and social pressures, enabling systematic environmental impact monitoring and operational efficiency optimization.

Research limitations/implications: The main research limitations stem from the use of findings presented in the report on Green BPM in Poland. These limitations primarily relate to the non-random sample of organizations that participated in the study.

Practical implications: In terms of practical implications, the article provides insights for management practitioners seeking concepts that integrate process management with the requirements imposed by ESG.

Social implications: The article highlights the potential of aligning BPM with ESG requirements to drive sustainable practices, contributing to broader societal goals such as environmental protection, social equity, and corporate transparency. By fostering more responsible business operations, it supports the creation of value not only for organizations but also for communities and stakeholders impacted by these processes.

Originality: The originality of this article lies primarily in its integrative perspective on BPM and ESG, with a particular focus on the operational dimension. It emphasizes the importance of adopting the key concept of the business process in ESG reporting, especially within organizations. Additionally, it highlights the critical context of BPM M and presents solutions aimed at simultaneously increasing BPM M level to more effectively achieve ESG objectives.

Keywords: BPM, ESG, Business Process Management, Green BPM, Green process.

Category of the paper: Conceptual paper.

1. Introduction

As diverse political ideologies and economic conditions complicate implementation of sustainable development (SD) practices across regions, the European Union (EU) emphasized a need for a unified global framework (Lapsley, Eggertsson, 2022). ESG (Environmental, Social, and Governance) principles have become a cornerstone of sustainable development in the global economy. The ESG is a framework that takes sustainability down from international level to micro level of companies and integrates sustainability into corporate practices and investment strategies (Zhong, 2023). ESG represents a shift from profit-oriented models to a broader focus on community and environmental stewardship, driven by globalization and industrialization (Lapsley, Eggertsson, 2022). The concept has become popular as businesses and investors have recognized the importance of environmental and social issues alongside traditional financial metrics (Bowley, Hill, 2024; Clark, Dixon, 2023). The implementation of ESG measures into a company's strategy and value chain is proved to be meaningful for development of sustainable business practices. Companies are often incorporating ESG policies into their core business strategies, due to stakeholder interests and risk management frameworks (Ingole, 2022). The focus on ESG is also driven by investor demand for sustainable practices, which in the end may lead to improvement of financial performance and reduction of risks (Saini et al., 2022). Companies that effectively integrate ESG factors not only improve their financial performance, but also transform value chain into sustainable direction. It is particularly important in industries like petrochemicals, where sustainable practices are crucial for long-term viability and therefore may enhance added value. To give an example, companies may assess the products' life cycle and maximize its sustainability and profitability by implementation of circular business model (Vechkasova et al., 2023).

Increasing stakeholder requirements for more sustainable services and products are driven by a variety of factors, including dynamic business environment, heightened competition, as well as the need for transparency, and trust. Organizations enhance their offerings to meet these evolving demands, necessitating a robust approach to requirements engineering. This involves understanding stakeholder needs and the integration of complex multi-stakeholder requirements into product-service systems (PSS) (Yin et al., 2020). Consumers are increasingly prioritizing eco-friendly considerations when selecting green products, driven by heightened awareness of environmental issues and a desire for sustainability solutions. Key factors influencing this shift include the demand for products with minimal environmental impact, such as those with reduced carbon footprints and sustainably sourced materials (Schandl, 2016). Assuming that the structure of customer needs is increasingly shaped by a focus on aspects that have not been strongly emphasized in the past—such as the green dimension of processes—it is essential to highlight a fundamental organizational category present in every enterprise: the business process (see Sliż, 2021). The business process strongly

underscores the necessity of addressing customer needs in generating added value within an organization (Grajewski, 2016). To elaborate further, in the context of the discussed issues, *BPM is not about improving the way individual activities are performed. Rather, it is about managing entire chains of events, activities, and decisions that ultimately add value to the organization, and its customers* (Dumas et al., 2018, p. 1). The evolution of BPM, as opposed to its initial developmental phases (see Bitkowska, 2019), has increasingly focused on Green Processes and Green BPM. This shift represents a natural progression driven by the changing business landscape and evolving customer expectations, emphasizing the need for sustainability and environmental responsibility.

Based on the literature review, a research gap was identified regarding the scarcity of publications that address BPM and ESG in an integrative manner, particularly in the context of BPM maturity (BPM M) growth within organizations. This gap highlights the need for studies that explore how organizations can enhance their process maturity to effectively meet ESG requirements. The identified research gap determined the research problem, which was formulated as the following research question (RQ):

RQ: How can BPM evolve to effectively integrate ESG principles and maximize both sustainability and operational performance within organizations?

To effectively address ESG requirements and maximize operational benefits, Business BPM must evolve into Green BPM by embedding sustainability into its core practices. This transformation necessitates integrating Environmental Performance Indicators (EPIs) to measure and manage environmental impacts, thereby enabling continuous improvement (Roohy, Indulska, 2020).

The research problem formulated in this way defines the main aim of the paper: to explore the integration of Business Process Management (BPM) with Environmental, Social, and Governance (ESG) principles, focusing on the role of BPM Maturity in enhancing sustainability practices. The study seeks to assess how BPM frameworks can be adapted to address ESG requirements, improve process efficiency, and foster organizational transformation toward sustainable and responsible business operations.

2. ESQ requirements: from now to next

The integration of ESG principles into corporate strategies is becoming a pressing necessity. Companies face increasing pressure from consumers and investors to adopt sustainable practices that align with societal expectations (Warouw et al., 2024). This shift reflects a broader recognition of the importance of ESG frameworks in addressing environmental and social challenges within business operations. Adopting ESG principles is not only an ethical imperative but also a strategic necessity for ensuring long-term business viability and

competitiveness. Organizations that embed ESG considerations into their operations are better positioned to navigate evolving market dynamics and regulatory landscapes (Warouw et al., 2024). Organizations increasingly recognize that integrating ESG principles is vital for long-term success. The integration of ESG practices into organizational operations has enhanced efficiency, resilience, and long-term value creation. Companies such as Unilever and Microsoft demonstrate improved operational efficiency and cost savings by embedding ESG principles into their core operations (Blagova et al., 2024). This integration influences investment decisions and market dynamics, thereby fostering a more resilient business model (Warouw et al., 2024). Furthermore, aligning ESG with the United Nations' Sustainable Development Goals (SDGs) is particularly critical in emerging markets, where companies face unique challenges related to compliance and resource allocation (Markopoulos, Ramonda, 2022).

While the emphasis on ESG processes continues to grow, some argue that the focus on compliance might overshadow the ethical imperatives driving ESG initiatives. This perspective highlights the need for companies to not only meet regulatory requirements but also strive for authentic social and environmental impact.

Quality assurance in ESG reporting hinges on robust internal controls. The COSO guidelines outline the necessity of such frameworks to enhance the reliability and transparency of ESG processes (Uludag, 2023). Effective management of these processes is essential for maintaining stakeholder trust (Uludag, 2023). Technological innovations, particularly in artificial intelligence (AI), are revolutionizing ESG strategies. AI enhances data analysis and reporting capabilities, enabling real-time monitoring of sustainability metrics and providing actionable insights for improved decision-making (Rane et al., 2024). AI tools play a pivotal role in preventing greenwashing by ensuring the authenticity of ESG claims. These technologies enhance transparency and accountability, fostering trust among stakeholders and reinforcing the credibility of corporate sustainability initiatives (Rane et al., 2024). Artificial intelligence (AI) technologies are transforming ESG processes by enhancing data collection, analysis, and reporting capabilities. AI tools improve the accuracy and timeliness of ESG reporting, enabling informed decision-making. Additionally, AI-driven tools play a pivotal role in identifying ESG-related risks and mitigating greenwashing, thereby fostering greater transparency and accountability (Rane et al., 2024). Frameworks like the Balanced Scorecard, adapted to include ESG metrics, align sustainability with financial and operational goals (Michalski, 2024), while organizational learning and sustainability management further drive ESG performance (Xia, 2022; Bettley, Burnley, 2008). ESG also fosters stakeholder trust, enhances market competitiveness, and supports systemic resilience through interconnected frameworks like the ESGOR matrix (Leoni, 2024). Although critics highlight the complexity of ESG integration, its strategic adoption ensures environmental, social, and governance objectives contribute to enduring corporate success (Macneil, Esser, 2021; Li et al., 2024). The lack of established methodological frameworks for integrating ESG factors into business management presents significant challenges. This gap underscores the

need for further research and innovation to develop practical strategies for ESG implementation (Kozlova, 2023). Utilizing robust design methods can help organizations ensure compliance with standards while enhancing overall sustainability efforts (Lontsikh et al., 2022).

ESG reporting has evolved beyond its traditional role as a risk management tool. It now serves as a mechanism for creating business value, reflecting a company's commitment to sustainability and its ability to address emerging challenges effectively (Kostyuchenko et al., 2024). Robust ESG reporting practices contribute to improved competitiveness by demonstrating a company's dedication to sustainable development. Such practices enable organizations to differentiate themselves in a rapidly changing business environment, thereby securing a competitive advantage (Kostyuchenko et al., 2024). Despite the growing emphasis on ESG principles, the voluntary nature of many ESG initiatives can lead to inconsistent application across industries. This variability poses a challenge to achieving widespread environmental sustainability and limits the effectiveness of ESG frameworks in driving systemic change (Duarte, 2023).

The integration of ESG principles into corporate strategies and operations is essential for achieving sustainability and operational excellence. By leveraging technological advancements such as AI and adhering to robust internal controls, organizations can align their strategies with global sustainability goals. However, addressing the challenges posed by the lack of standardized frameworks and methodologies requires concerted efforts from stakeholders, researchers, and policymakers.

3. Integrative perspective on BPM and ESG

Integrating BPM with ESG factors offers a comprehensive approach to increasing the sustainability of an organization. Integrating these two frameworks can lead to improved sustainability performance by embedding ESG considerations into core business processes. This approach not only aligns with stakeholder expectations but also increases transparency and accountability (Aldowaiish et al, 2022). Integrating ESG into BPM requires aligning company's vision, strategy, business models, and functions. It may cause evolutionary changes like enhancing process design, compliance, automation, and reporting to effectively address ESG requirements and optimize operational benefits for organizations (von Rosing et al., 2015). An integrated approach to BPM supports the creation of comprehensive models that encompass multiple business perspectives, including ESG factors. This approach bridges gaps in existing BPM languages and improves understanding across business domains (Letsholo et al., 2014). This evolution prevents reactive compliance actions and increases operational benefits by aligning management systems with economic, ecological, and social sustainability standards, supporting a proactive approach to ESG requirements (Rozman et al., 2015).

Integrating BPM with ESG principles is becoming a key element of the strategy of organizations striving for sustainable development. As Green BPM includes environmental aspects in the management of business processes, it also analyzes the environmental impact at each stage of the enterprise's value chain. The introduction of Green BPM requires redefinition of processes taking into account pro-ecological aspects and support from management staff. Implementation of Green BPM supports mandatory ESG reporting, enabling organizations to meet regulatory requirements and increase transparency of pro-ecological activities (Brajer-Marczak et al., 2024).

González et al. (2018) prove that the Green BPM, a connection of ESG and BPM, should start with actions of managers, whose main actions towards sustainability in process management should with emissions in processes, resources used, and its quality, good green practices introduced to processes, waste created and its quantity and purpose, as well as KEIs and EPIs for further actions. At the same time, González et al. (2018) researched that most of the scientific studies on Green BPM focus on defining the green goals in the life cycle. The research analyzed addresses all stages of a process's life cycle, with the greatest focus on design (52%), monitoring (45%), and improvement (45%). Implementation and operation stages receive comparatively less attention, addressed in 29% and 39% of studies, respectively. This distribution highlights the prioritization of stages critical to establishing and refining processes. The findings underscore the importance of design and monitoring in process management research. Unfortunately, the data indicates that the majority of studies place significant emphasis on the planning phase (89%) and the realization phase (64%). However, corrective actions, which are essential for achieving objectives and improving processes, receive comparatively less attention, with only 38% focusing on the "check" phase and 21% on the "act" phase. These corrective measures, despite their limited emphasis, are recognized as valuable for integrating ESG-BPM practices, such as fostering collaboration with more sustainable suppliers (Kuppusamy, 2015). According to this, Brajer-Marczak et al. (2024) shows some areas in which the integration of BPM and ESG can be done in a company (see in table 1).

Table 1.

The examples of green practices implemented across different processes to contribute to sustainability and reduce environmental impact

Processes	Examples of Implemented Process Practices
Customer Service	• Digital communication: Using email, chat, and online platforms for customer interaction to reduce paper usage. • Energy-efficient equipment: Use energy-efficient computers, headsets, and lighting in call centers.
Back-office Operations	• Paperless processing: Adopting electronic transaction processing, account management, and record-keeping. • Cloud-based systems: Using cloud computing to reduce demand for physical servers and save energy.

Cont. table 1.

Financial Reporting and Analysis	• Digital reporting tools: Using digital tools to create and share reports to minimize paper printing. • Remote collaboration tools: Implementing video conferencing and collaboration software to reduce travel to meetings.
IT and Technical Support	• Virtualization: Using server and desktop virtualization to reduce the number of physical machines. • Energy-efficient data centers: Implementing eco-friendly practices in data centers, such as efficient cooling systems and renewable energy sources.
Human Resources Management	• Online recruitment processes: Conducting interviews and assessments online to reduce paper usage and travel. • E-training: Offering digital training modules and e-learning options for employee development.
Regulatory Compliance Management	• Electronic document management: Digital management of legal documents and compliance records. • Telecommuting options: Enabling employees to work remotely to reduce emissions from commuting.
Data Management	• Automated data processing: Using software to automate data entry tasks, reducing paper demand. • Energy-efficient device modes: Ensuring computers and other devices are set to energy-saving modes when not in use.
Procurement and Supply Chain Management	• Eco-friendly suppliers: Choosing suppliers that use eco-friendly practices and products. • Sustainable office materials: Choosing office supplies made from recycled or sustainable sources.

Source: (Brajer-Marczak et al., 2024).

The integration between BPM and ESG can be also started with comparing BPM M assessment with ESG, because traditional BPM M assessment models focus mainly on operational efficiency (see Szelągowski, Sliż 2024). The inclusion of ESG criteria allows a holistic assessment that considers environmental, social and governance impacts. Integrating ESG factors into the BPM M assessment in banks can improve risk management and regulatory compliance while promoting sustainable business practices (Mahaux, Dahlstedt, Wilmont, 2016). Integrating ESG factors into BPM maturity assessment involves expanding traditional BPM maturity models to incorporate sustainability considerations. Table 2. contains steps to approach this integration systematically.

Table 2.

Integrating ESG factors into BPM M assessment

1. Understand the BPM Maturity Framework • BPM Maturity Models: Familiarize yourself with existing BPM maturity models such as the Capability Maturity Model Integration (CMMI) or the BPM Maturity Model (BPMM). These frameworks typically assess process efficiency, standardization, and optimization. • ESG Dimensions: Identify how environmental, social, and governance factors align with BPM activities, such as resource management, stakeholder engagement, and compliance.
2. Define ESG-Specific Criteria for BPM Assessment • Environmental Factors (Assess the environmental impact of processes, e.g., energy usage, waste generation; Include metrics like carbon footprint reduction, renewable energy adoption, and resource efficiency). • Social Factors (Evaluate employee well-being, diversity, and community impact; Use metrics such as workplace safety incidents, employee satisfaction, and community investments). • Governance Factors (Examine compliance with regulations, ethical standards, and risk management; Include measures such as anti-corruption practices, data security, and transparency).

Cont. table 2.

3. Enhance Existing BPM Maturity Dimensions - Add ESG-related aspects to traditional BPM maturity dimensions such as: • Strategic Alignment (Ensure processes align with organizational ESG goals and sustainability strategies). • Governance and Culture (Foster a culture of sustainability and ethical behavior within BPM practices). • Process Optimization (Optimize processes for both operational efficiency and sustainability outcomes). • Technology Use (Leverage technologies that support ESG goals, such as energy-efficient systems or digital collaboration tools).
4. Develop ESG-Specific Assessment Questions - Create targeted questions for each BPM maturity level (e.g., initial, managed, defined, quantitatively managed, optimized) that focus on ESG factors. Examples include: • Initial Level: Are sustainability considerations part of any process planning or documentation? • Managed Level: Are there metrics in place to measure the environmental impact of key processes? • Defined Level: Is there a standardized approach to integrating ESG factors across all processes? • Quantitatively Managed Level: Are ESG outcomes consistently tracked and analyzed to guide decision-making? • Optimized Level: Are processes continuously improved to achieve superior ESG performance?
5. Incorporate ESG Metrics into Maturity Scoring • Assign weights to ESG criteria in the maturity assessment. • Use quantitative (e.g., emission reductions) and qualitative (e.g., policy compliance) indicators to score ESG integration.
6. Engage Stakeholders in the Assessment • Internal Stakeholders (Collaborate with sustainability teams, compliance officers, and process managers to ensure ESG factors are accurately represented). • External Stakeholders (Engage customers, regulators, and community representatives to validate ESG priorities and performance).
7. Leverage Tools and Frameworks • Use existing ESG reporting standards such as: ○ Global Reporting Initiative (GRI): For sustainability metrics. ○ Sustainability Accounting Standards Board (SASB): For industry-specific ESG factors. ○ ISO 26000: For social responsibility guidance. • Use BPM tools that allow integration of custom metrics, dashboards, and ESG reporting features.
8. Benchmark and Monitor Progress • Compare the organization's ESG-integrated BPM maturity with industry benchmarks. • Regularly reassess and refine the maturity model to adapt to evolving ESG standards and organizational goals.
9. Link ESG Integration to Business Outcomes - Demonstrate how ESG integration enhances BPM maturity by linking it to: • Reduced operational costs. • Improved compliance and risk management. • Enhanced brand reputation and stakeholder trust.

Source: based on (Mahaux et al., 2016).

Sustainable BPM aims to embed sustainability into business processes, extending beyond external reporting to internal operations. This includes integrating life cycle assessment (LCA) into BPM to effectively assess and improve sustainability performance (Fritsch et al., 2022). Vom Brocke et al., (2011) prove that the Sustainability-Oriented Process Analysis (SOPA) methodology integrates sustainability into the BPM lifecycle. SOPA is a methodology that extends the BPM lifecycle with life cycle LCA) and activity-based costing (ABC) to analyze and redesign processes with a focus on sustainability. Implementing SOPA enables organizations to identify and reduce the negative impacts of business processes on the

environment, supporting sustainable development goals. The integration of BPM and ESG perspectives enables organizations to not only improve operational efficiency but also meet increasing regulatory requirements and stakeholder expectations regarding sustainability (vom Brocke et al., 2011). Table 3. contains steps to incorporate SOPA framework demonstrates how BPM and ESG perspectives.

Table 3.

The six steps to incorporate SOPA framework to BPM and ESG perspectives

1. Understand the Process Scope and Context • Identify the process (Determine which business process or set of processes will be analyzed. Define its boundaries, inputs, outputs, and stakeholders.) • Assess relevance to sustainability (Analyze how the process impacts environmental, social, and governance (ESG) aspects. Focus on areas where the process has significant sustainability implications.)
2. Conduct a Sustainability-Oriented Analysis • Life Cycle Assessment (LCA) (Evaluate the environmental impact of each process step, such as energy use, material consumption, and waste generation; Identify phases of the process with the highest environmental burden.) • Activity-Based Costing (ABC) (Use ABC to allocate costs to activities based on their resource usage. Include sustainability costs (e.g., emissions, energy consumption) in the cost analysis.) • Social Impact Analysis (Assess the social implications of the process, including employee health and safety, community impact, and ethical considerations.)
3. Redesign the Process for Sustainability • Define sustainability goals (Set measurable objectives such as reducing carbon emissions, optimizing resource use, or improving social equity). • Redesign process steps (Replace resource-intensive activities with eco-friendly alternatives; Incorporate renewable energy or materials; Modify workflows to minimize waste and inefficiency). • Use technology (Implement digital tools and automation to improve efficiency and reduce unnecessary energy use).
4. Implement Changes • Engage stakeholders (Communicate the changes to all stakeholders, emphasizing the sustainability benefits). • Train employees (Educate team members on new processes and sustainability practices).
5. Monitor and Measure Outcomes • Establish KPIs: (Track key performance indicators (KPIs) related to sustainability, such as energy consumption, carbon footprint, and cost savings). • Conduct regular reviews (Continuously monitor the performance of the redesigned process and its impact on sustainability goals).
6. Iterate and Improve • Identify new opportunities (Revisit the process periodically to identify further areas for improvement). • Incorporate feedback (Use stakeholder feedback and data to refine the process further).

Source: based on (vom Brocke et al., 2011).

The changes in BPM may prioritize ESG factors, enhance data analysis capabilities, and foster sustainable practices, ultimately maximizing operational benefits and driving responsible business practices in payment services (Chandramouli, 2023). Those evolutionary changes may also focus on leveraging Information and Communication Technologies (ICT) tools to meet ESG requirements while improving operational efficiency and compliance. That can be done by further integration of BPM and ESG with Business Intelligence (BI) to enhance process sustainability (Kabra et al., 2018).

Gonzalez et al. (2018) propose to incorporate ESG indicators to software used for reporting. These authors based their idea on the concept of Process Greenability, understood as the degree of efficiency of executing the process is in terms of environmental impact, consumption of energy, use of ecological and/or recycled resources, allocation of the required amount of resources and their use, generation of emissions, and production of waste and its destination, in this way creating the KEIs or EPI associated with a sustainable processes (Table 4).

Table 4.

The examples of KEIs or EPI associated with sustainable processes

KEI/EPI	Description
Energy efficiency	Degree of efficiency with which the business process consumes energy when executed.
Resource use	Degree to which the exact amount of the resources required to execute a business process is allocated and used, to perform the business process functions in an optimal manner.
Minimization of environmental effects	Degree to which the execution of a business process reduces the effects on the environment.
Ecological and recycled resource use	Degree to which ecological and/or recycled resources are used in the execution of a business process.
Waste minimization	Degree to which the business process reduces the production of waste during its execution and whether the destination of that waste is defined.
Emission minimization	Degree to which the execution of a business process reduces emissions.

Source: (González et al., 2018).

Integrating BPM and ESG can bring benefits and improved decision-making, such as:

- An integrated ESG approach helps companies in sectors such as food and beverages measure their sustainability performance and meet stakeholder expectations. It provides a structured methodology for assessing ESG impacts, supporting strategic decision-making (Gallo et al., 2023).
- Integrating ESG factors into financial reporting increases transparency and accountability. Internal organizational factors such as governance and financial stability play a key role in effective ESG integration (Budiasih, 2024).
- Integrating sustainability into BPM prevents ad-hoc compliance activities (Rozman et al., 2015).
- Managerial trainings enhance adaptation to competitive business environments (Rozman et al., 2015).
- Development of enterprise sustainability reference content (von Rosing et al., 2015).
- Integration of sustainability into business process management (von Rosing et al., 2015).
- ESG metrics integration drives operational excellence and sustainability (Chandramouli, 2023).
- Strategic ESG integration is crucial for sustainable business practices (Chandramouli, 2023).
- Integrated BPM and BI enhance process sustainability (Kabra, 2018).

While integrating BPM and ESG offers numerous benefits, challenges remain, such as the lack of standardized methodologies and the complexity of matching different ESG factors to business processes. Addressing these challenges requires ongoing research and collaboration among stakeholders to develop a solid framework that supports sustainable business practices.

4. Green processes in Poland: results and discussion

The identification of the degree of implementation of green business processes has been extensively discussed in the report *Green Processes in Organizations in Poland. Report 2024* (Berniak-Woźny et al., 2024). The study reflects the structure of the analyzed issue, as it simultaneously focuses on BPM Maturity as well as aspects related to ESG. This approach highlights the interconnectedness of these two constructs, emphasizing the need for their systematic integration. It underscores the association between the degree of BPM implementation and the focus on green processes. The study aimed to assess the extent of ESG principles integration with process management in the context of increasing non-financial reporting requirements. The MMPM2 process maturity model was applied, enabling the classification of organizations into five levels of process maturity—ranging from low process orientation to advanced process optimization. The study utilized the assumptions of the BPM Maturity Model (BPM MM)—MMPM (Sliż, 2018a) and MMPM2 (Sliż, 2021).

The obtained results can be divided into the following categories (Berniak-Woźny et al., 2024):

- **Environmental awareness and responsibility**
 - 66.57% of respondents stated that their organizations are aware of their environmental impact and take responsibility for it.
 - Larger companies demonstrated a higher level of awareness and responsibility compared to smaller entities.
- **ESG training**
 - Over 50% of respondents reported that employees receive training on environmental issues.
 - Larger companies are more likely to invest in employee competency development than smaller organizations.
- **Process monitoring (KPIs) for environmental impact**
 - 44.76% of organizations declared that they systematically analyze their processes in terms of environmental impact.
 - Companies with higher process maturity levels are more likely to implement monitoring and reporting mechanisms.

- **Use of environmental indicators**
 - 36.28% of organizations incorporate “green” indicators into process definitions.
 - However, a significant proportion of companies have not yet implemented such indicators.
- **ESG certification and audits**
 - 27.12% of organizations hold ESG certifications or undergo regular audits, primarily among companies operating in international markets.
 - Smaller organizations show less engagement in formal certification processes.

Furthermore, the report highlights that organizations with higher levels of process maturity implement ESG principles more frequently and effectively. However, significant gaps in awareness and engagement, particularly among smaller companies, were identified. The authors of the report emphasized the following recommendations (Berniak-Woźny et al., 2024):

- increasing investments in ESG education and training for management and employees,
- developing process monitoring mechanisms and implementing environmental performance indicators,
- promoting continuous process improvement instead of a project-based approach,
- formulating policies to support the adoption of ESG principles in small and medium-sized enterprises.

The presented report (Berniak-Woźny et al., 2024) serves as a foundation for a broader discussion on the integration of BPM and ESG principles, with particular emphasis on the role of processes and process management, conceptualized through BPM M. This, in turn, raises a critical question regarding the necessity of incorporating ESG considerations into methodologies for BPM implementation within organizations.

- **The role of BPM in ESG implementation** - the BPM maturity model (MMPM2) applied in the study highlights that the development of organizations from a functional to a process-oriented structure (Level 5) is associated with greater capabilities for monitoring environmental impacts and systematically reporting results. Organizations with higher maturity levels demonstrate stronger engagement in analyzing the environmental impact of their activities and implementing mechanisms to optimize environmental efficiency.
- **The rationale for integrating BPM and ESG** - integrating BPM with ESG requirements addresses the growing regulatory and social pressures related to non-financial reporting. BPM facilitates the identification, modeling, and optimization of processes, which supports the elimination of inefficiencies, enhances transparency, and enables systematic monitoring and reporting of ESG activities.

It is also worth emphasizing that, based on the summarized findings presented in the report (Berniak-Woźny et al., 2024), conclusions can be drawn regarding the surveyed group of Polish organizations. These insights, supported by prior research on BPM Maturity in Poland

(see e.g., Bitkowska, 2013, 2019; Sliż, 2018b, 2021; Kalinowski, 2019), pertain specifically to enterprises operating in Poland.

Challenges for organizations in Poland:

- **Low BPM M Level**– The report indicates that a significant portion of organizations in Poland operate at lower levels of BPM M.
- **Lack of awareness and resources** – Nearly 42% of organizations are unsure whether they hold ESG certifications or undergo audits, while only 27% confirmed their presence. This highlights the need for education and support in ESG implementation.
- **Ad-hoc approach to ESG** – ESG activities are often carried out on an ad-hoc and project-based basis rather than being embedded in an integrated process strategy.
- **Deficiencies in monitoring and reporting** – Only 38.6% of organizations systematically monitor processes for their environmental impact, indicating gaps in accountability and oversight mechanisms.
- **Insufficient training programs** – The lack of comprehensive educational programs hampers the development of ESG competencies among employees, particularly in smaller organizations.

This analysis underscores the need for systematic efforts to build process maturity, improve awareness, and develop ESG-oriented strategies and tools to address current challenges and promote sustainable development.

5. Conclusion

The issues discussed in this article highlight the intersection of BPM and ESG frameworks, necessitating the search for a common ground where these domains converge. While the concept of green BPM aligns with this inquiry, the ongoing evolution of ESG reporting requirements calls for dynamic adjustments to its structural frameworks. This dynamic shift implies that ESG aspects should be considered not only at the BPM level but also during the design phase of business processes.

This consideration extends beyond production processes and carbon footprint generation to a broader spectrum of components influencing ESG reporting. At the level of business process architecture, organizations may face managerial dilemmas. These include whether to integrate ESG considerations into the design of new processes or projects that enable the collection, analysis, and reporting of source data, or whether to embed mechanisms in every process to dynamically measure and report ESG-related Key Performance Indicators (KPIs). Additionally, organizations must address how to regulate employee empowerment levels, enabling them to improve processes or propose enhancements based on ESG requirements.

The response to these dilemmas may depend on several factors, such as whether the organization is mandated to report ESG metrics or does so voluntarily. Nevertheless, the two components outlined in this discussion appear complementary. On one hand, it is essential to design processes with a green context in mind. On the other hand, it is equally important to implement processes or projects in which all KPIs are analyzed and incorporated into ESG reporting.

It is also worth emphasizing the research gap identified in this article. The limited number of publications addressing the discussed issues, especially empirical studies, suggests that many proposed solutions remain conceptual and require further evaluation for operational feasibility. At the same time, this research gap highlights numerous avenues for future studies, focusing on the interplay between BPM and ESG, along with extending this scope to include processes, projects, and ESG integration.

Moreover, the direction of change also pertains to incorporating a green context within the BPM Life Cycle, as outlined in this article. It raises the need to examine how this approach will influence core BPM elements, such as the reconfiguration of the six core elements (Rosemann, vom Brocke, 2015). These identified research directions also underscore the limitations of this publication, particularly in terms of its reliance on desk research. The presented study was conducted using a non-random sample selected based on convenience, limiting the generalizability of its findings to only those who voluntarily participated in the research.

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CITY PLACEMENT AND SET-JETTING: GENDER DIFFERENCES IN THE CASE OF *MAMMA MIA!* MOVIE

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Purpose: The objective of this paper is to examine the relationship between the depiction of locations in films, referred to as city placement, and the decision-making process for travel destinations, known as set-jetting, with a focus on differences between women and men. To achieve the primary objective, two specific aims were adopted: first, to determine the importance of film and destination attributes that stimulate such choices, and second, to establish the profile of a typical city placement audience.

Design/methodology/approach: The study employed an online survey (CAWI) conducted with 200 respondents using a structured questionnaire based on validated scales. Three research questions were formulated: 1) Are viewers influenced by city placement? 2) What factors motivate viewers to visit film locations (propensity for set-jetting)? 3) How does city placement impact the perception of locations depicted in films? *Mamma Mia!* movie case study was chosen as an example for respondents.

Findings: The analysis revealed that women exhibit a higher susceptibility to city placement and a greater propensity for set-jetting compared to men. The results enabled the characterization of numerous variables influencing respondents' motivation to travel to film locations. For both genders, key motivators included the presence of diverse tourist attractions at the destination, recommendations from close acquaintances, and a desire to compare the image of the place created by the film with its real-world appearance. Additionally, the portrayal of the location in the film, including how it was presented and the desire for personal experience, emerged as significant factors. The perceived outcomes of city placement were evaluated positively in both groups under analysis.

Practical Implications: The findings of the study may serve as valuable input for developers of promotional strategies targeting destinations that appear in films. The identified attributes can be instrumental in designing territorial marketing strategies aimed at leveraging such locations for promotional purposes.

Originality/Value: The paper presents an original study that evaluates both the characteristics of locations featured in films and the needs of viewers that motivate them to visit these destinations.

Keywords: City placement, set-jetting, film tourism, gender differences, *Mamma Mia!*

Category of the paper: Research article.

1. Introduction

City placement is an increasingly utilized tool of territorial marketing in the promotional activities of local governments (Szromnik, 2016). However, the question arises: does this type of tool achieve its intended goals, particularly in influencing the decision to visit a destination featured in a film?

The exploration of the relationship between city placement and set-jetting stems from long-term research into the impact of territorial marketing tools on specific target group behaviors (Romanowski, 2013). Within this context, the positioning of locations in artistic works, such as books, films, TV series, video games, or other media, aims to encourage emotionally engaged audiences to take specific actions (Lemańska, 2024).

To address this question, the study was designed to examine whether a relationship exists between the depiction of locations in films and travel destination decisions, identify the factors influencing such choices, and determine which audience segment is most strongly impacted by city placement. The research questions were as follows:

- 1) Are viewers susceptible to city placement?
- 2) What factors motivate viewers to visit film locations (propensity for set-jetting)?
- 3) How does city placement affect the perception of locations depicted in films?

The primary objective of this paper is to determine the relationship between city placement in films and travel destination decisions (set-jetting) across genders. Two specific objectives were adopted to support the main goal: (1) assessing the significance of film and destination attributes that stimulate such decisions, and (2) identifying the profile of a typical city placement audience.

2. Literature review

City placement refers to promotional activities aimed at showcasing cities or regions through media such as films, books, TV series, or video games (Werenowska, 2018, p. 90). This tool leverages media platforms to highlight the advantages of a specific area, thereby creating a positive image among audiences. For instance, films or TV series can be used to emphasize the investment and tourism appeal of a city or region.

The effectiveness of city placement depends on several factors, including the way a location is depicted in media, as well as the storyline, popularity, and acting performances within the featured content. Properly implemented city placement offers various benefits for a city or region, such as: building a positive image among audiences, increasing interest in the city or region for both investment and tourism purposes, enhancing awareness and popularity of the

area, elevating the region's significance and strengthening local pride and community ties (Werenowska, 2018, pp. 90-91).

The concept of city placement derives from product placement, a promotional strategy involving the integration of products into media content to create promotional effects. While product placement focuses on physical items, the concept has been adapted to promote cities and regions. The main aim of city placement is to draw the attention of potential tourists and investors, both local and external, by showcasing the advantages and investment potential of the area. City placement leverages films and TV series to present the qualities of a location and convince viewers of its appeal. The success of such efforts is closely tied to the audience's reception of the film or series.

A film's attractiveness significantly influences audience interest in the destination depicted within it, as higher appeal correlates with greater interest in the featured location (Zawadzki, 2014, pp. 134-136). Another interpretation of city placement involves providing a location for artistic events, such as film, music, or literary activities, in exchange for direct or indirect promotional exposure to audiences. When analysing the essence of the concept of city placement, we can distinguish 8 levels (Fig. 1).

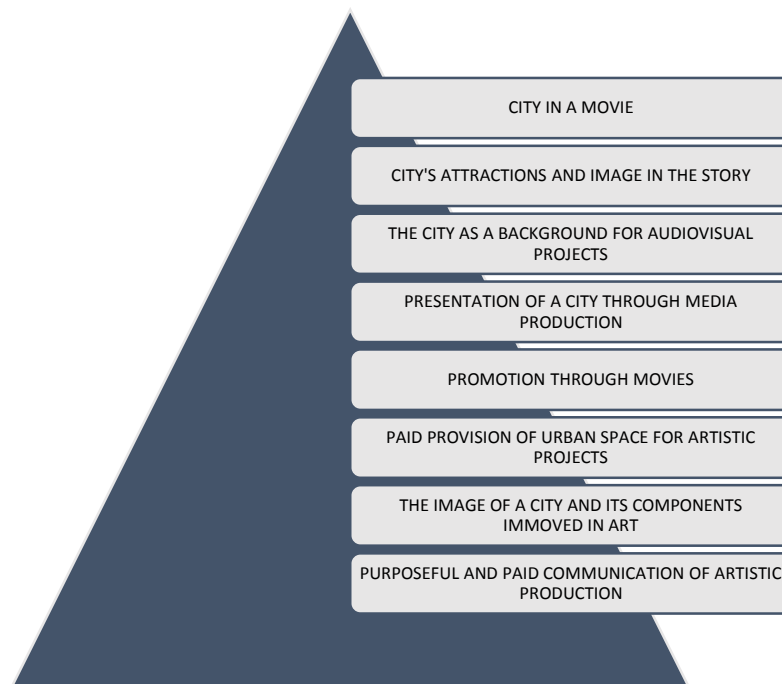


Figure 1. Elements of city placement.

Source: Szromnik, 2016.

The levels of city placement are presented in order from the least specific to the most detailed (Fig. 1). The broadest understanding of this place marketing tool defines it as a deliberate and paid form of communication within artistic production (Zawadzki, 2014). This interpretation encompasses a wide approach to the concept of city placement, referring to any promotional activities that use media—manifested here as artistic productions—for marketing purposes. The term “city in film” appears to be the most precise definition of this

instrument, as it directly pertains to the positioning and portrayal of a specific location within a film production for marketing goals.

In many instances, the promotion of a product, in this case, a city, through city placement does not involve a comprehensive presentation of the location. While some productions showcase a location holistically, treating the city as the central product where all aspects are subject to promotional activities, most movie or television productions focus on select elements of the location. Marketing efforts tied to promoting a specific place often leverage factors that directly or indirectly shape its unique appeal, such as cultural heritage or natural attributes. Movies significantly influence the image and identity of a city or region (Bieńkowska-Gołasa, Gołasa, 2021, pp. 7-8). Movie productions allow viewers to explore the advantages of a given location, highlighting its most popular attractions or, conversely, introducing lesser-known areas and drawing attention to new elements.

City placement activities can be observed in numerous productions. These initiatives often spotlight both well-established locations, already ingrained in viewers' awareness (usually to show popular destinations from a fresh perspective), and lesser-known locations that gain popularity and interest through their inclusion in films. A prime example of a filmmaker who adeptly utilizes city placement in his works is the American screenwriter, director, and producer Woody Allen.

Allen's films showcase three productions that effectively serve as visual tours of European capitals such as Barcelona, Rome, and Paris. These cities are not merely backgrounds but integral elements of the storyline. Scenes are constructed around the cities, their communities, and cultural achievements. Woody Allen's productions are largely financed by the budgets of the featured cities (Konieczna, 2012). For instance, *Vicky Cristina Barcelona* portrays the Spanish city as a protagonist. The Catalan region allocated 10% of the total production costs to promotional activities tied to showcasing the city. This equated to €1 million from Barcelona's municipal budget and an additional €500,000 from the Catalan government. Despite the significant financial investment, the film became a visual showcase for Barcelona, presenting its remarkable architecture in an appealing manner that encouraged viewers to visit the destination. It also emphasized the distinctiveness of the Barcelona community (Kortus, 2014).

City placement aligns with the phenomenon known as place placement. By skillfully showcasing a location in a movie production, demand for movie-related tourism can be stimulated (Stando, Romanowski, Maierová, 2023). A critical aspect of city placement involves constructing and fostering a favorable image of a destination through film, encouraging audiences to visit, fostering set-jetting. In this context, the concept of image is key, as it influences the future functioning of markets by raising awareness among consumers of a specific location or its accessibility.

3. The Essence and Development of Set-jetting

Decisions to visit specific destinations are influenced by a combination of factors, primarily natural and cultural, that shape the attractiveness of a location from a tourism perspective. The concept of tourism attractiveness encompasses activities that guide the direction, location, and intensity of travelers' movements (Urbańczyk, 2019, pp. 85-86). As regions and cities are increasingly promoted in movies and television series, there has been a notable rise in interest in the phenomenon known as set-jetting (Joliveau, 2009).

Set-jetting, considered a rapidly developing form of tourism, involves traveling to real locations featured in films by moviegoers and fans (Joliveau, 2009). Film tourism, therefore, refers to traveling to locations that have been depicted in movies or television series. Film tourism can be divided into two levels: biographical tourism and fictional film tourism (Bieńkowska-Gołasa, Gołasa, 2021). The biographical level of film tourism includes visits to places such as: biographical museums of film stars, birthplaces, residences, or burial sites of film stars, biographical monuments, commemorative plaques, tombstones of film stars, film festivals. The fictional level of film tourism encompasses: visits to film and television sets (real or constructed), participation in outdoor reenactments, participation in film workshops, film-themed amusement parks.

The concept of film tourism broadly captures travel motivated by viewing a film or television series (Stando, Romanowski, Maierová, 2023). Its key manifestations include various forms such as location-based film tourism, commercialized location tourism, studio-based film tourism, studio commercialization tourism, and event-based film tourism (Table 1).

Film tourism represents one of the fastest-growing branches of tourism within the broader cultural tourism sector (Stando, Romanowski, Maierová, 2024). Its English counterpart, set-jetting, is a term credited to Gretchen Kelly (2007), who is considered its originator. Set-jetting refers to travel undertaken to visit locations where the action of a particular film or television series took place (Stasiak, 2009, pp. 225-226). The motivations behind this phenomenon vary, often including a desire to immerse oneself in the atmosphere or experience the unique mood of a given cinematic work. Set-jetting allows viewers to physically travel to the places where actors performed and provides an opportunity to form personal impressions and opinions about those locations.

Table 1.*Classification of film tourism (FT)*

Form	Characteristics	Example
<i>On-Location Tourism</i>		
FT as a main tourist motive	The film production site is an attraction big enough to generate interest among tourists	New Zealand (The Lord of the Rings), Scotland (Outlander)
FT as a part of tourist visit	Visiting film locations during longer vacations	Croatia (Dubrovnik – Game of Thrones)
FT of nostalgia	Production sites representing past periods	The Andy Griffith Show
FT of celebrities	Participate in organized tours of the homes of movie stars, directors, etc.	A “road trip” around Hollywood
<i>Commercial On-Location Tourism</i>		
Film trails and guiding	Commercially operated guided tours of film locations	The Tolkien Trail in New Zealand
<i>Off-Location Tourism</i>		
Study trips	Study trips visits during film production	Movie studios during filming
<i>Commercial Off-Location Tourism</i>		
Commercial Study Tours	Visits to official Tourist Film Studios	Warner Bros. Studio Tour London
FT of theme parks	Visits to specific film and television theme parks and attractions	Universal Studios
<i>One-off or Recurring Events Tourism</i>		
Film Festivals	Trips to film festivals	<i>Off-Camera</i> Cracow
Movie premieres	Trips to watch films on movie premieres and to see film/TV stars	Embassy Theatre (Wellington)

Source: Urbańczyk, 2019.

The primary aim of set-jetting is to experience firsthand the locations featured in films or series by visiting the landmarks, monuments, and environments depicted in the production. For some, this might even extend to retracing the paths of the actors themselves. Film tourism encompasses various types of destinations, which can be categorized by the nature of the locations depicted. This classification distinguishes between on-locations, real, existing filming sites, and off-locations, which are fictional or created solely for the purpose of the production (Bieńkowska-Gołasa, Gołasa, 2021, pp. 6-7).

Set-jetting involves visiting locations where films or television series were set, whether it is a viewer's favorite production or one currently popular. This form of tourism has emerged as a robust and highly lucrative segment of cultural tourism (Stasiak, 2009, pp. 225-226), particularly in relation to theme parks dedicated to cinematic works. Beyond theme parks, the growing popularity of set-jetting can also be observed in the increasing demand for visits to film studios where productions are created. In some cases, these studios, once filming has concluded, are transformed into tourist attractions for fans and visitors.

Set-jetting, therefore, constitutes travel to destinations featured in films or series. This subfield of tourism is evolving rapidly, gaining increasing popularity year after year. Film tourism often leads to the development of new and engaging attractions tied to cinematic works. Fans worldwide actively seek out destinations connected to their favorite productions and are eager to visit these locations and explore the experiences they offer.

4. Methodology of the Study

This chapter is devoted entirely to the analysis of a study investigating the correlation between the portrayal of locations in films and the decision-making process regarding travel destinations. The research was carried out using the Computer-Assisted Web Interview (CAWI) method, surveying a sample of 200 participants between May and June 2024. No categorical restrictions were applied in the selection of respondents. The sampling process primarily considered gender while also taking into account variables such as age, education level, and the type of locality (Table 2).

Table 2.
Characteristics of the study sample

Variable	Categories	Share	Number of respondents
Gender	Female	50.5%	101
	Male	49.5%	99
Age	18-29	50.5%	101
	30-39	20.0%	40
	40-49	16.0%	32
	50-59	9.5%	19
	60+	4.0%	8
Education	Primary	0.0%	0
	Vocational	13.5%	27
	Secondary	28.0%	56
	Higher	58.5%	117
Category of a place	Village	15.5%	31
	Town up to 10,000	15.0%	30
	Town from 10.1 to 50,000.	13.5%	27
	Town from 50.1 to 100,000.	13.0%	26
	City from 100.1 to 500,000.	20.5%	41
	City with over 500,000 inhabitants	22.5%	45

Source: own elaboration.

In the conducted study, the group of female respondents (50.5%) slightly outnumbered the male ones (49.5%). The majority of participants were aged 29 or younger (50.5%), while the smallest group consisted of individuals aged 60 and above (4%). Regarding education, the highest percentage was observed among respondents with higher education degrees (58.5%). Concerning the variable related to the size of the locality, the distribution was relatively balanced. However, the largest proportion of respondents resided in cities with populations exceeding 500,000 inhabitants (22.5%), while the smallest group lived in cities with populations between 50,001 and 100,000 (13%).

The survey questions addressed specific variables such as destination awareness, motivation to visit, and the influence of city placement activities. The questions utilized were adapted from five prior studies on similar topics (Table 3).

Table 3.*Classification of questions included in the questionnaire and their sources*

Variable	Source
Destination awareness	(Vila, Fraiz Brea, & de Carlos, 2020)
Visit motivation	(Vila, Fraiz Brea, & de Carlos, 2020)
	(Macionis & Sparks, 2009)
	(Shani, Wang, Hudson, & Gil, 2009)
The impact of a place	(Ferreira, Mendes, & Vareiro, 2017)
Existential authenticity	(Teng & Chen, 2020)

Source: own elaboration.

Using the aforementioned variables and assigned questions, the study sought to address research questions aimed at determining whether there is a relation between the depiction of places in films and decision-making regarding travel destinations. Most of the survey questions were constructed using a Likert scale. Initially, an analysis was conducted to examine how city placement impacts respondents based on gender, followed by a detailed characterization of the typical city placement audience profile.

5. Presentation and Analysis of Research Findings

The first research question sought to determine whether respondents, as viewers, are influenced by city placement activities (Table 4). Female respondents demonstrated a high level of interest in locations depicted in film productions, as three-quarters of the group reported becoming interested in at least one location featured in an artistic work (mean score: 5.44). Women not only exhibited awareness and paid attention to the locations presented in films (mean score: 5.49), but they also focused on the characteristics of the depicted places, such as landscapes (mean score: 5.36). Female respondents believed that the inclusion of outdoor scenes in film productions enhances diversity and positively influences audience reception. They are aware of efforts to feature places in films, notice these depictions, and are even willing to recommend such locations to friends or family (mean score: 5.38).

Table 4.*Respondents' susceptibility to city-placement activities*

Statements	Women	Men	Total
Exterior scenes enrich a movie	5.85	5.68	5.77
Seeing a tourism destination in a movie makes me interested in this destination	5.44	5.14	5.29
When I'm watching a movie, I pay attention to the place where it was filmed	5.49	4.87	5.18
I will recommend a visit to a tourism destination I saw in movie to my friends and family	5.38	4.81	5.10
When I watch a movie, I become interested in elements related to it (like landscape, architecture), and sometimes search for additional information in order to further connect with the story	5.36	4.99	5.18

Source: own elaboration based on scale adapted from Vila, Fraiz Brea & de Carlos, 2020.

Male respondents showed a similar attitude to their female counterparts regarding the belief that outdoor scenes enrich a film (mean score: 5.68) and interest in locations depicted in films (mean score: 5.14). A comparable level of interest was also noted in responses to questions about paying attention to and seeking information on elements shown in films (mean score: 4.99). Interestingly, despite the high percentage of interest in additional elements presented in films among men, the level of attention to the locations themselves was lower (mean score: 4.87). This finding suggests that men are more interested in individual elements rather than the location as a whole. Male respondents also displayed a lower willingness to recommend film locations compared to women, though the majority were still inclined to make such recommendations (mean score: 4.81). To assess whether respondents were interested in traveling to locations depicted in films, a question was posed to evaluate their attitudes toward such trips (Figure 2).

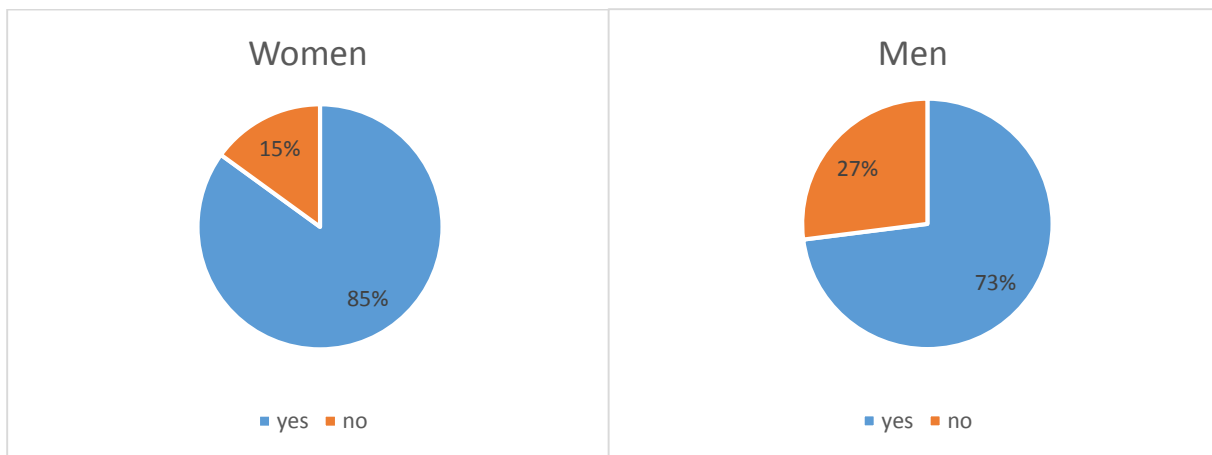


Figure 2. Number of respondents willing to visit location shown in a movie.

Source: own elaboration.

Female respondents demonstrated a high inclination to visit locations observed in film productions, with 85% expressing a willingness to undertake such travel. Women who displayed a positive attitude toward visiting places depicted in films were subsequently asked about the destinations they found most appealing. The most frequently mentioned locations included:

- Cracow, Poland (7 responses).
- New York, USA (7 responses).
- Paris, France (6 responses).
- Los Angeles, USA (4 responses).
- Warsaw, Poland (4 responses).
- Poznań, Poland (3 responses).
- Dubrovnik, Croatia (2 responses).
- Łódź, Poland (2 responses).
- New Zealand (2 responses).
- Toruń, Poland (2 responses).

The responses reveal that female respondents showed the greatest interest in visiting large urban centers, such as Paris, Los Angeles, and New York. An intriguing observation is the number of mentions of Polish cities, such as Warsaw, Poznań, and Kraków. This suggests that effectively leveraging city placement could inspire audiences to visit lesser-known, potentially more locally accessible destinations due to their portrayal in films.

Male respondents exhibited slightly lower interest in traveling to film locations (73%), though the level remained high, indicating that city placement has a significant impact on male viewers. Among male respondents, the most popular locations included:

- New York, USA (6 responses).
- London, UK (6 responses).
- Tokyo, Japan (4 responses).
- Hobbiton, New Zealand (4 responses).
- The Caribbean (3 responses).
- Iceland (3 responses).
- Rome, Italy (3 responses).
- Warsaw, Poland (3 responses).
- Greece (2 responses).
- Kraków, Poland (2 responses).
- Los Angeles, USA (2 responses).

Comparing male and female preferences reveals that male respondents also favor well-known destinations portrayed in films, such as Los Angeles and Tokyo. However, a notable difference is that men less frequently choose locations in Poland, instead preferring more distant destinations (e.g., the Caribbean, New Zealand). The second research question aimed to identify factors influencing viewer motivation to visit film locations (Table 5). All the listed factors positively influenced the level of motivation among female respondents. The most stimulating factor for women was the availability of additional tourist attractions (mean score: 5.48). Recommendations from close acquaintances (5.29) and the desire to compare the imagined version of the depicted destination with its real image (5.17) also played a significant role. Women additionally valued the opportunity to gain firsthand experiences of film locations (5.09) and the way a place was presented in a movie (4.99). The lowest level of influence was attributed to the mere fact that the location appeared in the film. This observation underscores the need for more detailed and engaging portrayals of destinations to make them attractive to women as a target audience.

Table 5.*Factors that motivate viewers to visit a movie location*

Statements	Women	Men	Total
Comparing images and icons I have in my mind from watching the TV series with the reality of the location	5,17	5,30	5,24
Having first-hand experience of a place where a movie has been shot and the actors and directors have been	5,09	4,75	4,92
Visiting the tourism destination for the simple reason of having learned about it through movie.	4,53	4,52	4,53
way of presenting a place in a movie	4,99	4,91	4,95
The destination's own promotional campaign.	4,67	4,23	4,46
The movie's promotional campaign.	4,69	4,20	4,45
Someone in my circle recommended the destination to me.	5,29	5,12	5,21
The existence of other tourism products/attractions (e.g., seaside tourism, nature tourism, food tourism...) in the destination.	5,48	5,37	5,43

Source: own elaboration based on scale adapted from Vila, Fraiz Brea & de Carlos, 2020.

For male respondents, the greatest motivating factor was also the availability of additional tourist attractions (5.37, Table 5). Their ranking of motivational factors closely mirrored that of female respondents, with the exception of a higher emphasis on comparing the film's depiction of a place with its actual appearance (5.30). This suggests that both groups similarly define factors that most strongly influence their motivation to visit film locations. Men assigned similar importance to the manner in which a place was presented in the film (4.91) and the opportunity to gain firsthand experience (4.75). The least motivating factor for men was the film's marketing campaign related to the location (4.20). Subsequent research addressed the actual relationship between respondents' exposure to the film *Mamma Mia!* and their willingness to visit Greece (without specific reference to Skopelos Island, where the film was shot) (Figure 3).

**Figure 3.** Number of respondents that have ever watched *Mamma Mia!* Movie.

Source: own elaboration.

The question served as a control measure to support further analysis of subsequent inquiries. Based on the responses, it can be inferred that a higher percentage of women had watched the referenced film (94%) compared to men (59%). For respondents who had not seen the discussed film production, a trailer was shown to familiarize them with the locations depicted in the artistic work and to enable them to respond to the following questions. Subsequently,

respondents were asked about the factors motivating viewers to visit the locations featured in the film *Mamma Mia!* (Table 6).

Table 6.

The impact of city placement in Mamma Mia! movie on Polish viewers

Statements	Women	Men	Total
The overall architecture and impression of the Korean filmed sites inspired me.	5,72	5,24	5,49
Sites in the movie reflected the culture of Greece in an authentic way.	5,39	4,77	5,08
I liked the way Greek sites blends with the attractive landscape/scenery, which offers many other interesting places for sightseeing.	5,80	5,00	5,41
I liked the information about Greek sites and found it interesting.	5,59	4,77	5,19

Source: own elaboration based on scale adapted from Teng & Chen, 2020.

Women exhibited a higher general interest to the location depicted in the film compared to men. Female respondents most strongly agreed that the region presented in *Mamma Mia!* offers numerous interesting places to visit (mean score: 5.80, compared to 5.00 for men). Women also believed that the architecture and landscape shown in the film positively inspired them (mean score: 5.72 vs. 5.24 for men) and found the information about the depicted location engaging (mean score: 5.59 vs. 4.77 for men). Female respondents largely agreed that the film authentically portrayed Greek culture (mean score: 5.39 vs. 4.77 for men). These observations suggest that men were less susceptible to the influence of city placement in the film *Mamma Mia!* than women. Further research delved into the needs influencing respondents' motivation to embark on trips inspired by *Mamma Mia!* (Table 7).

For both men and women, all identified needs contributed to increased interest in traveling to locations depicted in the film. The strongest motivator for both groups was the desire to see the scenery and landscape in person (mean score: 5.57 for women and 5.66 for men). The second-most significant factor was the desire to experience something new (mean scores: 5.54 and 5.52, respectively). Respondents expressed a willingness to undertake such travel to gain new experiences and a sense of adventure. The third-ranking motivator was treating the visit as a unique addition to a vacation (mean scores: 5.35 for women and 5.32 for men). This consistency allows local authorities to determine a good base of content and potential motivators for city placement regardless of gender. Less significant needs included purchasing film-related souvenirs (mean scores: 4.35 for women and 4.60 for men), viewing behind-the-scenes content (4.71 and 4.75), feeling closer to favorite actors (4.68 and 4.87), and "immersing oneself in the film" (4.78 and 4.77).

Table 7.

Viewer needs related to increasing the level of motivation to travel inspired by the film to visit the place shown in Mamma Mia! movie – propensity to set-jetting

Statements	Women	Men	Total
To see the scenery and landscape in real life	5.57	5.66	5.62
To have fun and feel entertained	5.36	5.48	5.42
To add something special to my holiday	5.35	5.32	5.34
To experience something novel and new	5.54	5.52	5.53
To take photos at the film sites	5.18	5.03	5.11
To see behind the scenes of the film	4.71	4.74	4.73
To get a sense of the film's atmosphere	4.89	4.75	4.82
To go to famous places my friends haven't been to	5.34	4.85	5.10
To buy film memorabilia/souvenirs of the location	4.35	4.60	4.47
To make a personal connection with the film	5.07	4.76	4.92
To make a pilgrimage to sites seen on film	5.21	5.18	5.20
To bring the film to life (make it real)	4.78	4.77	4.78
To fulfil a personal dream	5.04	5.31	5.18
To feel close to my favourite actor	4.68	4.87	4.78

Source: own elaboration based on scale adapted from Macionis & Sparks, 2009.

The findings revealed additional gender-based differences. For men, fulfilling a dream was relatively important (mean score: 5.31), while this factor was less significant for women (5.04). Conversely, women placed greater importance on visiting famous locations unseen by their peers (5.34), a factor of lesser importance to men (4.85). This highlights a need for prestige among women, linked to accomplishing something unique or visiting renowned destinations, a motivation less prominent among men. The study also sought to determine which elements of a place depicted in Mamma Mia! directly influenced the decision to visit (Table 8).

Table 8.

Features of the place and the plot shown in Mamma Mia! movie directly influencing the decision to travel to the film destination

Statements	Women	Men	Total
Landscapes	5,92	5,51	5,72
Scenery	5,59	5,20	5,40
The cultural attraction of the destination	5,56	4,89	5,23
The experiences of people in the film	4,99	4,44	4,72
The storyline of plot of the film	4,92	4,45	4,69
Tourist attraction	5,58	5,15	5,37
Willingness to see the place in real	5,89	5,35	5,63

Source: own elaboration based on scale adapted from Shani, Wang, Hudson & Gil, 2009.

All identified attributes of the location and plot were significant for respondents, though the influence was stronger among women. The most compelling reason for film-related travel was the landscape (mean score: 5.92 for women and 5.51 for men). Other key factors included the desire to see the place in person (mean scores: 5.89 for women and 5.35 for men) and the scenery (5.59 for women and 5.20 for men). Interestingly, narrative elements (4.92 for women and 4.45 for men) and the desire to feel like actors from the film (4.99 for women and 4.44 for men) were less influential.

The final research question explored the impact of city placement on various aspects of locations depicted in films (Table 9).

Table 9.

Assessment of the perceived city placement's results related to the place shown in a movie

Statements	Women	Men	Total
Helps to highlight their beauty	5,92	5,63	5,78
Increases the pride of the inhabitants of a place	5,63	5,11	5,38
Contributes to the preservation of local culture	5,44	4,78	5,11
Contributes to attracting more investment to these places	5,31	4,90	5,11
Contributes to the reconstruction/renovation of buildings in these places	5,20	4,76	4,98
Increases the bond with a place and its community	5,18	4,80	4,99
Contributes to the improvement of local infrastructure (e.g. Roads)	4,78	4,74	4,76
Contributes to the increase in the number of tourist services (e.g. Hotels, restaurants)	5,16	5,14	5,15
Contributes to the increase in the number of job offers	4,86	4,52	4,69
Contributes to the creation of difficulties in moving around the city (traffic jams / problems finding parking spaces)	5,19	4,75	4,97
Contributes to the increase in the level of dirtiness of the city	5,02	4,59	4,81
Contributes to the increase in the prices of goods and services	5,37	4,85	5,11
Affects the lives of local residents	5,47	4,99	5,23
Affects the disruption of peace and quiet	5,20	4,87	5,04
Affects the increase in the level of crime	4,18	4,34	4,26

Source: own elaboration based on scale adapted from Ferreira, Mendes & Vareiro, 2017.

The most significant perceived outcomes of city placement include highlighting the beauty of the locations depicted in films (mean score for women: 5.92; men: 5.63), fostering a sense of pride among residents (mean score for women: 5.63; men: 5.11), influencing the daily lives of locals (mean score for women: 5.47; men: 4.99), and increasing the availability of tourism services (mean score for women: 5.16; men: 5.14).

Conversely, the least significant perceived outcomes of city placement include a rise in crime rates (mean score for women: 4.18; men: 4.34), the creation of new job opportunities (mean score for women: 4.86; men: 4.52), and improvements to local infrastructure (mean score for women: 4.78; men: 4.74).

Women tend to believe that portraying a destination in a film affects the lives of its residents by encouraging investment and fostering renovation projects. A considerable portion of the female respondents also agree that showcasing cities in films promotes the growth of tourism services in the area and increases the prices of goods and services. Both groups, however, acknowledge that city placement impacts the lives of local inhabitants, often by disrupting their peace and quiet. Men, on the other hand, associate city placement with an increase in investment in the showcased locations.

The analysis reveals that, according to respondents, featuring locations in films impacts various aspects of those places. City placement serves as a tool with both positive effects, such as boosting residents' pride and highlighting the beauty of locations, and negative consequences, such as the disruption of tranquility and an increase in the cost of goods and services.

6. Conclusion

The conducted study focused on evaluating city placement as a marketing tool. The primary aim was to examine the relationship between the portrayal of locations in films (city placement) and the decision-making process regarding travel destinations (set-jetting). Specifically, the study sought to determine whether such a relationship exists, how it manifests, and how respondents perceive it.

The analysis was based on a research question that explored the influence of featuring locations in films on the decision to visit those places. To facilitate interpretation, the study addressed three sub-questions: the respondents' susceptibility to city placement, the factors motivating viewers to visit film locations, and the perceived outcomes of city placement for the depicted destinations. The interpretation considered gender-based differences among respondents.

The findings indicate that both women and men are susceptible to city placement strategies, with women exhibiting a higher degree of influence. Women are more likely than men to travel to locations featured in films. Their attention is often drawn to large destinations, including both international cities and domestic Polish locations. Men, while also interested in visiting major cities showcased in films, tend to opt for more distant destinations, often overlooking Polish attractions.

The research question confirmed that respondents are aware of the locations portrayed in films and provided insight into how city placement affects them. Both groups demonstrated an interest in the locations depicted in films, with men being influenced by the mere presence of a location in a film without necessarily considering its overall appeal. Women, however, analyse both the general characteristics and specific details of the depicted locations. The study further demonstrated the influence of city placement using the example of the *Mamma Mia!* movie, which showed that respondents, particularly women, are inclined to visit destinations featured in cinematic productions.

Another objective of the study was to identify and highlight the factors motivating viewers to visit film locations, forming the basis for their tendency toward set-jetting. A notable similarity was observed in the elements that drive motivation for both genders, with only minor differences. The results revealed several variables influencing respondents' motivation to travel to locations shown in films. For both groups, the main motivators include the presence of tourist attractions at the destination, recommendations from close acquaintances, and the desire to compare their imagined perception of the location with its real-life appearance. Additionally, the way the location is depicted in the film, alongside the desire to gain personal experiences, plays a significant role.

The differences between the groups are as follows: for women, the least motivating factor is the mere fact that a destination is shown in a film, as women tend to analyse the depicted areas in greater detail. For men, the least motivating factors are marketing campaigns, whether related to the location or the film itself. Both genders, however, share a strong desire for new experiences, adventures, and the opportunity to evaluate the beauty of the scenery firsthand. Visiting a film location is often perceived as a form of entertainment or a vacation enhancement, with women more frequently associating it with fulfilling personal dreams. Women are also driven by the desire to visit places their acquaintances have not yet seen, to experience famous locations and feel a sense of prestige.

The final part of the study aimed to determine the perceived outcomes of city placement for locations shown in films. Both groups identified several variables influenced by city placement. Respondents generally viewed the tool as having more positive than negative effects. Both genders agreed that featuring locations in films highlights their beauty and unique qualities. This form of promotion boosts residents' pride in their areas, although it can disrupt local tranquility by attracting more tourists. Increased interest in a location fosters the preservation of local culture and draws further investment. According to respondents, the growing popularity of a location due to its presence in a film correlates with the development of tourism services in the region, which, in turn, raises the prices of goods and services.

To further investigate city placement, the study aimed to profile the typical consumer of this marketing tool. This was achieved by analysing respondents' answers in terms of variables such as age, education, and locality size.

The results indicate that city placement has the strongest impact on individuals aged 30-39 and those under 29. In terms of education, the tool most significantly influences women with higher education qualifications. Interestingly, the example included in the survey also highlighted its impact on women with vocational education. City placement is particularly effective among respondents living in small and medium-sized cities (with populations of up to 100,000).

City placement proves to be a tool that significantly influences travel decisions. The study concludes that there is a clear relationship between featuring locations in films and the selection of travel destinations. Although various factors determine the level of motivation to visit a specific place, the appropriate use of city placement can decisively influence these choices. Respondents demonstrated a high level of awareness regarding locations portrayed in artistic works and, after evaluating their attributes, made travel decisions accordingly.

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IMPLEMENTATION OF MANAGEMENT ACCOUNTING TOOLS IN BUSINESS MANAGEMENT

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Purpose: The purpose of this article is to evaluate the application of management accounting tools in the execution of enterprise management functions. Management accounting, using information from the financial accounting subsystem supported by ERP class financial and accounting information systems, and leveraging process automation, for example in the form of RPA - Robotic Process Automation, constitutes one of the cornerstones of the information system of an economic entity.

Methodology/approach: Using PAPI (Paper and Pencil Interview) and CAWI (Computer-Assisted Web Interview) methods through the 'webankieta.pl' online survey service, an empirical study was conducted among two groups of respondents. Firstly, managers using information from the management accounting subsystem for operational and strategic decision-making were surveyed. Secondly, information was obtained from accountants who prepare and provide necessary information to managers. A purposive sampling was used, based on knowledge and professional experience in managerial positions and accounting. The study involved 107 owners/managers – representatives of small, medium, and large enterprises, as well as 144 accountants participating in qualification courses organized by the Accountants Association in Poland, District Branch in Bydgoszcz.

Findings: In entities from the SME sector, basic managerial accounting tools are used to support operational decision-making. Advanced managerial accounting tools were applied to a low and very low extent in small and medium-sized enterprises. In large entities, the range of use of the advanced management accounting tools, supporting the performance of management functions at both the operational and, primarily, strategic levels, increased.

Research limitations/implications: The study conducted may form the basis for further considerations in the direction of integration of management accounting tools and accounting IT systems supported by modern technologies.

Practical implications: Development of management accounting tools and their use in the management process at operational and strategic levels.

Originality/value: The results of the study provide new insights into the application of management accounting tools in business management in the context of modern technological developments.

Keywords: accounting, management, subsystem of management accounting.

Category of the paper: research paper.

1. Introduction

Management accounting is a process of providing managers with financial and non-financial information (Otley, 2016). Managers need information for conducting the management functions of business, systematically making short-term and long-term decisions. Contemporary management accounting, along with the financial accounting subsystem and systematic cost accounting, forms the key foundation of a company's information system (Duci, 2021; Gonçalves, Gaio, 2021). Dynamic changes of business environment and the uncertainty associated with conducting business activities have increased the importance of information in business management. There is an observed implementation of new practices in the field of management accounting (Bedford, 2015).

Changes in production technologies, the growing importance of environmental protection, the development of information technologies, and new communication channels, influenced by the pandemic, provide management accounting tools with broad application possibilities in business management. Information systems in financial and accounting of the ERP class, supported by RPA - Robotic Process Automation, and in the future by elements of artificial intelligence such as ML - Machine Learning and NLP - Natural Language Processing, allow for real-time data processing (Ruivo et al., 2014; Ribeiro et al., 2021). Equipping financial and accounting software programs with a BI - Business Intelligence module enables the preparation of advanced reports, analyses, summaries, and their clear graphical presentation (Appelbaum et al., 2017; Ahmed et al., 2023).

Management accounting practices are evolving in an interdisciplinary direction, encompassing management, intellectual capital management, energy management, environmental management, finance, asset management, information management, and strategic management. According to the authors, there is an emerging **research gap** concerning the updating of research results on management accounting tools applied in enterprise management under conditions of intense change and the emergence of context variables that previously did not occur with such intensity. **The aim of the paper** is to evaluate the application of management accounting tools in the execution of business management functions. The article focuses on small, medium, and large manufacturing, trading, and service entities, where management accounting tools were used at various levels of advancement. Firstly, the empirical study was conducted among enterprise managers responsible for current operational and strategic management. Secondly, data were collected from accountants employed in financial and accounting departments or accounting offices. During the research work, literature studies were conducted, which allowed for the formulation of the following research questions:

- Is the management accounting subsystem adapted to the needs of managing small, medium, and large enterprises?
- To what extent are the tools of operational and strategic management accounting used in managing small, medium, and large enterprises?
- Does the extent of management accounting tools depend on the size of the entity?
- Which management accounting tools require changes?

In their literature research, the authors used the methods of induction and deduction. Then, in the empirical study, they employed synthesis and analysis methods, using questionnaires as a research tool. The paper provides an update of the research results conducted for the purpose of preparing a doctoral dissertation on the topic *Accounting Information System in the Management of Small and Medium Enterprises*.

2. The essence of management accounting

Accounting has evolved into a future-oriented information system that aids in enterprise management, rather than a mechanism based on historical data for maintaining accounting records. The role of management accounting in the enterprise information system has been emphasized by several authors. For instance, Nowak noted, "The essence of management accounting lies in providing information that supports the management process" (Nowak, 2003). Similarly, Belkaoui stated, "Management accounting is a subsystem of the contemporary accounting information system" (Belkoui, 2002). These changes lead to the increase in the volume of data required by enterprises for decision making and development planning. The subsystem of management accounting within the enterprise information system creates a bridge between the past and the future through its methods and techniques (Uyar, 2019; Papazov, Mihaylova, 2015). Nowadays, the management accounting subsystem provides information that assists managers in controlling the organization (Kaplan, Atkinson, 1998). Management accounting integrates into the enterprise control process, and employees of financial and accounting departments are active participants in every stage of the decision-making process in the entity (Lew et al., 2019; Chang et al., 2023).

The orientation of management accounting towards supporting managers in the process of creating value and achieving strategic objectives has been emphasized in definitions by international professional organizations. CIMA (Chartered Institute of Management Accountants) in collaboration with AICPA (American Institute of Certified Public Accountants) highlighted that in their document "Global Management Accounting Principles" (CIMA, 2025). According to the IMA (Institute of Management Accountants) in their publication "Definition of Management Accounting", management accounting is a system of identifying, measuring, accumulating, analysing, preparing, interpreting, and communicating

financial information used by management. It aids in planning, evaluating, and controlling the organization and ensures the appropriate use and accountability for the resources utilized by the business entity (IMA, 2008).

The significance of cost accounting and management accounting as a tool supporting managerial decisions was emphasized by Winiarska (Winiarska, 2009). Sadowska viewed management accounting as an element of an integrated information system of a business entity (Sadowska, 2018a) and analysed its importance in the enterprise's information system (Sadowska, 2018b). The evolution of management accounting definitions was presented by Szychta (Szychta, 2018). She also conducted research on the use of management accounting tools from the perspective of enterprise size (Szychta, 2019a) and the qualifications of management accounting specialists (Szychta, 2019b). The organisation of the management accounting system and the role of accountants and organisational culture were highlighted by Carlsson-Wall et al, and Hadid and Al-Sayed (Carlsson-Wall et al., 2014, Hadid, Al-Sayed, 2021). The use of management accounting tools to support decision-making processes that depend on the size of the business entity was studied by Cescon et al., Azudin, Mansor, Armitage et al. (Cescon et al., 2019, Azudin, Mansor, 2018, Armitage et al., 2016).

The application of modern technologies and automation in management accounting processes was described by Łada and Burnet-Wyrwa (Łada, Burnet-Wyrwa, 2015; Łada, 2016). The significance of digitalization in the development of management accounting tools was also studied by Pavlatos, Kostakis (Pavlatos, Kostakis, 2018) and Möller, Schäffer, Verbeeten (Möller et al., 2020). Research results on the benefits and obstacles of using automation and robotics in the management accounting system and business intelligence tools were described in publications by e.g. Januszewski et al., Kokina, Blanchette, Rikhardsson, Yigitbasioglu (Januszewski et al., 2021; Kokina, Blanchette, 2019; Rikhardsson, Yigitbasioglu, 2018).

Such a perception of the management accounting subsystem aligns with the concept of accounting as a fundamental element of the business entity's information system that supports the management process.

Tools of operational management accounting

Business management refers to the effective process of formulating and achieving set objectives through the use of existing resources based on available information. Effective management of a modern enterprise depends on the processing, presentation and ability to use information from the management accounting system (Ax, Greve, 2017). This information, thanks to the use of modern technologies, is reported in real time (Trigo et al., 2014; Quattrone, 2016; Güney, 2014).

Proper implementation of tools within the management accounting subsystem requires systematic cost accounting for products or services rendered (Drobyazko et al., 2019). Cost accounting, on one hand, accumulates and organizes costs for the preparation of financial statements in accordance with legal regulations – the Accounting Act; on the other hand,

it provides detailed information necessary for enterprise management. Full cost accounting, conducted in accordance with legal regulations and based on simple cost accumulation and their allocation to produced goods or provided services, can be used for decision-making over a longer period (Chatterjee et al., 2016). To obtain complete information about the points of cost origin, it is necessary to conduct *variable costing*, which allows for detailed control over the size and structure of costs (Wierzbiński, 2019). Variable costing provides reliable data for cost control and reflects the short-term financial result. A more advanced form of cost accounting is *Activity-Based Costing (ABC)*, which offers more precise information about production, auxiliary costs, and product costs (Quesado et al., 2021; Tran et al., 2022). Its key objective is to provide management with accurate cost information and business process execution (Pietrzak et al., 2020; Lu et al., 2017). *ABC* has become an innovative method supporting the management process, eliminating gaps inherent in traditional cost accounting (Park et al., 2019). The information generated in activity-based costing can be used for order management, in marketing decisions regarding product mix, product positioning, labour productivity, customer profitability, customer service, utilization of production capacities, process improvement, supplier relationship management, and marketing and advertising (Pashkevich, 2023).

In making short-term operational decisions, entrepreneurs utilize *methods of operational and financial budgeting* as the fundamental technique for cost control and management. Budgeting is a central element of the management system supporting key operational decisions related to the coordination of activities, allocation of resources, financing, measurement of work performance, and employee motivation (Sponem, Lambert, 2016; Becker et al., 2016). The decentralization of the management process means that budgeting aids in dividing responsibility for the execution of assigned tasks. Depending on the type of organizational structure, we can distinguish departments/teams/positions responsible for implementing approved budgets and controlling costs incurred in various segments of operations (Libby, Lindsay, 2010; Arnold, Artz, 2019). Budgeting allows for the identification of deviations from preliminary assumptions and the rapid implementation of corrective actions (Hansen, Mowens, 2009).

In corporate management, budgeting supports the planning of annual activities, setting goals, determining ways to achieve them, responsibility for their implementation, and overseeing any arising deviations. It allows for the evaluation of work and serves as a motivating factor.

Tools of strategic management accounting

Strategic management is subject to a process of change (Krzakiewicz, Cyfer, 2018). Strategic management accounting supports long-term management by providing information about the engagement of assets and capital in implementing the adopted business strategy (Tappura et al., 2015). In the literature, strategic management accounting was defined in 1981

by Simmonds as "the analysis of information provided by management accounting tools related to the entity, its competitive position, for the purpose of developing a business strategy" (Simmonds, 1981). In 1990, Bromwich added that "strategic management accounting extends beyond the scope of information about the enterprise and its market position but responds to questions about what advantages and factors influence the building and maintaining competitive advantage" (Bromwich, 1990).

In the long-term perspective, for making strategic decisions, advanced management accounting tools are recommended, such as the balanced scorecard, target costing, cost of quality and life cycle costing.

The Balanced Scorecard (BSC), developed by Kaplan and Norton in the 1990s, is one of the most frequently chosen management accounting tools supporting the management process in large entities (Kaplan, Norton, 2021). According to the principles set by Kaplan and Norton, the tool comprises four business perspectives: processes, finance, customers, and research and development. For each of these perspectives, it is necessary to establish a measure of goal achievement, which ultimately translates into the realization of the entity's adopted strategy (Cooper et al., 2017; Quesado et al., 2018).

Target costing is a tool of strategic management accounting, through which a company plans the prices, margins, and production costs. Target cost calculation provides managers with a tool for continuous monitoring of product costs from the design phase through the entire product life cycle. This enables achieving a stable level of profitability in the production environment (Horngren et al., 2012). The design of products is influenced by market needs, and the set cost objectives ensure management dynamism.

The cost of quality (COQ) accounting is another tool that supports the strategic management process. The cost of quality is associated with preventing, detecting, and correcting problems related to the quality of products or services provided. COQ allows determining to what extent resources are used for activities preventing the low quality of products or services, influenced by internal and external factors (Shah et al., 2011; Ross, 2017). In the literature, studies on the application of quality cost accounting include works such as Sadkowski's 2017 "Quality Cost Accounting in Enterprises - Evolution, Implementation, Tasks" or in 2020 "Quality Cost Accounting in a Selected Service Enterprise" (Sadkowski, 2017; Sadkowski, 2020).

The life cycle costing (LCC) involves summing up all costs that a company must incur throughout the entire life cycle of a product (Pasch, 2019). These costs include initial investments related to research and development, launching the product/service into the market, investments in product improvement extending its market life, as well as operational costs incurred each year (Spickova, Myskova, 2015; Bierer et al., 2015). This calculation enables the identification of potential cost-generating factors and the introduction of savings for products/services throughout their entire life cycle (Martinez-Sanchez et al., 2015; Mitakea et al., 2021).

3. Methodology of the study

The authors identified their research problem as the question: to what extent do the applied management accounting tools support the management of enterprises? This problem refers to the research gap related to updating research findings on management accounting tools used in enterprise management amidst intense changes and the emergence of context variables, which previously did not occur with such intensity. In the secondary research, literature concerning the management accounting subsystem in the management area was analysed. Basing on that, research questions were formulated and respondents for primary research were selected, including managers holding executive positions in companies, and accountants participating in courses conducted by the Accountants Association in Poland, District Branch in Bydgoszcz. Purposive sampling was applied and detailed criteria for participation in the study were defined. The research was conducted in two stages: the first from June to October 2020, and the second from July to September 2021.

Enterprise research methodology

In the case of enterprises, the main criterion for selecting participants for the study was the obligation to maintain full accounting records and their job position:

- owner/manager of the enterprise,
- strategy manager position,
- middle management,
- operational management.

The research tool used was a CAWI (Computer-Assisted Web Interview) questionnaire, which was sent via the webankieta.pl service to 474 entities cooperating with the Technology Transfer Centre of the Bydgoszcz University of Science and Technology. For in-depth analysis, 107 correctly completed questionnaires were accepted.

Accountants' research methodology

In the group of accountants, the main criterion was the knowledge and skills possessed, therefore it was established as a classification criterion that the respondent participates in the 2nd, 3rd, and 4th degree qualification courses conducted by the Accountants Association in Poland, District Branch in Bydgoszcz. The research tool again was a questionnaire prepared both in paper form – PAPI (Paper and Pencil Interview) and CAWI (Computer-Assisted Web Interview). The research was addressed to 164 accountants. A total amount of 144 correctly completed questionnaires were obtained. The data were analysed using a matrix in the form of an Excel file, into which data were incorporated from the electronic webankieta.pl platform.

The questionnaire used semi-open questions with an 'other (what?)' response option, as well as closed questions. The Likert scale was used as the measurement scale. The size of the enterprise was adopted as the comparative criterion for both groups, relating to the set goal of the study and the posed research questions. Examining both groups allowed for a broader analysis of the research problem, ensuring a comprehensive view of the selected issue.

4. Results of the study

The study involved 144 accountants participating in qualification courses conducted by the Accountants Association in Poland, District Branch in Bydgoszcz. The largest group consisted of accountants employed in small entities (76 individuals), followed by medium-sized entities (52 individuals), and large entities (16 respondents). The study included 43 chief accountants, 11 financial directors, 22 employees of accounting offices, 41 finance and accountancy professionals from small entities, 18 finance and accountancy professionals employed in medium-sized entities, and 9 from large entities. Among entrepreneurs, the largest group was made up of entrepreneurs/owners of small entities (62 individuals), followed by medium-sized entities (39 respondents), and large entities (6 managers). In the entrepreneurs' group, there were 44 owners/managers, 32 strategic managers, 23 middle-level managers, and 8 respondents employed at the operational level.

In the main part of the study, respondents first evaluated the extent to which various management accounting tools are used in making current operational and strategic decisions. The results, considering the criteria for dividing respondents and the size of the entities studied, are presented in Table 1.

Table 1.

The extent of use of management accounting tools in making operational and strategic decisions in the opinion of entrepreneurs and accountants

Tools of the management accounting subsystem	Entrepreneurs' opinion			Accountants' opinion		
	Small entities	Medium-sized entities	Large entities	Small entities	Medium-sized entities	Large entities
Making operational decisions - short period of time						
Variable costing	56.2%	54.5%	33%	42.1%	42.3%	60%
Activity-based costing	19.6%	60.6%	50%	31.6%	46.2%	64%
Financial budgeting	66.4%	69.7%	67%	34.2%	48.1%	73%
Operational budgeting	38.2%	69.7%	83%	34.2%	48.1%	73%
Making strategic decisions - extended period						
Target costing	27.2%	53.6%	67%	34.2%	34.6%	50%
The life cycle costing	17.3%	36.4%	50%	22.4%	19.2%	64%
Cost of quality	10.2%	27.3%	50%	27.6%	34.6%	63%
Balanced Scorecard	15.1%	60.6%	50%	22.37%	26.9%	79%
Variable costing	42.3%	72.7%	50%	44.7%	40.4%	63%
Activity-based costing	17%	51.5%	83%	34.2%	44.2%	60%

Cont. table 1.

Financial budgeting	55.9%	84.8%	83%	42.11%	55.8%	67%
Operational budgeting	41.1%	81.8%	67%	39.5%	48.1%	73%

*Results represent the sum of the 'large' and 'very large' categories.

Source: own study.

According to managers, budgeting tools are primarily used in current operational management. In small entities, financial budgeting is the main tool (66.4% of responses), in medium-sized entities, it's equally used with operational budgeting (69.7% of responses), and in large entities, operational budgeting (83% of responses) and financial budgeting (67% of responses) are prevalent. Similar opinion was expressed by accountants employed in medium and large entities. Financial budgeting and operational budgeting were specified by 48.1% of respondents from medium-sized entities and 73% from the large entities. However, accountants employed in small entities had a different view; 42.1% of these respondents emphasized the extensive use of variable costing, while only 34.2% mentioned the use of both operational and financial budgeting.

Making strategic decisions, managers of small entities to a large and very large extent relied on the variable costing (42.3% of responses) and financial budgeting (55.9%), and on operational budgeting (41.1%). Managers of medium-sized entities in strategic management mainly used budgeting. Compared to small entities, these methods were nearly twice as prevalent: financial budgeting (84.8% of responses) and operational budgeting (81.8% of responses). Medium-sized business managers utilized also variable costing (72.7% of responses) and, among more advanced management accounting tools, mentioned the balanced scorecard (60.6% of responses) and activity-based costing (51.5% of responses). Managers of large entities, compared to the small and medium-sized ones, applied more advanced tools of management accounting: activity-based costing (83% of responses) and target costing (67%). Operational and financial budgeting were also used extensively (83% for financial budgeting and 67% for operational budgeting). Accountants employed in small entities indicated the use of variable costing (44.7% of responses) and financial budgeting (42.1% of responses) in strategic management. On the other hand, accountants from medium-sized entities most often specified financial budgeting (55.8% of responses) and operational budgeting (48.1%). Accountants working in large entities, referring to more advanced management accounting tools, highlighted the balanced scorecard (79% of responses) and, again, operational budgeting (73%).

In a subsequent question, respondents identified elements of the management accounting subsystem that, in their opinion, required improvement. The results, considering the size of the entity surveyed, were presented in Table 2.

Table 2.

Elements of the management accounting subsystem requiring improvement, according to entrepreneurs and accountants

Tools of the management accounting subsystem	Entrepreneurs' opinion			Accountants' opinion		
	Small entities	Medium-sized entities	Large entities	Small entities	Medium-sized entities	Large entities
Variable costing	50.4%	22.9%	25%	32.6%	28.4%	25%
Activity-based costing	33.3%	11.4%	25%	10.2%	14.9%	18.75%
The life cycle costing	3.3%	28.6%	25%	7.3%	3.0%	6.25%
Target costing	15.8%	45.7%	0%	10.2%	11.9%	0%
Cost of quality	2.1%	8.6%	0%	7.3%	9.0%	37.5%
Operational budgeting	40.0%	71.4%	75%	11.8%	10.4%	0%
Financial budgeting	48.3%	48.6%	50%	17.5%	13.4%	0%
Balanced Scorecard	20.4%	28.6%	25%	3.0%	9.0%	18.75%

Source: own study.

According to the representatives of small entities there are two areas requiring improvements: Variable costing (50.4% of responses) and financial budgeting (48.3%). Managers of medium and large entities expected changes in the use of operational budgeting (medium entities - 71.4% of responses, large entities - 75% of responses) and financial budgeting (medium entities - 48.6% of responses). Accountants, however, had a different view, expecting changes of Variable costing - in small entities 32.6% of responses, and in medium entities 28.4%. Accountants employed in large entities expected a change in target costing (37.5% of responses).

In the next question, respondents provided answers regarding the directions of changes in the management accounting subsystem. The results are presented in Figure 1.

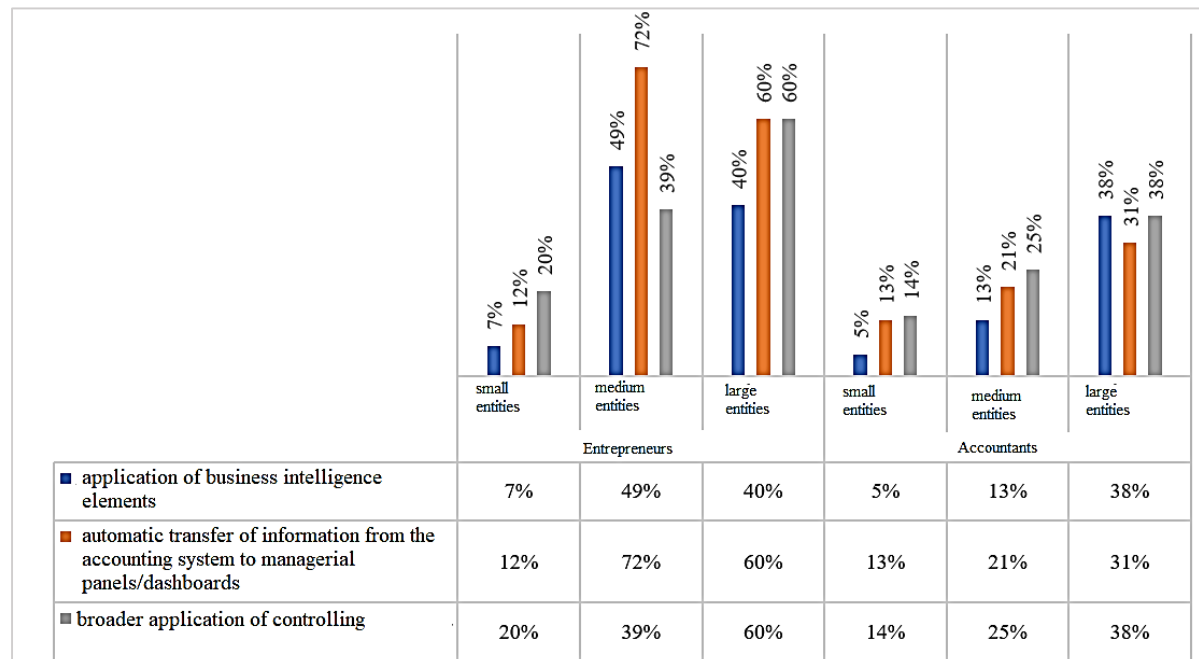


Figure 1. Directions of change in the management accounting subsystem improving management processes, according to the opinions of entrepreneurs and accountants.

Source: own study.

Managers of small entities expected a wider use of controlling (20% of responses), while those of medium and large entities suggested the automatic transfer of information from the accounting system to managerial panels/dashboards (medium entities - 72% of responses, large entities - 60% of responses). Besides, managers of large entities indicated a preference for the broader application of controlling (60% of responses). The development of the management accounting subsystem was most expected by accountants employed in large entities - with the application of business intelligence elements (38% of responses) and a wider use of controlling (38% of responses). The wider use of controlling was specified by accountants from medium (25% of responses) and small entities (20%), whilst 21% of accountants employed in medium entities identified the direction of development as the automatic transmission of information from the accounting subsystem to managerial panels/dashboards, which would allow for real-time data processing and utilization.

5. Discussion and implications

The environment in which businesses operate has become very dynamic and complex. Pandemics as well as security concerns have also contributed to this situation. To react quickly and correctly to emerging risks, businesses need fast, simple, and graphical information from a management accounting system. This improves the company's internal decision-making process, efficiency, and effectiveness (Drury, 2021; Fielder et al., 2016). A survey of managers and accountants confirmed that the management accounting system is not adapted to the needs of business management, especially in the SME sector. The use of management accounting tools in decision-making is most often largely limited to variable cost accounting and financial and operational budgeting. The extent of use of advanced management accounting tools in strategic and operational decision-making is at a low level. Again, much lower in the SME sector. Advanced management accounting tools enable forward-looking, forecasting, substantive programming, ensuring visualisation of the information presented and use in strategic management (Alsalmi et al., 2023). The implementation of these methods provides managers with a complete analysis of data to assist in planning, organising, motivating, and controlling the implementation of the strategy adopted. The use of innovative management accounting tools, advanced applications, helps accountants to collect, evaluate and analyse the available information and develop scenarios to forecast alternatives that can be used in the future (Moll, Yigitbasioglu, 2019). The results of the study confirmed the need to develop the management accounting system using advanced technology and process automation. The use of management accounting tools to support decision-making is still little recognised empirically and is an interesting line of research, particularly in the SME sector (Kanodia, Sapra, 2016; Leone et al., 2029).

6. Conclusions

The aim of the study was to assess the application of management accounting tools in managing enterprises. The acquired results proved that in the examined economic entities, the extent of the use of individual management accounting tools varied and depended on the size of the entity. Both managers and accountants heavily utilized financial and operational budgeting, at both the operational and strategic levels. In the SME sector entities, the more advanced management accounting tools mentioned were the activity-based costing – in operational management, and the balanced scorecard – in strategic management.

Strategic management accounting tools, such as target costing, cost of quality, and the life cycle costing were indicated as being used to a low and very low extent in SME sector entities. In large entities, half of the respondents indicated the use of these tools, with the most mentioned being activity-based costing and target costing. Thus, it can be inferred from the results that management accounting subsystem was not adapted to the management needs of SME sector entities. In large entities, however, the scope of application of management accounting tools supporting management functions was significantly higher. Large entities made greater use of advanced management accounting tools, mainly in strategic management. Due to the lower extent of use of management accounting tools in SME sector entities. Table 3 presents a recommendation for their expansion.

Table 3.

Application and recommendations for implementation of management accounting tools in operational and strategic management of SME sector

Tools of the management accounting subsystem	Small entities		Medium-sized entities	
	Applied tools	Recommended tools	Applied tools	Recommended tools
Making operational decisions - short period of time				
Variable costing	☐	V	☐	V
Activity-based costing		V	☐	V
Financial budgeting	☐	V	☐	V
Operational budgeting		V	☐	V
Making strategic decisions - extended period				
Target costing		V		V
The life cycle costing		V		V
Cost of quality		V		V
Balanced Scorecard		V	☐	
Variable costing	☐		☐	
Activity-based costing		V	☐	
Financial budgeting	☐		☐	
Operational budgeting		V	☐	

☐ - tool used in large and very large extent, based on the study.

V - tool recommended for future use.

Source: own study.

Most respondents in the group of surveyed entrepreneurs and accountants saw the need to develop the management accounting subsystem, pointing to opportunities in the application of modern technologies and process automation, which allows for data processing and obtaining real-time information.

The considerations and the research results presented herein, regarding the management accounting subsystem in enterprise management, can form the basis for further scientific research in the areas of:

- assessment of reasons for the little application of advanced management accounting tools in SMEs,
- application of modern technologies supporting the use of management accounting tools,
- development of financial and accounting IT systems integrated with the management accounting tools.

The above areas are insufficiently explored and constitute interesting research directions.

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EMPLOYER BRANDING IN BUILDING EMPLOYEE RELATIONS

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Purpose: The aim of the article is to determine the importance of employer branding in building external and internal relationships with employees and candidates. The article indicates the components, tools, and benefits of a strong employer brand.

Design/methodology/approach: The research involved a study of specialized literature on employer branding, dedicated to the development of the concept as well as its theoretical and practical aspects. A total of 45 publications, including monographs and scientific articles, were used.

Findings: The article emphasizes the importance of various areas in shaping a strong employer brand and identifies tools used in employee relations, which contribute to achieving economic and social benefits. It also affects attracting and developing talent, thus shaping the organization's current and future competitive ability.

Research limitations/implications: Undoubtedly, it is worth continuing research on companies and employees in the future, verifying the importance of individual tools and their practical application. Employer brand identification can be conducted by industry, taking into account the specific conditions of the labor market.

Practical implications: Effective employer brand management can bring tangible benefits to companies and other organizations, not only by improving their position in the labor market but also by enhancing their competitiveness through the acquisition and development of top candidates. This is particularly important in growth industries that require educated employees whose competencies are sought-after.

Social implications: The theory and practice of employer branding relate to the management of organizations and shaping the attitudes of employees and candidates seeking employment. These areas undergo constant changes that require continuous recognition.

Originality/value: The results of the analysis have both cognitive and utilitarian value, especially in the context of developing and implementing a strategy for building a strong employer brand.

Keywords: employer branding, employees, talent acquisition.

Category of the paper: General review.

1. Introduction

Contemporary organizations emphasize how valuable a skilled and committed team is. Talented and dedicated employees contribute not only to achieving exceptional goals but also to developing a competitive advantage to outperform rivals in the market (Nawracaj-Grygiel, 2019). Therefore, attracting the best candidates for employment has become a strategic goal for most companies. The conditions prevailing in the labor market can be described as a “war for talent” (Pauli, 2016). To win in this competition, achieving competitiveness against other employers is crucial. A key tool in achieving this goal is employer branding.

Employer branding (EB) is an English-language term used in foreign publications that lacks a direct Polish equivalent. It is most often translated as the employer brand or image (Muszyńska, 2020). EB is a relatively new concept that officially appeared in 1990 at a conference organized in the UK by the *Chartered Institute of Personnel and Development* (Wojtaszczyk, 2010). The concept of building the image of an organization was first described in 1996 by S. Barrow and T. Ambler as a collection of functional, economic, and psychological benefits offered by the employer, through which the company is identified with these benefits (Ambler, Barrow, 1996).

In 2001, McKinsey, in the *The War For Talent* magazine, characterized employer branding as the need to develop an organization's identity as an employer in order to attract the most valuable job candidates, referred to as talents (Dąbrowska, 2014). In a more detailed view, employer branding is also defined as a long-term strategy for managing the perception and awareness of an employer in the eyes of three key groups: employees, candidates-potential employees, and other stakeholders (Mandhanya, Shah, 2010).

2. The process of creating employer branding

Taking all stakeholder groups into account, employer branding becomes two-dimensional. One part of their activities is focused on internal actions within the organization – referred to as *internal employer branding*. The other part refers to *external employer branding* (Kampioni-Zawadka, 2014). The former is primarily aimed at the company's current employees.

Activities within the organization include *internal branding*, which refers to creating a brand inside the company. This term was highlighted by Berthon, Ewing, and Hah, who assigned the actions taken to three key areas (Berthon, Ewing, Hah, 2005):

- effective brand communication directed towards employees,
- convincing employees of the value of the company's brand,
- connecting the work performed for the employer with delivering the so-called essence of the brand.

Considering the challenges organizations face in terms of attracting and managing talent, strategic actions that build a positive brand and reputation present an extraordinary opportunity to achieve competitiveness. Therefore, building the employer brand has become one of the top strategic priorities, aimed not only at more effectively attracting the most valuable candidates but also at building employee loyalty, so that instead of leaving, employees choose to grow within the organization (Nawracaj-Grygiel, 2019). In addition to increased loyalty, a strong employer brand can also positively impact employee motivation. Table 1 presents the benefits of an organization having a strong employer brand.

Table 1.
Benefits of a strong employer brand

Personal benefits	Benefits of building a brand
Improving the quality of human resources – talented employees	
• Increase in employee motivation. • Reduction of employee turnover. • Easier and shorter recruitment. • Lower costs.	• Stronger brand of the organization. • Stronger brands of the products or services offered.

Source: Wojtaszczyk, 2010, p. 21.

Contrary to appearances, the essence of employer branding is not to legitimize the organization with a strong employer brand, but rather to support it in its efforts to create value for specific stakeholder groups by meeting their expectations and needs. The positive recognition of the organization in the labor market represents an intermediate goal (Wojtaszczyk, 2010).

The literature outlines four types of approaches to achieving this intermediate goal: strategies related to human resource management, methods for building the brand, the internalization of the company's goals and values, and the company's reputation as an employer of choice (Wojtaszczyk, 2010).

The process of building an employer brand is divided into four phases, constituting one full cycle (Muszyńska, 2020):

- Phase 1 is analytical in nature. It involves diagnosing the current state by examining the present image, awareness, and consistency of the employer's message. It usually begins with determining the current identity of the organization, followed by creating a vision of the desired image. The effect of this procedure is to compare and define the image gap.
- Phase 2 is conceptual in nature. It involves selecting and creating tools, projects, or communication channels that will be used to bring the organization closer to its intended goal.
- Phase 3 focuses on implementing and executing previously planned actions.
- Phase 4 includes tasks connected with control and evaluation. The actions taken earlier are monitored and assessed for their correctness and effectiveness.

Consistency is an extremely important value in the process of building an employer brand, both in terms of overall branding activities (including external and internal communication) and alignment with the company's business strategy: its mission, vision, and development goals. The lack of integrity between the message and business decision prevents achieving a positive and authentic outcome. Communication and branding actions must be true, genuine and connected to the organization's activities in other areas (Kampioni-Zawadka, 2013).

In addition to ensuring authenticity and consistency in communication, the key components in building a strong employer brand include (Born, Kang, 2024):

- developing a distinctive, up-to-date, and unique message,
- selecting appropriate communication channels,
- providing a clear message about the organization's values, culture, and business goals,
- measuring the effectiveness of actions in attracting talent and meeting employee needs,
- using the most authentic method of promoting the organization - employee advocacy - i.e. encouraging employees to share their opinions, to recommend the organization and stand up for it,
- continuous evaluation and improvement of the Employer Value Proposition (EVP).

The Employer Value Proposition is an integral part of the employer brand and is considered a key factor in the decision-making process of prospective and current employees regarding joining and staying with the company (Pham, Vo, 2022). It determines the attractiveness and competitiveness of working in a given organization.

EVP allows to determine which employer offers more attractive conditions, and consequently, which one is considered more desirable. Changing jobs has become increasingly common when the current employer does not offer sufficiently attractive work conditions. This is confirmed by the results of a study from April 2024, in which 46% of respondents declared the offer of better financial conditions from another employer as the reason for changing jobs. 30% indicated receiving a more favorable form of employment from another organization, while 36% of respondents stated dissatisfaction with their previous employer as the reason for the change (Randstad Research Institute, 2024).

EVP serves as the foundation of the employment offer and a statement from the employer regarding the expectations it meets, while also providing information about the costs (investments) required to take full advantage of the offer. Due to the increasingly intense competition for talent, companies are trying to offer more favorable conditions, making EVP an attractive calling card. To ensure that the value proposition meets all stakeholder expectations and can serve as a competitive element of the employer brand, it should be based on five pillars: sincerity, stability, attractiveness, emotionality, and uniqueness (Wojtaszczyk, 2010).

The process of creating an attractive and convincing employer image is unique and complex. The literature identifies five key elements without which an employer brand cannot be considered complete. The first component is the strength of the organization's brand in relation to its products or services. Products of a strong brand are more positively associated and additionally more desirable than those of competitors. This psychological mechanism also applies to the labor market, where an employer associated with a strong product brand is more attractive than one with lesser recognition and reputation (Stuss, 2016).

Organizational culture is the second essential component. It is defined as the set of principles and values adopted within a given organization, referring to three elements: the environment, the organization itself, and its participants. The main factors influencing organizational culture include the impact of dominant leaders, legislation and the organization's environment, customers, the company's history and traditions, organizational structure and resources, technologies used, products and services, expectations, the applicable information and control system, the system of rewards and penalties, together with the goals, values, and beliefs of the team members (Serafin, 2015).

The third element of a strong employer brand is work-life balance, which refers to the balance between professional and personal life. Work-life balance is defined as the ability to fulfill professional obligations without compromising responsibilities in other areas of life, such as family (Delecta, 2011). In the modern labor market, a company will not attract employees if it is not able to ensure that their personal life remains unaffected.

The fourth component is the work environment and conditions, which relate not only to issues of workplace health and safety but also to the atmosphere and attitudes promoted by key members of the organization, including management and HR department (Stuss, 2016).

Motivational factors, both material and immaterial, constitute the fifth and final component that an employer can offer to employees. This category includes financial benefits, non-financial perks, the position within the company hierarchy, the type and role of the work performed, and the planned career development (Ashwini, Aparna, Sudhakar, 2011).

3. Employer branding tools in shaping external and internal relations

Employer branding serves two key functions for an organization – it attracts potential employees and also stimulates the current team members, specifically their alignment with and commitment to the organization. According to the model created by Backhaus and Tikoo, the final result of employer branding efforts is to build the employer's attractiveness and employee productivity. Figure 1 presents the structure of employer branding according to Backhaus and Tikoo.



Figure 1. The structure of employer branding – Backhaus and Tikko model.

Source: Backhaus, Tikoo, 2004, p. 505.

In order to achieve the desired outcomes, employer branding efforts must successively influence brand attachment, organizational identity, and organizational culture, which in turn affects the employer brand itself. Brand loyalty is responsible for creating the employer's image, through which the organization can gain attractiveness in the eyes of stakeholders. Organizational identity and culture directly impact employee loyalty to the brand, which in turn affects their productivity (Backhaus, Tikoo, 2004). By focusing on the values highlighted in Figure 2, organizations reach for a variety of different tools.

In the literature, employer branding tools are typically grouped into three general categories: human resource management tools, marketing tools, and tools related to the broad communication conducted by the organization (Wojtaszczyk, 2012). Table 2 presents examples of tools most commonly used in practice.

Table 1.

Most frequently used employer branding tools

Tool	Type of employer branding
Financial and non-financial incentives	internal and external
Flexible working conditions	internal and external
Modern internal communication tools – intranet	internal
Participation in contests and employer certification programs	internal and external
Employee satisfaction surveys	internal and external
Developed training system	internal and external
Clear career paths	internal and external
Internal recruitment	internal
Competitions, gamifications	internal and external
Team-building activities – events, trips	internal and external
Referral programs	internal and external
Organization or participation in industry events and initiatives	internal and external
Corporate Social Responsibility (CSR)	internal and external
Participation in job fairs	external
Activities at universities and colleges, including ambassador programs	external
Internship and trainee programs	external
Open days	external
Company social media	external
Well-developed company website	external
Career pages	external
Recruitment advertisements	external
Modern recruitment methods	external
Employee advocacy	external

Source: own study summarized after: Szczepański, 2013, p. 167 and Stuss, 2016, pp. 23-25.

One of the key issues in employer attractiveness is the use of financial and non-financial motivators. The first group includes all forms of financial remuneration for work, such as base salary, bonuses, awards, or commissions. As for non-financial benefits, the most commonly offered options are private healthcare, company equipment (phone, laptop, etc.), company cars, meal subsidies, private life insurance, fitness cards, gift vouchers, or points on cafeteria platforms (Szczepański, 2013).

Providing employees with flexible working conditions is another tool increasingly chosen by employers. Allowing employees to choose their working hours independently is becoming standard, and some organizations also implement non-standard working hours while ensuring task performance and efficiency (Gonera, 2018).

Shortening the workweek by several hours or even by one full working day has also been gaining popularity as a solution in this area (Łukaszuk, 2019). Some organizations opt for fully remote work, while many adopt a hybrid model, where they allow employees to work outside the office for a certain percentage of their time. Another increasingly common trend is the so-called “workation”, which allows employees to work from outside the country (Sidor-Rządkowska, 2022).

An extremely important tool affecting the emotional aspects of workplace attractiveness is the use of modern and effective internal communication. Properly managed communication impacts greater trust and loyalty within the team, positively fosters the sense of belonging, and reduces the feeling of isolation. It builds understanding and integration, shapes team atmosphere, and facilitates bonding, conflict resolution, and strengthening trust and loyalty (Ober, 2018). Modern internal communication tools include (Chwiałkowska, 2012):

- use of Intranet – a dedicated closed system for internal communication within an organization, typically including features such as email, document libraries, reservation mechanisms (for office spaces, conference rooms, equipment, etc.), contact lists, address books, shared schedules, calendars, and more (Adamczyk, Gębarowski, Kandefer, 2004),
- dedicated business-related communicators, e.g. Teams or Slack,
- company social media.

The use of these tools not only facilitates simple and quick communication but also improves operations, transforms organizational culture, automates decision-making processes, and creates virtual tools and spaces that strengthen internal team collaboration. As a result, these tools contribute to increased efficiency and cost savings (Kandefer, Mazurek, 2004).

Measuring employee satisfaction and evaluating offered benefits is another commonly used tool. These activities can take the form of internal surveys or external initiatives such as polls, competitions, or audit-type programs. These activities not only help assess the company's situation, create benchmarks, and compare implemented solutions with those of other participants, but also generate positive publicity and brand recognition (Berłowski, 2013).

Tools particularly valued by young employees include: training opportunities, as well as clear prospects for future development and career paths, enabling advancement in the organizational hierarchy (Szczepański, 2013). A contemporary trend is also to provide access to partner training platforms, cover education costs (including academic education, obtaining certifications, external training, or language courses), or offer a designated training budget for employees to use throughout the year (Gonera, 2018). Presenting a sample internal development path already at the recruitment stage has become essential (Otola, Raczek, 2016). An attractive initiative for employees is conducting internal recruitment and supporting team members in migrating between various company divisions and departments (Bednarska-Olejniczak, 2015).

Initiatives that positively impact employee integration and workplace atmosphere constitute another type of employer branding tool. A traditional approach involves organizing trips and team-building activities aimed at fostering bonds and a sense of community among employees, which positively influences their loyalty to the team and the entire organization. Additionally, documented trips and events can serve as promotional materials for the company, and simultaneously act as a tool to attract potential employees (Kolasa, 2017).

The group of tools supporting integration also includes competitions and gamification, which include playful activities based on group or individual competition, scored and culminating in the announcement of a winner (Woźniak, 2015). By using the desire for competition and rewards, employers can motivate employees to complete various tasks, often aligned with the organization's values, with a level of engagement that would be challenging to achieve in another way. Examples of stimulating employee behavior through gamification include (Woźniak, 2015):

- photo competitions from shared activities, meeting specific requirements,
- awarding points for daily physical activity,
- organizing meetings of groups of participants at the same level of advancement.

Another tool that combines talent attraction and employee engagement is referral programs. The essence of these programs is to acquire new candidates for ongoing recruitment by having current team members recommend or refer friends, in exchange for additional benefits, such as financial bonuses (Karolewska-Szparaga, Kołoszycz, Wilczyński, 2023).

Participating in and organizing events or industry projects are tools that also evoke a lot of interest. Such activities help gain publicity and build recognition as an expert in a given field. Examples of such activities include participating in or sponsoring industry conferences, organizing workshops, courses and webinars, running blogs, forums or social media pages, publishing articles, hosting podcasts or organizing industry-related competitions (Nazdrowicz, 2015).

The next type of tools are those related to Corporate Social Responsibility (CSR). Operating according to a coherent and distinctive CSR strategy and effectively communicating it in the labor market allows to build an image of a responsible and environmentally engaged

organization. This approach creates a competitive advantage in the eyes of many stakeholders (Berniak-Woźny, 2015).

Another type of activity is one typically aimed at external audiences: potential candidates and employees, including students. An increasing number of organizations are introducing ambassador programs, which involve collaboration with selected students whose task is to connect the student group with the organization. The ambassador directly promotes the company as a good employer, informs about internships, apprenticeships, or projects offered. They also recruit new talents from among students. More extensive academic initiatives may also include organizing classes, competitions, or funding specific initiatives (Sobczak, 2018).

Other popular external employer branding tools include: participation in job fairs, organizing open days, regular activity in social media, maintaining a well-developed and extensive company website, including a detailed section dedicated to working in the organization and career opportunities, carefully crafted recruitment announcements, modern recruitment methods such as the use of videos, quizzes and workshops, as well as the previously mentioned employee advocacy. All of these initiatives aim to positively stimulate the inflow of talent into the organization. The exact impact of employer branding activities has been described in the next section.

4. The impact of employer branding on attracting talent

In reference to the essence of employer branding defined by K. Wojtaszczyk, which involves creating value for specific stakeholder groups, one of the primary target groups are undoubtedly the future employees. All external employer branding initiatives largely focus on them (Kampioni-Zawadka, 2014).

Organizations worldwide, regardless of their size and industry, face challenges in finding and retaining best and most talented employees. This is why efforts to ensure attractiveness in their eyes are such an important matter. Employer branding can be seen as a field of work pedagogy, particularly in relation to career development and maintaining an optimal work environment. The main assumption in this area is taking care of employees through conscious and deliberate actions that align with the idea of partnership, while fostering a mentor-student (or mentor-mentee) relationship between the employer and the employee. By shaping the employer's image in this way, we simultaneously create and implement an image strategy while demonstrating care and attention to employees' interests (Bartkowiak, Szłapińska, 2014).

Only such attitude and the continuous pursuit to achieve an image of an attractive, engaged employer will allow organizations to attract the valuable candidates and to maintain their constant interest in the job market. This translates into easier and faster identification of well-matched profiles, as well as into reduced recruitment costs. Another effect of employer

branding activities that contributes to savings is an increase in employee retention, as well as a rise in the number of hires through referrals and recommendations, reducing the need to conduct or repeat the search for suitable candidates. All the benefits resulting from a strong employer brand and related to recruitment are listed in Table 3.

Table 2.

Recruitment benefits resulting from a strong employer brand

Recruitment benefits resulting from a strong employer brand
“higher quality” candidates
alignment between hired employees, managerial expectations, and organizational culture
increased interest in the employer
higher number of applications
higher rate of accepted offers
lower recruitment costs
higher employee retention
higher number of candidates from recommendations/referrals
higher probability of recommendations of the employer by employees

Source: Gallup, Employment Brand & Employee Value Proposition, <https://www.gallup.com/workplace/215378/gallup-employer-brand-employee-value-proposition.aspx>, DOA: 12.05.2024 r.

The literature indicates that a strong employer brand positively influences many aspects of an organization's life (Frankowska, 2015). The results of a 2014 study showed that the main benefits were most often associated with new employees.

The most frequently recognized benefit of employer branding activities was the ease of attracting candidates, closely followed by increased employee engagement and recognition as an employer of choice. The last mentioned benefit was the reduction in recruitment costs.

In addition to benefits directly related to recruitment, effective employer branding activities can lead to positive economic outcomes in the long term. Organizations that consistently work to be seen as attractive employers have a much greater chance of attracting the right people, and consequently, gaining a competitive advantage. This, in turn, translates into a strong financial performance. A company's good financial situation forms the foundation of a solid employer brand and also allows for covering the costs of more advanced recruitment tools and more competitive employer branding strategies (Nazdrowicz, 2015).

Talent management is another important activity in building an employer brand. It refers to all actions aimed at recognizing and acquiring talents, retaining them, and motivating them to achieve the highest goals (Morawski, Mikula, 2005). An effective policy for managing skills and potential within an organization can positively influence its attractiveness in the labor market (Kampioni-Zawadka, 2015). Nowadays, career development involves not only upskilling but also reskilling, which means acquiring entirely new skills in a different field or even a complete career change. Employees are therefore looking for organizations where their opportunities will not be limited to just one position or even one potential area of expertise (Li, 2022).

Assuming that every individual has developmental potential, and that providing the right conditions is enough to reveal it, it can be presumed that each employee, when surrounded by proper care and support, can achieve exceptional results (Kampioni-Zawadka, 2003). The challenge for the employer is to provide an environment conducive to development, thus meeting the employees' needs while also aligning their growth with the company's strategic goals (Bartkowiak, Szłapińska, 2014).

When paying attention to many aspects of employer branding activities, it is easy to notice that, in addition to the image-related benefits, they are also a source of profits resulting from the proper stimulation of human resources. Employees themselves decide on the use of individual resources, so only through care for their engagement and dedication can the organization achieve success.

Human resources are also crucial in developing competitiveness, which, in rapidly growing industries, is the fundamental goal of every company.

5. Conclusions

The foundation of success for modern organizations lies in skilled and engaged employees. However, labor market conditions make acquiring and retaining the best talented candidates exceptionally difficult. In the face of these challenges, innovative recruitment and an attractive employer branding strategy have become a necessity.

Due to strong competition and the gaps in experienced and educated specialists, employers must ensure that their job offers are attractive and that the values and image of the organization encourage candidates to join the team.

Key decision-making factors when choosing an employer include the opportunities for development and flexibility, especially in the context of changes and remote work. In the practice of companies and employees, understanding and knowledge about employer branding seem to be insufficient, as evidenced by the high variability in job positions. In practice, the impact of both financial and non-financial tools is constantly being evaluated. The demographic situation and differences in attitudes of successive generations entering the labor market also play a significant role in this process.

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VAT IN POLAND AND SELECTED EUROPEAN UNION COUNTRIES

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Purpose: The aim of this study is to identify how the VAT rate in Poland compares to other European Union countries. Additionally, the article aims to emphasize the essence of harmonization of the tax systems of EU countries in the context of this tax and to point out problems with its collection. The study aims to identify similarities and differences in the VAT structure and rates.

Methodology: This study employed a comparative analysis to examine the VAT system in Poland and selected European Union countries. The research covers Poland and other EU Member States, with the analysis based on data from 2023, which remains valid in the following year. Secondary data were sourced from the Official Website of the European Union. A comparative analysis of standard VAT rates and reduced rates across EU countries was conducted, focusing on both their number and values. The data were also subjected to statistical and descriptive analyses.

Findings: The results of the study indicate that the tax arrangements for goods and services tax vary across EU Member States. This variation arises from EU regulations, which allow for a degree of discretion by setting only a lower limit for the standard rate. Member States are then permitted to apply rates suited to their individual needs, provided they comply with EU requirements. Compared to the approaches adopted in other countries, Poland's standard VAT rate is higher than the EU average. Consequently, in the majority of Member States, the standard VAT rate is lower than 23%. This can be viewed positively from the perspective of generating greater tax revenue for the state budget, or negatively from the taxpayer's viewpoint, who directly bears the cost of this tax, which impacts the price of goods and services subject to the rate. In Poland, two reduced rates are applied, a common practice in EU countries. These rates apply to a specific group of goods and services, thereby supporting citizens' ability to purchase them. There is a difference of 3 percentage points (p.p.) between these rates in the Polish tax system, which can be seen as a relatively narrow range of reduced rates compared to other EU Member States. Non-compliance remains a problem for VAT collection. The problem raised is that consumers have no incentive to ask for an invoice because they prefer to buy products and services without additional VAT included in the purchase price. The carousel and missing trader frauds mentioned in the text also pose a significant threat to VAT harmonization.

Originality: Although VAT is one of the main sources of budget revenues in European Union countries, there are only few studies comparing in detail the differences in its structure between Poland and other EU countries. Research so far focuses mainly on the general principles of

harmonization, ignoring detailed differences in VAT rates. This study aims to fill this gap. This article examines the differences and similarities in the VAT systems of individual EU Member States, using examples from across the EU, in comparison with the solutions adopted in Poland. It is aimed at entrepreneurs planning to enter foreign markets, as well as anyone interested in VAT.

Keywords: VAT, European Union, harmonisation, reduced rates.

Category of the paper: Literature review.

1. Introduction

Taxes are a common public levy applied in nearly all countries worldwide. However, each country has a different approach to structuring this aspect of its economy, leading to variations between national tax frameworks. Taxes paid by the public form the foundation and cornerstone of the economy. The need for tax harmonization appeared for the first time in the European Union (Peci, 2017). By uniting Europe, the European Union aims to achieve tax harmonisation, which involves aligning the tax systems of the Union's Member States as closely as possible and establishing common norms and standards (Kuraś, 2009). The harmonization process started with the first Council Directive of April 1967 and continued through subsequent directives. This process included the adoption of VAT and the ongoing convergence of rates and structures among Community members. Over the years, the European Commission has developed various proposals aimed at standardizing VAT rates and harmonizing its structure. An important part of the debates on the practical implementation of unified VAT rates were issues related to determining the ranges in which VAT rates should fall, the selection of products subject to a reduced rate and resolving problems related to the application of a zero rate to selected goods (Frenkel, Razin, Symansky, 1991). Harmonisation of tax systems is essential, as one of the EU's primary tasks is to create an internal market based on the four freedoms: the movement of goods, capital, services, and people (Kuraś, 2009).

Tax harmonisation is a necessary component of increasing integration. As a general principle, the higher the degree of integration between states, the more permanent the internal links between them become, and the greater the need for tax harmonisation. In such a context, the development of foreign investment would be facilitated, and individual EU Member States would no longer be able to compete by lowering taxes. In the long term, this could lead to financial instability and undermine public finances. Furthermore, tax harmonisation would help prevent potential conflicts arising from tax differences between countries on shared economic matters, such as transport or agriculture (Kuraś, 2009).

For the most part, EU Member States are reluctant to implement the tax changes required by the Union, which consistently enforces the provisions of the Treaty. Harmonisation encompasses both direct and indirect taxes and aims to establish similar tax conditions across Member States (Piłatowski, 2012).

Value-added tax (VAT) is particularly attractive as a revenue instrument in environments about weak law enforcement. However, non-compliance remains a problem for VAT. This is obvious in the case of business-to-business relationships and consumers (B2C), due to the fact that consumers have no incentive to ask for an invoice and prefer to buy products and services without VAT (Naritomi, 2019). In this situation, there is scope for companies to evade the contract and collusion between the company may occur and the client. So at the end of the value chain, VAT has a last mile problem (Beuttner, Tassi, 2023). Another problem is carousel or missing trader fraud. In 2012, Michel Aujean pointed out that that carousel fraud may be the most obvious and inevitable consequence of an insufficiently harmonized VAT system in intra-EU trade (Aujean, 2012). Eleven years later, Ilir Murtezaj still notes that despite great efforts, the tax systems of EU member states have not yet been fully harmonized (Murtezaj, 2023).

Value-added tax is a cornerstone of state revenue for the members of the European Union. However, tax policies vary across countries, resulting in different regulations governing VAT. Over the years, the European Union has sought to harmonise this aspect, but this remains challenging due to the variation in rates between countries. Harmonising these rates could lead to price increases – in countries with lower rates – or a reduction in tax revenue in countries with higher rates. In 1992, a minimum level for the goods and services tax rate was established for Member States. The standard rate must be no less than 15%, while for reduced rates, the VAT rate must not fall below 5%. The Fourth Directive outlines which goods and services can be subject to reduced rates. However, in 1996, the maximum standard VAT rate was set at 25% (Kuraś, 2009).

The document outlining the common VAT rules for all Member States is Council Directive 2006/112/EC of 28 November 2006 on the common system of value-added tax (OJ L 347, 11.12.2006, pp. 1-118). It sets out mandatory standards that must be applied, and national VAT systems must be adapted to comply with the requirements of the Directive. The common system applies up to and including retail sales. The Directive defines both the scope of the subject and the scope of the object, specifying rate levels, exemptions, and many other important aspects. However, the guidelines contained in the legislation often allow some flexibility for Member States. For example, Article 97 states that the standard VAT rate should be higher than 15%, meaning it can be set at any rate between 16% and 23%.

The Council of the European Union adopted the aforementioned Directive, considering a range of factors that influenced its final content. The changes introduced by this document's entry into force significantly impacted the regulations previously adopted by the Member States. As a result, a transitional period was established, during which each country had time to amend its legislation to comply with the terms of the Directive. The Directive also specified the rules for international transactions within the European Union during the transitional period (Council Directive 2006/112/EC of 28 November 2006 on the common system of value-added tax, OJ L 347, 11.12.2006, pp. 1-118).

In addition to domestic transactions, EU Member States also engage in international trade among themselves. These transactions are classified as intra-Community acquisitions of goods or intra-Community supplies of goods, depending on the entity's position in the transaction. Such transactions occur when both the seller and the buyer are subject to VAT. If the taxpayer meets the formal requirements to obtain an identification number from the relevant Member State, they may apply a 0% VAT rate. This is advantageous for taxpayers, as it ensures that the VAT rate of another country does not apply, which could otherwise discourage international transactions. This system has a positive effect on the economic development of Member States (Więckowski, 2021).

Intra-Community acquisition and intra-Community supply are analogous to the concepts of import, i.e. bringing goods into one's own country (Słownik języka polskiego PWN, Księgarnia internetowa [PWN Polish Dictionary]), and export, i.e. selling goods or services abroad (Słownik języka polskiego PWN, Księgarnia internetowa). However, these terms apply exclusively to transactions between economic operators within the European Union. Such transactions are harmonised in the context of value-added tax, with uniform rules applicable across all Member States, irrespective of national VAT regulations. This harmonisation promotes greater freedom and facilitates the development of international transactions (Ministry of Finance, podatki.gov.pl).

2. Research Results

Comparison of Basic VAT rates

All EU Member States are required to apply a goods and services tax within their tax systems and to comply with the European Union's regulations, which stipulate that the standard VAT rate should be no less than 15%. This condition is fulfilled by all Member States (see Table 1).

Table 1.
Basic VAT rates in EU countries

EU Member State	Basic rate	Relationship to EU requirement
Austria	20%	+ 5 p. p.
Belgium	21%	+ 6 p. p.
Bulgaria	20%	+ 5 p. p.
Cyprus	19%	+ 4 p. p.
Czech Republic	21%	+ 6 p. p.
Germany	19%	+ 4 p. p.
Denmark	25%	+ 10 p. p.
Estonia	20%	+ 5 p. p.
Greece	24%	+ 9 p. p.
Spain	21%	+ 6 p. p.
Finland	24%	+ 9 p. p.

Cont. table 1.

France	20%	+ 5 p. p.
Croatia	25%	+ 10 p. p.
Hungary	27%	+ 12 p. p.
Ireland	23%	+ 8 p. p.
Italy	22%	+ 7 p. p.
Lithuania	21%	+ 6 p. p.
Luxembourg	17%	+ 2 p. p.
Latvia	21%	+ 6 p. p.
Malta	18%	+ 3 p. p.
Netherlands	21%	+ 6 p. p.
Poland	23%	+ 8 p. p.
Portugal	23%	+ 8 p. p.
Romania	19%	+ 4 p. p.
Sweden	25%	+ 10 p. p.
Slovenia	22%	+ 7 p. p.
Slovakia	20%	+ 5 p. p.

Source: Own study based on the Official Website of the European Union,
https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 April 2023.

The standard tax rate on goods and services, as set by legislators in individual EU Member States, varies, as shown in Table 3. Each country applies a specific rate established by national regulations that comply with EU requirements. Despite being subject to common regulations, differences in rates between countries arise because these regulations are not rigid and allow for a certain degree of flexibility. In the context of the standard VAT rate, only a minimum rate is mandated.

In all Member States of the European Union, the standard rate of goods and services tax ranges from 17% to 27%, inclusive. This represents a range of 10 p.p., highlighting a significant disparity between the lowest and highest rates applied across countries. Eleven distinct standard VAT rates are implemented throughout the European Union. Notably, the only rate between 17% and 27% that is not applied in any Member State is 26%.

The most common standard VAT rate in European Union countries is 21%, which is applied in six Member States: Belgium, the Czech Republic, Spain, Lithuania, Latvia, and the Netherlands. This rate is lower than the 23% rate applicable in Poland. In contrast, the rates of 17%, 18%, and 27% are each applied in only one Member State: Luxembourg, Malta, and Hungary, respectively.

The lowest standard VAT rate applicable within the European Union is 17%, which is only applied in Luxembourg. This rate is 2 p.p. higher than the minimum required rate of 15%. In comparison to Poland's standard VAT rate, the Luxembourg rate is 6 p.p. lower. Consequently, each PLN net of sales of goods and services subject to this rate generates PLN 0.06 more revenue for the Polish state budget than would be the case if Poland applied the Luxembourg rate.

The highest standard VAT rate applicable within the European Union is 27%, which is only applied in Hungary. This rate is 12 p.p. higher than the minimum required rate of 15%. In comparison to Poland's standard VAT rate, the highest rate is 4 p.p. higher. Consequently,

each PLN net of sales of goods and services subject to this rate generates PLN 0.04 less revenue for the Polish state budget than would be the case if Poland applied the rate in Hungary.

The geographical distribution of VAT rates across European Union countries is shown in Figure 1. Poland has the highest standard VAT rate compared to the rates of its neighbouring Member States. The distribution of rates varies according to the geographical location of the countries. Higher rates are generally applied in the northern and southern parts of the European Union, while lower rates tend to be found in the centrally located countries.

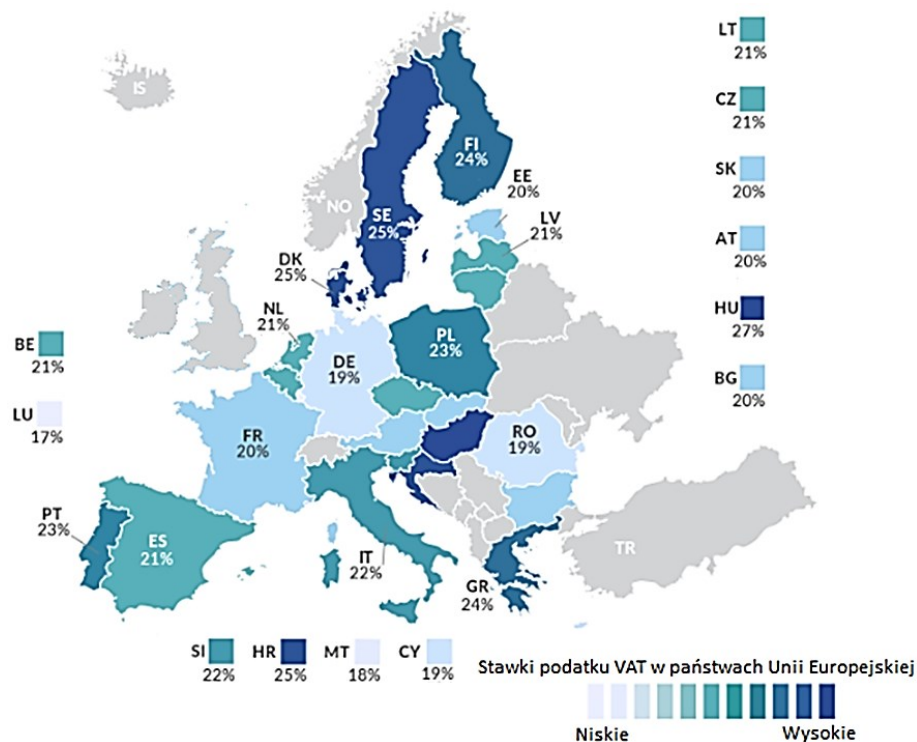


Figure 1. Geographical distribution of standard VAT rates in the European Union.

Source: own study based on: European Commission, 'Taxes in Europe Database v3', and Asquith R., 'Vat & GST rates 2023', https://files.taxfoundation.org/20230130150714/VAT_Rates_2023.png?_gl=1*1evf6vs*_ga*MjE0NTE5NTMwNC4xNjgyNDQyOTg0*_ga_FP7KWDV08V*MTY4MjQ0Mjk4NC4xLjEuMTY4MjQ0MzI4My42MC4wLjA, 5 April 2023.

The arithmetic mean of the standard VAT rate in the European Union is approximately 21.52%. This average is higher for some countries and lower for others. The value of 21.52% represents the hypothetical standard VAT rate that would exist in each country if the rates were averaged, taking into account all the rates currently in force. A comparison of the rate in Poland and selected EU countries to the arithmetic mean of all Member States is shown in Figure 2.

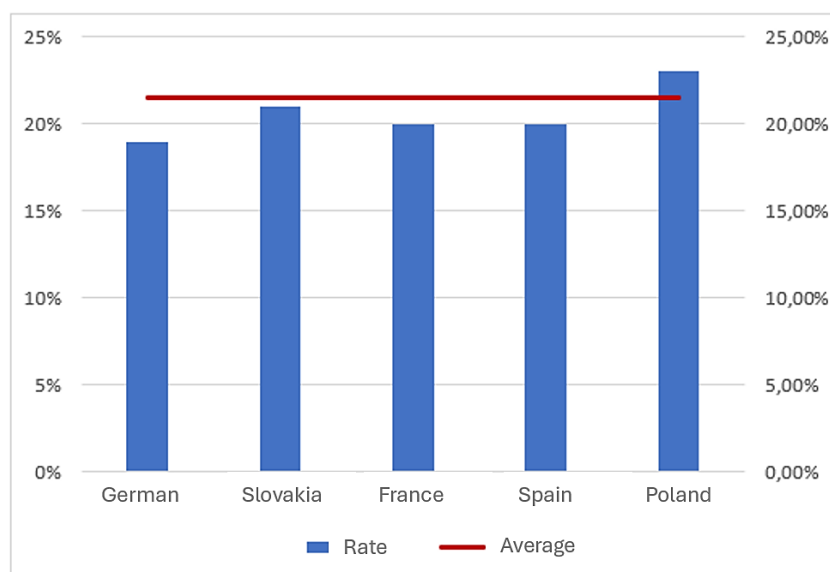


Figure 2. Comparison of VAT rates of selected countries in relation to the EU arithmetic mean.

Source: own study based on the Official Website of the European Union, https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 May 2023.

All of the countries selected and described above, when compared with Poland, have a lower VAT rate than both the rate applied in Poland and the arithmetic mean of all EU countries (Table 2).

Table 2.

Deviation of VAT rates in selected countries from the EU average

State	VAT rate	Deviation from EU arithmetic mean
Germany	19%	-2.52 p.p.
Spain	21%	-0.52 p.p.
Slovakia	20%	-1.52 p.p.
France	20%	-1.52 p.p.
Poland	23%	+1.48 p.p.

Source: own study based on the Official Website of the European Union, https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 March 2023.

Germany has the lowest basic VAT rate in the comparison above, with a rate of 19%. This is 4 p.p. higher than the minimum required by the Community and 4 p.p. lower than the rate applied in Poland. The rate in Germany is also approximately 2.52 p.p. lower than the EU average. For this rate to exceed the EU average, it would need to be increased by more than 2.52 p.p., e.g., by 3 p.p., bringing it to 22%. Even then, the German rate would still be lower than the rate applied in Poland. The 4 p.p. difference corresponds to an additional PLN 0.04 for every PLN net of sales of goods or services subject to VAT, meaning the Polish state budget receives PLN 0.04 more for every PLN of sales under the Polish VAT rate compared to the German rate.

In both Slovakia and France, the basic VAT rate is 20%, which is 1 p.p. higher than the rate in Germany. This means that goods and services subject to this rate in France and Slovakia contribute PLN 0.01 more to the state budget from each PLN of net revenue from sales

compared to the German rate. The Slovak and French rates are 3 p.p. lower than the basic rate in Poland. This implies that for every PLN of net revenue from sales, the state budget receives PLN 0.03 more when applying the Polish VAT rate of 23%.

The 20% rate applied in France and Slovakia is 1.52 p.p. lower than the EU average rate, meaning these countries can be classified among those with a basic VAT rate lower than the average rate across EU Member States.

The standard VAT rate in Spain is 21%, which is higher than in the other countries compared to Poland in Figure 1. This rate is 2 p.p. lower than the rate applied in Poland, meaning that with the Spanish rate, the inflow to the state budget from VAT on each net PLN of sales would be PLN 0.02 lower. Additionally, the Spanish rate is 0.52 p.p. lower than the EU average, which represents a smaller difference than that seen in the other countries compared to Poland.

In Poland, the only country analysed in Figure 1, the basic VAT rate is higher than the EU average, which classifies Poland as a country with a higher VAT rate compared to the rest of the European Union. The rate applied in the Polish tax system is 1.48 p.p. higher than the arithmetic mean of all EU Member States, which constitutes a small difference. For transactions between Member States, the rates applied in other countries are not relevant, as such transactions are classified as intra-Community supplies of goods in the case of exports, or intra-Community acquisitions of goods in the case of imports. In such cases, they are tax-neutral for the parties involved in terms of value-added tax (Table 2).

3. Comparison of Reduced VAT rates

In addition to the standard VAT rate, which applies to the broadest category of goods and services, EU Member States also apply reduced rates. These reduced rates have a more limited scope, as they apply only to selected goods and services. The number, amount, and scope of these rates are determined individually by each state through national legislation, in accordance with EU law (Table 3).

Reduced VAT rates result in lower revenue for the state budget from the sale of goods or services subject to the reduced rate, which may affect the price of these goods and their accessibility to the poorest citizens. Reduced VAT rates are often applied to goods that meet basic living needs, as discussed in Chapter Two, where VAT regulations in selected countries are presented (Table 3).

Table 3.*Amount and quantity of reduced VAT rates in EU countries*

EU Member State	Reduced VAT rates	Number of reduced VAT rates	Difference between rates (if two)
Austria	13%, 10%	2	3 p.p.
Belgium	12%, 6%	2	6 p.p.
Bulgaria	9%	1	-
Cyprus	9%, 5%	2	4 p.p.
Czech Republic	15%, 10%	2	5 p.p.
Germany	7%	1	-
Denmark	-	0	-
Estonia	9%	1	-
Greece	13%, 6%	2	7 p.p.
Spain	10%	1	-
Finland	14%, 10%	2	4 p.p.
France	10%, 5.5%	2	4.5 p.p.
Croatia	13%, 5%	2	8 p.p.
Hungary	18%, 5%	2	13 p.p.
Ireland	13.5%, 9%	2	4.5 p.p.
Italy	10%, 5%	2	5 p.p.
Lithuania	9%, 5%	2	4 p.p.
Luxembourg	8%	1	-
Latvia	12%, 5%	2	7 p.p.
Malta	7%, 5%	2	2 p.p.
Netherlands	9%	1	-
Poland	8%, 5%	2	3 p.p.
Portugal	13%, 6%	2	7 p.p.
Romania	9%, 5%	2	4 p.p.
Sweden	12%, 6%	2	6 p.p.
Slovenia	9.5%, 5%	2	4.5 p.p.
Slovakia	10%	1	-

Source: own study based on the Official Website of the European Union, https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 March 2023.

The majority of EU Member States implement reduced VAT rates in their tax systems. The only exception is Denmark, which applies a standard rate of 25% (see Table 3), relatively high compared to the rates in other countries. The remaining countries apply either one or two reduced rates, with a clear predominance of those applying two rates (Table 3).

Only one reduced VAT rate is applied in seven Member States, with rates ranging from 7% to 10% in these countries. The lowest of these reduced rates is applied in Germany, while the highest, 10%, is applied in Slovakia. The remaining countries, with the exception of Denmark, which does not apply any reduced rate, have introduced two reduced rates (Table 3).

The highest reduced rate, as well as the highest standard VAT rate, is set by the Hungarian tax system at 18%. This makes Hungary's first reduced rate higher than the standard rate applied in Luxembourg. Conversely, the lowest reduced rate in the European Union is 5%, which is applied in ten countries. It is important to note that the 5% rate is only used in countries with two reduced VAT rates, where it is the lower of the two. This differs from Hungary, which has both a reduced and a standard VAT rate, and from Luxembourg, which, although it has the lowest standard rate, does not have the lowest reduced rate. Luxembourg's single reduced rate is 8%, which is 3 p.p. lower than the lowest reduced rate currently in use (Table 3).

The largest difference, 13 p.p., can be observed in the reduced VAT rates applied in Hungary, where the second reduced rate is 5%, which is the same as the second reduced rate in Poland. However, in Poland, the spread between the reduced VAT rates is among the smallest in the European Union, amounting to just 3 p.p., just as in Austria. In contrast, the smallest rate difference is found in Malta, where the rates are 7% and 5%, respectively. These rates are only 2 p.p. apart, indicating a much smaller gap compared to the spread in Hungary (Table 3).

The countries whose VAT systems have been compared and analysed in detail differ in their approach. Germany, Slovakia, and Spain apply only one reduced VAT rate, while France and Poland have two reduced VAT rates (Figure 3).

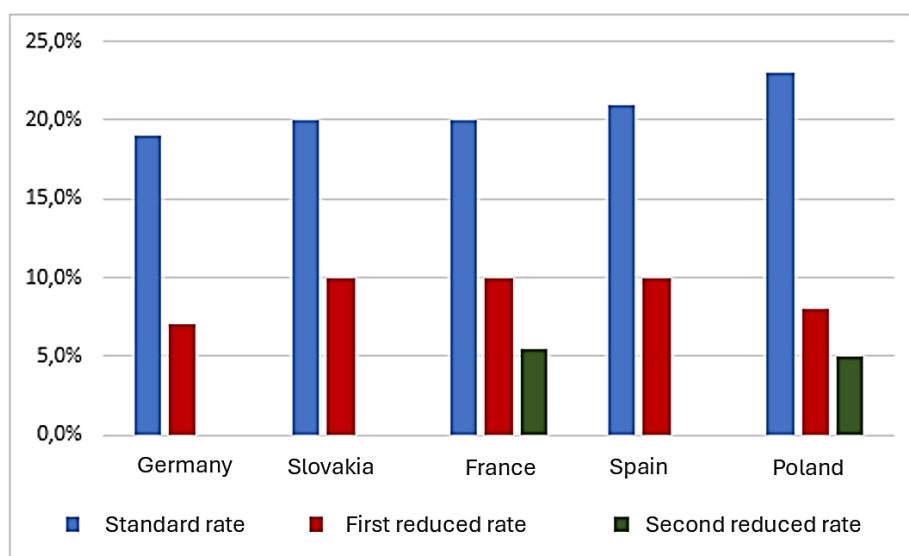


Figure 3. Comparison of standard VAT rates with reduced rates in selected countries.

Source: Own study based on the Official Website of the European Union, https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 March 2023.

The highest reduced VAT rate is 10%, which applies in Slovakia, France, and Spain. This rate is 11 p.p. lower than the standard rate in Spain, representing the largest difference among the three countries. By contrast, the difference in France and Slovakia is 10 p.p., as Spain's standard VAT rate is 1 p.p. higher than that of France and Slovakia (Table 4).

The lower reduced VAT rates are found in Poland and Germany, where they are 8% and 7%, respectively. The Polish reduced rate is 2 p.p. lower than those applied in countries with a 10% rate, while the German rate is 3 p.p. lower. The gap between the standard VAT rate and the reduced rate in Poland is 15 p.p., which is the highest in the entire comparison. In Germany, the difference is similar, amounting to 12 p.p. These differences are greater than in the other countries, with the Polish case specifically reflecting the fact that the basic rate is relatively high, while the reduced rate is low (Table 4).

Only France and Poland have a second reduced VAT rate. These rates in both countries are at a similar level, with the French rate set at 5.5% and the Polish rate at 5%, resulting in a 0.5 p.p. difference between the two. The second reduced VAT rate differs from the first reduced rate by 4.5 p.p. in France, where the rates are more spread out compared to the Polish

system. In Poland, the spread is 3 p.p. The lower of the reduced rates in France is 14.5 p.p. lower than the standard VAT rate in that country. In Poland, on the other hand, the difference is 18 p.p., which is greater than the French difference. This disparity directly reflects the difference in the standard VAT rates between Poland and France, which amounts to 3 p.p. (see Table 4).

Table 4.
Comparison of differences between VAT rates

State	Basic rate	First reduced rate	Second reduced rate	Difference between standard and first reduced rate	Difference between the first reduced and second reduced rate
Germany	19.0%	7.0%		12 p.p.	
Slovakia	20.0%	10.0%		10 p.p.	
France	20.0%	10.0%	5.5%	10 p.p.	4.5 p.p.
Spain	21.0%	10.0%		11 p.p.	
Poland	23.0%	8.0%	5.0%	15 p.p.	3 p.p.

Source: own study based on the Official Website of the European Union, https://europa.eu/youreurope/business/taxation/vat/vat-rules-rates/index_pl.htm, 10 March 2023.

4. Conclusions

According to the literature, the tax arrangements applied to value-added tax vary between EU Member States. This variation arises because EU regulations permit a degree of discretion, establishing only a minimum threshold for the standard rate. Each country can then apply a rate that suits its specific needs, provided it complies with the EU requirements.

Thanks to a comparative analysis of the basic VAT rate on goods and services in Poland, with the amount of this rate in the European Union countries, it can be seen that this rate in Poland is higher than the EU average, which means that in most Member States the basic VAT rate is lower than 23%. Poland has the fourth highest basic VAT rate in the EU, tied with Ireland and Portugal. This rate is 6 percentage points higher than the lowest applied in the EU. This can be seen positively from the perspective of generating greater tax revenues for the state budget or negatively from the perspective of the taxpayer who pays such tax, which has a direct impact on the prices of goods and services covered by this rate.

Poland applies two reduced VAT rates, a practice common among European Union countries. These rates are designated for a specific group of goods and services, aiming to support their acquisition by citizens. In the Polish tax system, there is a 3 p.p. difference between the two rates, which can be described as a relatively small range of reduced rates compared to other EU Member States.

Taxes paid by society are the foundation and key element of the economy. The need to harmonise taxes in the European Union emerged with the desire to unify tax systems and establish common standards. This process began in 1967 and was continued through subsequent

regulations. The European Commission has developed numerous proposals for VAT harmonisation, including the definition of rate ranges, the selection of products covered by a reduced rate and the rules for applying the zero rate. Tax harmonisation supports the functioning of the EU single market, based on the free movement of goods, capital, services and people.

It should be emphasized that non-compliance with the regulations still remains a problem for VAT collection. Noticed issue of consumers not having the incentive to ask for an invoice because they prefer to buy products and services without additional VAT included in the purchase price. The above-mentioned carousel and missing trader frauds also pose a significant threat to VAT harmonization.

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THE USE OF VIRTUAL REALITY IN MANAGEMENT AND BUSINESS ACADEMIC EDUCATION PROCESS – OPPORTUNITIES AND LIMITATIONS

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Purpose: The rapid growth of technology can be responsible for new approaches to teaching. The development of Virtual Reality facilities and technology can significantly reshape the academic education process. This paper aims to identify the opportunities and limitations to discuss the potential benefits and challenges of Virtual Reality (VR) for management and business academic education processes.

Methodology/approach: The method used was an in-depth literature study based on an electronic basis, e.g., SCOPUS, for theory background. In the empirical part, qualitative research using a case study with observation support was conducted. The study is exploratory in nature due to the uniqueness of the activities studied in VR provided by the Business Process Simulation Center situated at the Wroclaw University of Economics Campus. In the article, two research questions were asked: (RQ1) What are the opportunities of using virtual reality in the management and business academic education process? (RQ2) What are the limitations and barriers to using virtual reality in the management and business academic education process?

Findings: The research allows the author to identify that by using VR and making various decisions, the students can observe their impact on the simulated environment. Users can repeatedly attempt and refine their skills, allowing for continuous development and learning in a safe, simulated environment. This approach addresses one of the main challenges of modern education, especially higher education, and the gap between theory and practice. It is one of the reasons for the often difficult transition that graduates face when encountering the challenges of their early careers.

Originality/value: The main value and contribution is identifying the list of VR advantages and disadvantages as a potential challenge for management and business education institutions.

Keywords: Virtual Reality, management education, merchandising.

Category of the paper: Research paper.

1. Introduction

The last few years have shown that due to rapid technological development, the subject of Virtual Reality (VR) has been of great interest to researchers from various fields. VR has become a topic of great importance in industry, medicine, communications, and education. Teaching using virtual reality is associated with visualization through illustrative examples and the safety of teaching, as well as with experience and connection with didactic games in an online environment. Didactic games in virtual reality are a suitable motivational element for involving pupils or students in teaching. This VR technology can significantly reshape the academic education process. Didactic games primarily interest pupils and engage them voluntarily. The secondary benefit of these activities is learning and fulfilling the set of learning objectives (Pecina, Andrisiunas, 2023). Today, VR is based on the nature of presence, interactivity, and immersion, and understood as “VR leverages immersive technologies to simulate interactive virtual environments or virtual worlds with which users become subjectively involved and in which they feel physically present” (Wohlgenannt et al., 2020).

The article focuses on analyzing VR's theoretical and practical aspects as a tool in the education process. This paper aims to investigate the opportunities and limitations of using VR in the management and business education process. For the purposes of this article, a double bibliometric analysis of the SCOPUS electronic database was carried out (1 for keywords - Virtual AND Reality and 2 for keywords - Virtual AND Reality AND Higher AND Education) to determine the state of the art. The exploratory study was used to answer the research questions: (RQ1) What are the opportunities of using virtual reality in the management and business academic education process? (RQ2) What are the limitations and barriers to using virtual reality in the management and business academic education process? The type of qualitative research was selected, and a case study with observation support was chosen as the research method. The presentation and evaluation of the Merchandising course conducted at the Business Process Simulation Centre of the Wroclaw University of Economics provides a deeper and broader understanding of the potential of VR. This paper's main contribution is identifying attributes for the use of VR in higher/academic education and the future potential for Universities. By incorporating VR into the classroom, educational institutions may prepare their students to work professionally. This paper also highlights VR's capacity to engage, educate, and empower students in management fields, emphasizing its strengths and role as a catalyst for educational innovation as well.

2. Virtual Reality and its educational potential - theoretical background

Virtual reality (VR) is a technology already used and defined by Steuer (1992) as a “real or simulated environment in which a perceiver experiences telepresence” over 30 years ago (Song, 2024). There are many definitions in the literature regarding virtual reality, but despite VR having also been widely used in various areas, such as industry, medicine, architecture, meteorology, or aviation in the past decade, its definition is not unified. Virtual reality, augmented reality (AR), and their variations were identified as computer interface techniques that consider the tridimensional space. In this space, the user acts in a multi-sensorial way, exploring aspects of this space through viewing, hearing, and tact (Piovesan et al., 2012). Some scholars posit that virtual environments or worlds displayed on monitors are different from VR because presence and immersion as its characteristics are absent (Berg, Vance, 2017); Although the technology has changed drastically throughout the years, the similarities in definitions remain in current literature “VR is a three-dimensional computer-generated simulated environment, which attempts to replicate real world or imaginary environments and interactions” (Abbas et al., 2023).

Virtual reality is characterized by three basic ideas: *Immersion* (the user has the real sensation of being inside the virtual world of the computer. Devices that make this sensation: digital helmets and digital cave), *Interaction* (the user manipulates virtual objects. Devices that make this sensation: digital gloves), *Involvement* (exploring of a virtual environment, it's as if the user took part of the virtual world and he can interfere directly in result of the application, the user can navigate on the virtual environment in a passive or active way) (Piovesan et al., 2012).

VR can enhance the sense of presence, immersion, and interactivity (Makransky, Petersen, 2021; Wohlgenannt et al., 2020). According to Girvan, the VR environment allows multi-user interactions and provides “shared, simulated spaces which are inhabited and shaped by their inhabitants who are represented as avatars” (Girvan, 2018).

Today VR possesses multiple defining characteristics that make it a distinctive technology (Berkman, Akan, 2024): a key element of VR is its ability to induce a sense of presence (North, North, 2016), which can be described as a sense of ‘being there’ in the virtual environment (VE) (Bareišytė et al., 2024). Moreover, interaction is possible in VR and often achieved using hand-held controllers, 3D-tracked data gloves, or motion suits (Caserman, Garcia-Agundez, Konrad, Goobel, Steinmetz, 2019; Seo, Jung, Kim, 2024). These characteristics make VR a unique realistic technology, by combining user control and 360° immersion within a simulated environment (Bowman, McMahan, 2007). With the development of digital technologies, presence, and immersion can also be displayed in virtual worlds such as metaverses.

Most recently, Wohlgenannt et al. (2023), based on the nature of presence, interactivity, and immersion, understood VR as “VR leverages immersive technologies to simulate interactive virtual environments or virtual worlds with which users become subjectively involved and in which they feel physically present”.

Due to rapid technological development, the subject of Virtual Reality has been of great interest to researchers from various fields. For the purposes of this article, the bibliometric analysis of the SCOPUS electronic database was performed (keywords – Virtual AND Reality). The results show a huge number of documents and an increase in the number of articles over the last four years - 204 674 between 1990 and 2024 (Figure 1).

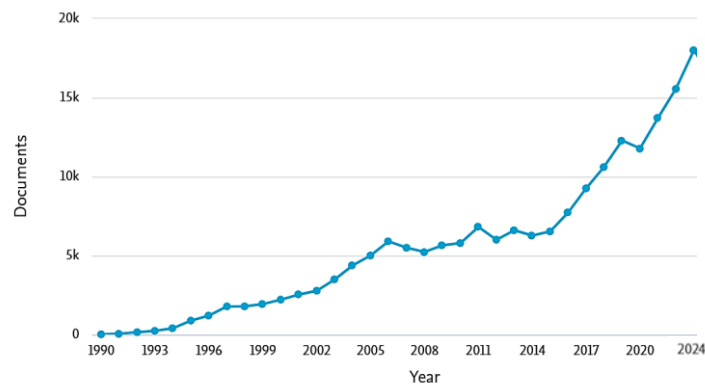


Figure 1. Documents by the year – keywords: Virtual AND Reality (1990-2024).

Source: SCOPUS base: <https://www.scopus.com/term/analyzer.uri?sort=plf-f&src=s&sid=f0e13acf6b693bf591e79fd0aa5bb1e&sot=a&sdt=a&sl=34&s=TITLE-ABS-KEY%28virtual+AND+reality%29&origin=resultslist&count=10&analyzeResults=Analyze+results>

Analyzing documents by subject area (Fig. 2) shows that articles in Computer Science (31,9%) and Engineering (20,5) dominate and reach over 52% total. However, it is more interesting that the analysis showed that the share of the business and management field was only 2.9%, and it was placed in the Other section.

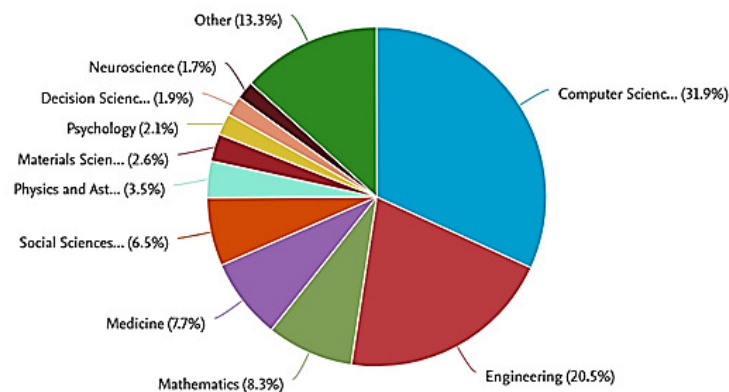


Figure 2. Documents by the subject area - keywords: Virtual AND Reality (1990-2024).

Source: SCOPUS base: <https://www.scopus.com/term/analyzer.uri?sort=plf-f&src=s&sid=f0e13acf6b693bf591e79fd0aa5bb1e&sot=a&sdt=a&sl=34&s=TITLE-ABS-KEY%28virtual+AND+reality%29&origin=resultslist&count=10&analyzeResults=Analyze+results>

Digital transformation has affected using VR in many areas, including the economy, industry, health, communications, and education as well. Virtual reality in higher/academic education has gained considerable importance, providing students and learners with immersive experiences. Students learn complex topics by entering a realistic virtual world where they can

talk, make decisions, and learn while interacting with 3D simulations and objects. Such applications have led to an increased demand for virtual reality in education (Fortune Business Insights, 2024). The global virtual reality in education market size was valued at USD 14.55 billion in 2023. The market is projected to grow from USD 17.18 billion in 2024 to USD 65.55 billion by 2032, exhibiting a CAGR of 18.2% during the forecast period. The U.S. Virtual Reality in Education Market is anticipated to grow significantly, reaching an estimated value of 11.36 billion by 2032, driven by Innovations in VR-based Assessment Evaluation and Personalized Learning Experiences (Fortune Business Insights, 2024).

To assess scientists' interest level in using VR in higher education, a second bibliometric analysis of the SCOPUS electronic database was carried out (keywords – Virtual AND Reality AND Higher AND Education). The results show only 3,429 documents in 1994-2024 (Fig. 3), and the 2% for Business and Education (Fig. 4).

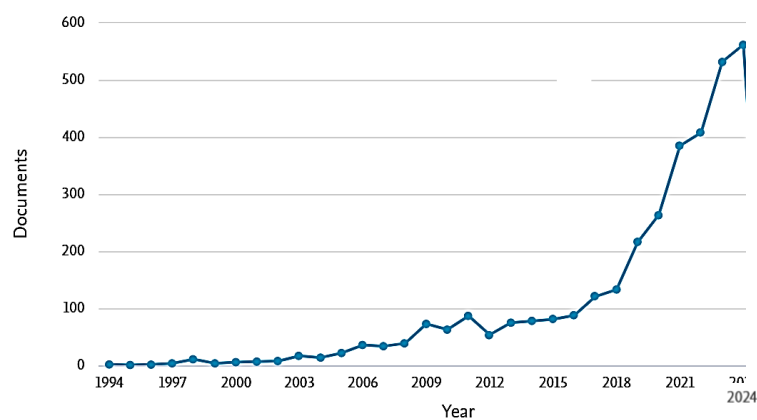


Figure 3. Documents by the year (for searching: virtual AND reality AND higher AND education).

Source: <https://www.scopus.com/term/analyzer.uri?sort=plf-f&src=s&sid=f0e13acfacb693bf591e79fd0aa5bb1e&sot=a&sdt=a&sl=47&s=TITLE-ABS-KEY%28virtual+reality+higher+education%29&origin=resultslist&count=10&analyzeResults=Analyze+results>

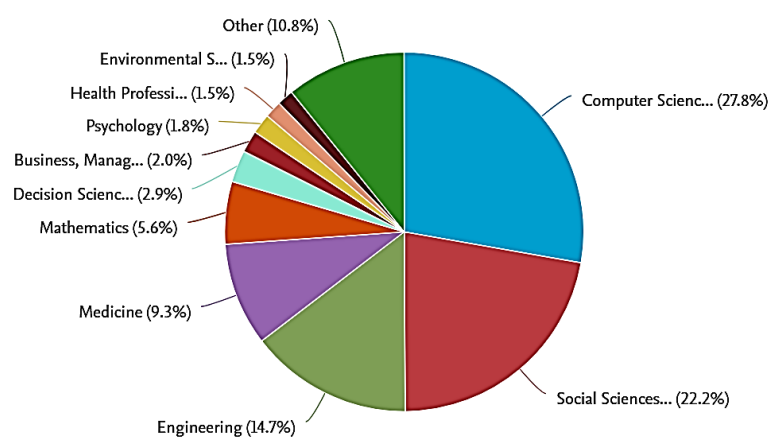


Figure 4. Results for searching - Documents by subject area (for searching: virtual AND reality AND higher AND education).

Source: <https://www.scopus.com/term/analyzer.uri?sort=plf-f&src=s&sid=f0e13acfacb693bf591e79fd0aa5bb1e&sot=a&sdt=a&sl=47&s=TITLE-ABS-KEY%28virtual+reality+higher+education%29&origin=resultslist&count=10&analyzeResults=Analyze+results>

The results of searching 1 and 2 were summarized and compared in Table 1, allowing us to identify the top five positions and determine the place of the field of Business and Management.

Table 1.

Comparison of bibliographic reviews results 1 and 2 - Ranking of subject areas

Ranking 1	Subject Area	Number of results Searching 1	%	Ranking 2	Number of results Searching 2	%
1	Computer Science	120148	31,9	1	1774	27,8
2	Engineering	77494	20,5	3	938	14,7
3	Mathematics	31191	8,3	5	594	5,6
4	Medicine	29220	7,7	4	1416	9,3
5	Social Sciences	24525	6,5	2	359	22,2
(...)				(...)		
12	Business, Management and Accounting	6017	2,9	7	126	2,0

Note: Ranking 1 (Results for Virtual AND Reality); Ranking 2 (Results for Virtual AND Reality AND Higher AND Education).

Source: Own by Scopus Base.

Although VR has proven its effectiveness in the field of general education, the scientific literature is scattered and still presents limited studies about its use in management and business academic education processes – only 126 (2%). For this reason, further research is needed to determine how VR technology can improve higher education in this field. Therefore, an exploratory research gap was identified.

The next step was a literature review to determine the current state of knowledge and formulate research questions. Considering the analysis of the literature and available research on VR in higher/academic education in management and business, it can be stated that the introduction of virtual reality in education has revolutionized learning and teaching practices by fostering interactive experiences that engage students and enhance their understanding of complex subjects (Fortune Business Insights, 2024). To address a wide range of educational objectives, higher-education institutions have been incorporating an emphasis on developing both hard and soft skills in addition to traditional learning practices (Vogler et al., 2018). These skills include problem-solving strategies, teamwork, and communication abilities. Pursuing hands-on experiential learning paradigms to go beyond traditional learning approaches is often the best strategy for higher education (Terkaj et al., 2024). Numerous researches evaluating the use of immersive training in education have shown encouraging effects in terms of learning; with VR in the classroom, keeping students interested throughout the lesson and making learning and their experiences unforgettable is significantly more straightforward. VR promotes communication, enhances cognitive abilities, including memory retention, and increases motivation in the learning process (Gudoniene, Rutkauskiene, 2019). In particular, the feeling of being immersed in a learning environment helps individuals concentrate and remember knowledge; thus, VR education is particularly advantageous (Javaid et al., 2024). In addition, VR enables experiential learning by allowing learners to participate

actively in simulated experiences, experiments, or simulations. Learners can engage in hands-on activities, experiments, and problem-solving tasks within virtual environments, gaining practical skills, insights, and knowledge through trial and error. This experiential learning approach fosters critical thinking, creativity, and problem-solving skills by encouraging exploration, experimentation, and discovery (Fortune Business Insights, 2024). Virtual laboratories based on virtual reality and other digital technologies offer a valuable means of immersing students in realistic scenarios (Terkaj et al., 2024).

The main advantages of using virtual reality in higher education can therefore be summarized through the following arguments in the individual assessed areas (Pecina, Andrišiusas, 2023):

- **Safety.** There is no danger of an occupational accident in virtual reality. Dangerous and risky actions and activities can be tried without endangering the health and life of participants and their colleagues. There are also no financial risks associated with damage to expensive equipment and tools in case of inappropriate handling during the teaching and learning process.
- **Maximum visualization of teaching and learning.** All senses can be engaged in virtual reality stimulating the learning process. Things and events can be shown literally from every possible point of view and in different situations and settings.
- **Measurable progress in education.** Virtual reality enables more effective acquisition of intellectual and psychomotor skills. It allows learning progress to be recorded in individual areas, providing invaluable feedback to the learners and allowing them to adapt their pace and learning style to obtain new intellectual and psychomotor skills.
- **Use of gamification elements.** Due to their technical design, simulation and interactive software for virtual reality can be considered like computer games that use the advantages of didactic games in an electronic environment. Thus, virtual reality provides information and develops learning in a funny way through funny activities in teaching while stimulating the learning process.
- **Economic efficiency.** There is no need for expensive consumables or the purchase of expensive gadgets and accessories in virtual reality. It can be argued that interactive learning software for virtual reality is expensive in itself, but once the educational institution acquires it, there is no need to purchase any additional accessories. Everything happens in virtual space.

Javaid et al. (2024) identify additional attributes for the use of VR in higher/academic education - by incorporating VR into the classroom, educational institutions may prepare their students to work professionally. The instructors may recreate professional conditions using VR for students in many fields like corporate management, engineering, aviation, medical surgeries, etc. Students may get used to a previously unknown professional setting with such

simulations - educators may use VR to train engineering students about different facets of their professions, and medical students may rehearse procedures without endangering patients using VR (Javaid et al., 2024).

Virtual reality also has its reserves and disadvantages. The main reserves or disadvantages of using virtual reality in education can be summarized using the following arguments (Pecina, Andrisiunas, 2023):

- Virtual reality is, in fact, an illustrative preliminary stage of professional training for the real performance of a given activity. It is still only a "faithful substitute for reality" for the purpose of more effective and economically efficient professional training for the performance of given expertise.
- Virtual reality does not solve everything; it simulates activities and actions. The real world looks and can behave differently. There are always situations and circumstances that cannot be simulated and pretended.
- If virtual reality is not linked to artificial intelligence, there will be no automatic evaluation of individual steps and actions of the learning subject nor any other form of active adaptation of the educational process to the learner based on the achieved educational progress. In that case, a trained expert (trainer or instructor; teacher) must be available to do it.
- The relatively high equipment cost and the necessity of training the teaching staff.

Innovations in VR-based assessment evaluation and personalized learning experiences are emerging as a result of increased market demand. With the integration of advanced technologies such as artificial intelligence and machine learning, VR platforms offer immersive and interactive assessment methods, enabling educators to evaluate students' knowledge and skills more comprehensively and engagingly. Moreover, the implementation of virtual reality in education also encourages active learning, critical thinking, and problem-solving skills, empowering students to take ownership of their education and develop a deeper understanding of the subject matter (PARP Report 2024).

Taking the above into account the following research questions were asked: (RQ1) *What are the opportunities of using virtual reality in the management and business academic education process?* (RQ2) *What are the limitations and barriers to using virtual reality in the management and business academic education process?*

3. VR in Management academic education process – Merchandising course in Wroclaw University of Economics - case study

3.1. Research method

In the literature review, Virtual Reality has been shown to offer promise in education and development, and as VR and other technologies become more mainstream in higher/academic educational institutions, students of business and management need opportunities to work with VR for not only their learning but also their future careers. Given the gaps identified and the research questions, the research project was prepared.

To achieve the aim of the article and answer the research questions, a qualitative research method was selected, using the case study technique. The study is exploratory in nature due to the uniqueness of the activities studied in VR provided by the Business Process Simulation Center situated at the Wroclaw University of Economics Campus. Secondary publications on BPSC and Flexsim software, interviews published with the Director of BPSC, and American creators of the software used were used as sources of information. Primary sources were also used in the form of participant observations, conversations with students, and the author's own experiences resulting from the work of the author of the article on the game Merchandising, of which she is the main author.

The primary study in the form of participant observation was based on Merchandising courses that were conducted in the academic year 2023/24 in the field of Business Management - 1 group of full-time students (English version) and Management (Polish version) in full-time and part-time studies (3 groups in total). Totally, approx. 80 people were observed.

3.2. Analysis of Case Study - Merchandising course in Wroclaw University of Economics and Business

According to Prof. K. Nowosielski, originator, and manager of the Business Process Simulation Center (BPSC) at the Wroclaw University of Economics and Business (WUEB) - “BPSC is an original, ultra-modern research and didactics facility designed for the interactive simulation of business processes. It was incorporated into the WUEB infrastructure in 2022. This facility goes far beyond the solutions applied at Polish or even European universities. It was specially designed to allow comfortable work with process models, both when it comes to process design and its visual simulation. In its own way, it meets the requirements of the Industry 4.0 concept but is applied in an academic environment. In addition to the aforementioned virtual decision-making games, which in themselves are a novel and original use of FlexSim software, BPSC is a unique facility” (fig. 5a and 5b).

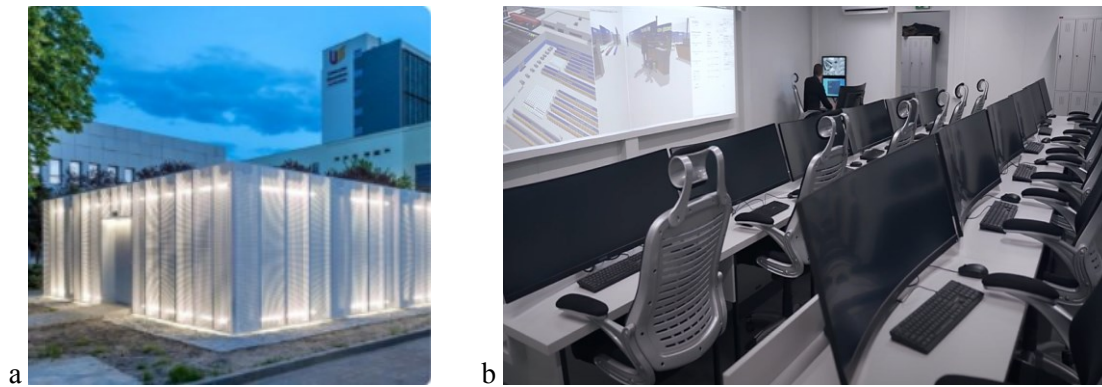


Figure 5. Business Process Simulation Center at the Wroclaw University of Economics and Business.

Source: WUEB web page.

The Merchandising course was designed for the 3rd year of Bachelor's studies. The classes at BPSC consist of half of the exercises intended for students, i.e. 8 hours. The simulation for this course, together with the Virtual Reality version, includes taking on one of three available roles: Store Manager, Sales Representative, or Customer. The player makes decisions regarding merchandising and checks the results by observing changes in KPIs or in Virtual Reality. As the Store Manager, the player's task is to design the store. This involves determining the size of the store and other parameters, such as the layout of the doors and the number of windows. The player can also implement one of the predefined shelf layouts or arrange them independently. They can also decide whether certain goods will be on sale. The goal of the player is to maximize profits by increasing sales. The Sales Representative, on the other hand, must ensure that their brand of products sells as well as possible. Therefore, they must decide where in the store to place their products to maximize sales.

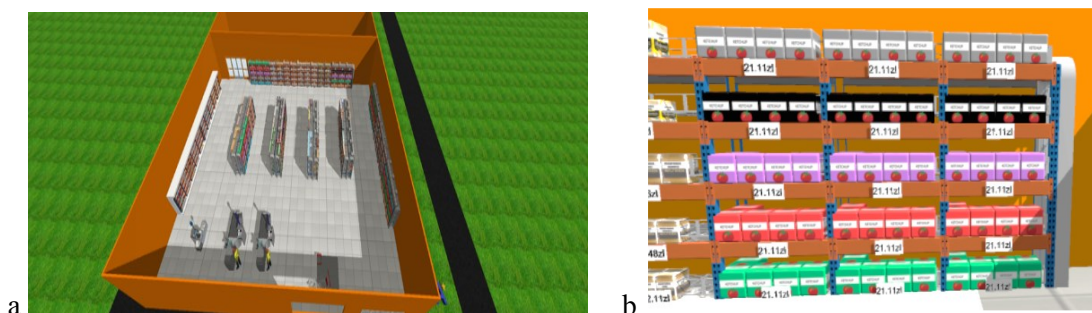


Figure 6. Merchandising simulation.

Source: Author's sources.

The role in the VR zone is the customer, whose task is to enter the virtual store to shop in VR mode (figure 7a and 7b). Depending on the scenario, the customer may need to buy specific categories of products. The store they shop in can be random or created by one of the “managers” to test the effectiveness of other players’ actions in different roles. After each shopping session by the “customer,” their recorded route and the places where they made product choices can be reviewed.

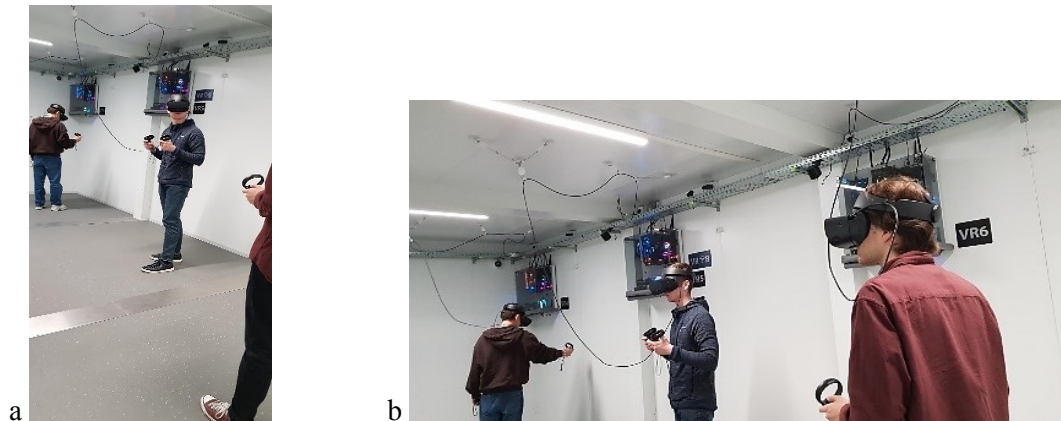


Figure 7. Virtual Reality zones – Merchandising.

Source: Author's sources.

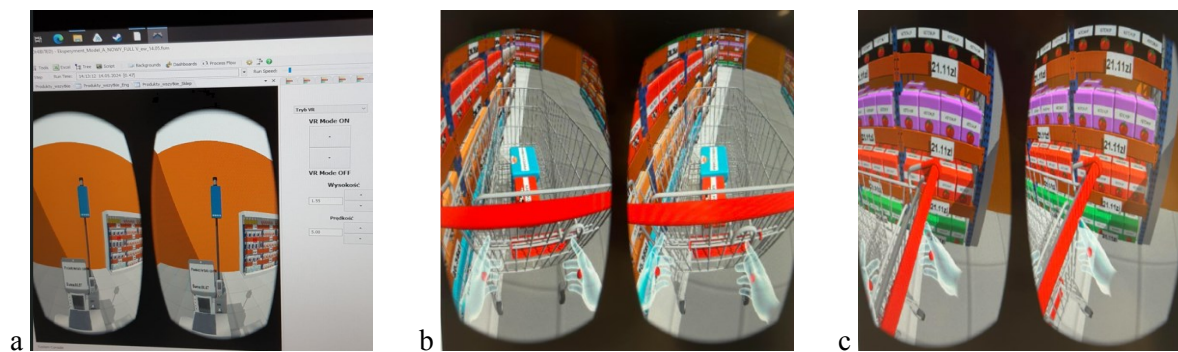


Figure 8. Virtual Reality view - using the VR goggles.

Source: Author's sources.

Gathering the information from the observation, the list of VR advantages and disadvantages by Pecina, Andrišiusas (2023), and Javaid et al. (2024) was applied to identify the opportunities and limitations of using VR in management and business academic education. Table 2 presents the results broken down into specific types of VR advantages and disadvantages and additional attributes for using VR found by the Author.

Table 2.

Advantages of using virtual reality – summary of evaluation based on the Merchandising course using simulation and VR in the Business Process Simulation Center

Advantages of using virtual reality in education	Evaluation based on the Merchandising course using simulation and VR in BPSC
Safety	Director of BPSC: - We copy real processes and managerial problems from business and implement them in software. Thus, students can play the role of managers and decision-makers, realistically affecting the process performance without leaving the WUEB campus Teacher: - There are no financial risks associated with damage to expensive equipment and tools in case of inappropriate handling during the teaching and learning process or the cost of study visits in real shops as well. - All negative consequences affect only the virtual model, not the actual enterprise.

Cont. table 2.

Maximum visualization of teaching and learning	Director of BPSC: - BPSC offers 20 high-performance PC stations powered by FlexSim, including 6 independent VR workstations, which allow the users to visualize and interact with the designed processes in a computer-generated environment with objects that appear to be real. Software/environment Providers - It provides the ability to design a process using 3D graphics objects, both in terms of active and passive process participants, i.e. the resources used in the process and so-called flow items. This is a very important feature, especially when we consider the expectations of students of the Z-generation regarding the graphical presentation of the contents of the class. - Visualizing the process models in 3D, as well as in VR, helps us, academic teachers, reach the audience better. The next thing is FlexSim's high flexibility, which allows us to design and visualize not only typical production or service processes but also to show, for example, the flow of documents, which is of great importance to academic teachers leading such management courses as management control, cost or management accounting. Students: - It was a very real experience - like being in a real store. Being able to move around the store, pick up items, and put them in my shopping basket really captures the real shopping experience.
It shapes creativity and prepares for the profession	Software/environment Providers: - The academic staff use these games during their classes. Most of the events and parameters are described by probability distributions, thanks to which each game is different – the disruptive situations, like, for example, the breakdown of machinery and equipment, the absence of an employee, or the introduction of a new tax by the country to which we import our goods is random. - The students learn the specifics of particular issues, gaining knowledge and experience that will pay off in the future when encountering similar problems in real life. As for the technical aspects, the game keeps track of the consequences of the user's decisions. - The user can dynamically react to such changes and witness the consequences of their decisions. - In these games, users take on various roles such as manager, director, or employee in any sector. Teacher: - Things and events can be shown literally from every possible point of view (manager, company owner, customer) and in different situations and settings. Students: - In a few minutes, I can learn the consequences of my merchandising decisions and all KPIs (after simulating one day of work) for the store I created. I can also learn the probable behavior of customers in this store using VR.
Measurable progress in education	Director of BPSC - The game also allows validation on multiple fronts. What is happening is visible, and the reactions to the decisions made are immediate. When a student makes a decision, he can see the results visually in the virtual space, as well as in the statistics and results that appear immediately. That makes a big difference and is an important aspect of the process. Software/environment Providers: - It is an innovative software with exceptional analytical capabilities that can quickly process as many experiments, optimizations, and simulations as you need to make the most favorable business decisions and get the best possible results. Teacher: - This experience allows users to better understand the importance of their decisions and observe the effects almost as if in real life. Their presence in the game can be further enhanced through interaction with existing objects, making them active participants in the process rather than mere observers. Users can verify whether the planned scenarios are physically feasible, which further increases the realism and educational value of the simulation.

Cont. table 2.

Use of gamification elements	Director of BPSC: - <i>The users of BPSC have at their disposal dozens of virtual decision-making games centered around logistics, production, and service process models.</i> - <i>These games are used as teaching aids during classes, allowing users to get acquainted with the 3D model of the process and its flow.</i> Software/environment Providers: - <i>It is a very good environment for decision-making games.</i> - <i>Such simulations provide users with valuable knowledge and experience necessary for tackling similar challenges in real life. During the game, users can make mistakes and learn from them. These mistakes can lead to various problems.</i>
Economic efficiency	Director of BPSC: - <i>This object sets new standards regarding the complexity of intelligent solutions for building management systems (BMS) and access control, making it extremely user-friendly but also cost-effective.</i> - <i>Thanks to the implemented "audio-video cloud" integrated with BMS, or virtual reception, the users can access a unique, fully automated, highly efficient, and economical platform.</i>

Source: based on: Witkowska-Cempel, 2022, pp. 23-24; Kogut, 2023, pp. 20-23; Żuchowicz, 2024, pp. 41-43; Greenwood, 2024, pp. 26-30; The author's materials are the interviews with students and participants' observations.

Table. 3

Disadvantages of using virtual reality – summary of evaluation based on the Merchandising course using simulation and VR in the Business Process Simulation Center

Disadvantages of using virtual reality in education	Evaluation based on the Merchandising course using simulation and VR in BPSC
An illustrative preliminary stage of professional training	Director of BPSC: - <i>The information is needed - It allows students to understand that their decisions matter. When they are faced with a problem or a situation that requires a decision, information is critical. The more data, the better. The more accurately informed the student, the more accurate the decision they can make. This is what we teach them in games: that they need information. When they have it, they can develop a plan, set a direction, and thus make wise decisions. In this way, we teach students that every decision has consequences, which can be positive and beneficial or negative and costly.</i>
Participant Health and Safety Concerns and Restrictions	Director of BPSC: - <i>BPSC has its own rules of use, which apply to both students and teachers.</i> - <i>We have also limited the number of people who can use the VR chambers simultaneously for safety reasons.</i> Students: - <i>I have never used VR, and I am afraid to put on the VR goggles.</i> - <i>I have a severe visual impairment, and I cannot use VR without my own glasses. VR goggles can damage my glasses.</i> - <i>After putting on the VR glasses, I felt dizzy. I did not know I would react like this and had to stop the exercise.</i> Teacher: - <i>It is necessary to provide all participants with information regarding contraindications to the use of VR.</i> - <i>It is necessary to have a person in the class who supervises the student's work in VR and can react in a dangerous situation to the student's health.</i> - <i>If not all Students can use VR, the final grade cannot be made dependent on this part of the class.</i>

Cont. table 3.

VR does not solve everything. There are situations and circumstances that cannot be simulated and pretended	Software/environment Providers: - <i>All negative consequences of simulation affect only the virtual model, not the actual enterprise. Users can repeatedly attempt and refine their skills, allowing for continuous development and learning in a safe, simulated environment. However, it is still only a simulation.</i> Teacher: - <i>Such simulations provide users with valuable knowledge and experience necessary for tackling similar real-life challenges. However, this depends on the teacher's knowledge of possible action scenarios that appear in market practice and the decisions necessary to understand.</i>
No automatic evaluation of individual steps and actions of the learning subject nor any other form of active adaptation of the educational process	Students: - <i>My absence from classes at BPSC means that I am not able to learn all the simulation functionalities and VR capabilities quickly enough.</i> - <i>The assessment should not promote those students who have more experience than me in using VR technology.</i> Teacher: - <i>It is necessary to divide the project concerning the shop space management and the location of the assortment into smaller parts.</i> - <i>The greater or lesser manual dexterity of students in operating hand controllers differentiates them in terms of the effects achieved in VR.</i>
The relatively high cost of equipment and the necessity of training the teaching staff	Director of BPSC - <i>BPSC- this facility is the outcome of project PORTAL – Integrated Programme for WUEB Development, and this project is co-financed by the European Union.</i> Teacher: - <i>Learning the functionality of both the simulation system and VR is time-consuming and requires additional training, which increases cost.</i> - <i>Developing VR projects and improving them to make them more attractive means making changes to the system, thus increasing the costs of operating the center.</i>

Source: based on: Witkowska-Cempel, 2022, pp. 23-24; Kogut, 2023, pp. 20-23; Żuchowicz, 2024, pp. 41-43; Greenwood, 2024, pp. 26-30; The author's materials are the interviews with students and participants' observations.

The case study based on the Merchandising course and comparison of the advantages and disadvantages of using VR in the educational process provided valuable insights into higher education. The analysis of the collected information indicates the importance of specific opportunities and limitations. This allows the Author to identify that by using VR and making various decisions, the students can observe their impact on the simulated environment. Users can repeatedly attempt and refine their skills, allowing for continuous development and learning in a safe, simulated environment. This approach addresses one of the main challenges of modern education, especially higher education, and the gap between theory and practice. It is one of the reasons for the often difficult transition that graduates face when encountering the challenges of their early careers. After a semester of this research, student opinions were positive toward the future implementation of VR in their educational process. By allowing students to assume roles such as store managers or sales representatives in a simulated environment, VR fosters experiential learning that helps students understand real-world dynamics. This hands-on approach aligns with the increasing demand for soft and hard skills in the labor market.

The compatibility of software with virtual reality (VR) technology significantly enhances the realism of decision-making. With VR goggles, users can immerse themselves in a simulated shop in a previously designed virtual store, providing an even deeper immersion in the game world. However, the main problem is the cost and time for preparing the simulation and training for teachers.

4. Conclusions, limitations, and future research

The study highlights the transformative potential of Virtual Reality (VR) in the field of management and business education. VR bridges the gap between theoretical knowledge and practical application by providing immersive and interactive learning environments. Entrepreneurs and universities continue to emphasize the need for closer cooperation between the education system and the professional sector. The dynamically changing requirements of the labor market press educational institutions to adapt their curricula to the current needs of employers. Introducing specialized courses supported by new technologies such as VR can significantly increase the chances of young people finding a satisfying job after completing their education. Such cooperation is crucial to preparing future generations for the challenges of the changing labor market.

The findings of this study offer several practical implications for the integration of Virtual Reality into management and business education, e.g. a competitive advantage for Universities. Institutions that adopt VR in their programs can differentiate themselves in a competitive education market. Offering cutting-edge learning experiences can attract prospective students and meet the expectations of employers seeking skilled graduates. The next is the cost efficiency in the long time. While initial investments in VR technology can be high, the long-term savings in consumables (e.g., materials and physical spaces) and the ability to replicate scenarios repeatedly without additional costs make VR a cost-effective tool for educational institutions. The study's limitations include the VR participants' nature as computer game users. Students who are heavy users were potentially more familiar with the technology. This allowed for relatively smooth use of handheld VR controls, which might have aided the experience of merchandising games and virtual reality shopping. Future research steps can be taken to build on this study's results. More studies are needed to compare these results in other academic disciplines or courses with the potential to refine student perceptions of virtual reality in higher education. Future research should also consider longitudinal studies to build on the insights gained from this study. Investigating the long-term effects of VR-based learning on student career success and skill retention would offer valuable insights into its efficacy. In the future, the new evaluation metrics can be created. Developing standardized tools and methodologies of evaluation is crucial to comprehensively assess the cognitive, behavioral, and emotional outcomes of VR-based higher education.

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ARTIFICIAL INTELLIGENCE IN STUDENT LIFE – OPPORTUNITIES AND THREATS

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Purpose: The aim of this article is to assess the role of artificial intelligence (AI) in the daily lives of students and to present the opportunities and threats it brings.

Design/methodology/approach: The study analysed the literature on the development of artificial intelligence and its use in education. Compilations and reports on AI were analysed. The study was conducted by means of a Google survey distributed to students at the Bydgoszcz University of Technology.

Findings: Artificial intelligence, while demonstrating human-like abilities such as learning, critical thinking and problem solving, but raises a variety of emotions. Currently, however, its role should focus on repetitive tasks, which would allow teachers to pay more attention to the individual needs of students. Unlike science disciplines such as mathematics, AI should focus primarily on supporting this aspect of education rather than replacing it.

Research limitations/implications: Future research may be related to the creation of mentoring programmes in the area studied.

Practical implications: The results of the study can be used as input for the design of training programmes in the study area.

Social implications: Artificial intelligence (AI) in higher education presents huge opportunities. It helps to personalise learning, access knowledge faster and automate tasks. However, it also brings risks, such as plagiarism, dependence on technology, and reduced critical thinking skills. Appropriate use of AI is key.

Originality/value This article is mainly addressed to education professionals who want to implement and correctly use artificial intelligence in the teaching process.

Keywords: Technology in Learning, Challenges of AI, Benefits of AI, Future of Learning.

Category of the paper: Research paper.

1. Introduction

The rapid development of technology is significantly impacting the modern world. One of the key developments in this field is artificial intelligence. These developments are leading to an exponential increase in the amount of information being processed. The increasing

amount of digital data and the greater capacity of storage media mean that electronic devices are acting as repositories for large collections of personal data. With the development of technology, cybercrime is also increasing.

The origins of artificial intelligence (AI) date back to the early 1950s (Rózanowski, 2007), when Alan Turing, a British mathematician and computer scientist, published *Computing Machinery and Intelligence*. In it, he introduced the concept of the Turing test to assess the intelligence of machines. This test was based on a text-based interaction between a human and a computer, without the possibility of eye contact. A judge, interviewing a human and a computer, was to judge which of the interviewees was a machine. If the computer was able to convince the judge that it was a human, it was considered to have passed the test and showed a certain level of intelligence (Semprik, 2023).

The concept of ‘artificial intelligence’ is difficult to define unambiguously, due to the lack of a precise definition of intelligence itself. There are many attempts to define it. Stern defined intelligence as the ability to adapt to new conditions and perform new tasks. According to Spearman, it means the ability to perceive relationships and dependencies, and Ferguson considered it to be the ability to learn. Intelligence encompasses the ability to process information at the level of abstraction, enabling a creative approach rather than a merely mechanical action. At the end of the 20th century, it was limited to intellectual abilities, but today it is seen as the ability to integrate emotional, motivational and interpersonal spheres (Łazarska, 2010).

The main objective of this article is to assess the role of artificial intelligence (AI) in students' daily lives by identifying its potential benefits and risks, based on the results of a survey. The article aims to show how students perceive AI. The survey conducted shows how students use AI in their studies, time organisation, creative work and personal life.

2. Artificial intelligence – opportunities and threats

The importance of artificial intelligence (AI, artificial intelligence) has been growing in recent years. Initially, the subject was mainly addressed in science fiction literature, but now there is increasing attention to the need for appropriate legislation. There are also opinions pointing to the possibility of using AI-based tools in relations between citizens in everyday life and in dealing with state authorities, including in court procedures (Załucki, 2021). Artificial intelligence is becoming a widely used tool.

Artificial intelligence (AI) is a broad term that refers to the ability of computer systems to perform tasks that require human intelligence. It includes areas such as evolutionary algorithms, heuristics, genetic algorithms, expert systems, artificial neural networks and fuzzy logic. One of its key areas is machine learning, which allows systems to learn and improve from data, without the need for explicit programming.

Machine learning is based on algorithms that iteratively analyse input data (training datasets) to make judgements, improve performance and predict unknown data. Different types of machine learning can be distinguished, including:

- Supervised learning: the system trains itself on a predefined dataset, which enables precise inference when analysing new data.
- Unsupervised learning: The system is presented with a set of data and then identifies patterns and relationships between them on its own.
- Reinforcement learning: The system learns by interacting with its environment in pursuit of a specific goal. The process is based on a trial-and-error method in which successes are rewarded by updating network parameters (Matulionyte, 2021).
- Deep learning: A specialised form of machine learning that uses complex neural networks with many hidden layers. The more complex the problem, the more layers the model contains (Hurwitz, Kirsch, 2018).

Each of these methods differs in the degree of supervision and human intervention in the learning process, adapting to different data analysis needs and challenges.

The increased interest in the subject of artificial intelligence (AI) in many research centres around the world has resulted in concrete solutions that are already finding widespread practical application. These include (Zestawienia, 2024):

- Technologies based on fuzzy logic, used to control processes in factories, especially when data is incomplete.
- Expert systems, i.e. advanced databases with artificial intelligence, allowing questions to be asked and answers to be obtained in natural language, successfully used in medicine and pharmacy.
- Machine translation of texts, e.g. the SYSTRANS system.
- Neural networks, used for approximation, interpolation, pattern recognition and classification, compression, prediction, control and association, among others.
- Data mining, supporting information analysis, knowledge extraction and practical conclusions.
- Optical recognition, including identification of people from facial images and automatic detection of objects in satellite images.
- Speech recognition, used in content identification, speaker and person recognition, commonly used in commercial applications.

- Handwriting recognition, used in masse to automatically sort letters or operate electronic notepads.
- Artificial creativity, including the generation of poetry, composition and interpretation of musical pieces, which can be difficult to distinguish from works created by humans.
- Economics, where AI is helping to assess creditworthiness, create customer profiles and plan marketing campaigns using data-driven automatic learning such as customers' credit histories.

These applications demonstrate the diversity and potential of artificial intelligence in many areas of life and the economy.

Artificial intelligence (AI) was launched to apply humans to the world, thought processes, planning, communication and perception. Its goal is to improve human intelligence and replace humans in situations where their cognitive capabilities are available in utility applications. In the context of the use of AI in education, a question arises: can we ask about the process of shaping intelligence? What could be the health consequences? Will citizenship in 60 years, in which there is an intelligent person who is in the notification about the operation of AI in the teaching system, will be important?

These issues also raise doubts as to whether a student who is 'offloaded' from the learning process by AI will actually benefit. Indeed, it may well be that AI's business philosophy, with its focus on optimisation and increasing efficiency, will be counterproductive in education. In business, AI facilitates company-customer interactions, but is a similar approach to the relationship between the learner and the education system appropriate? It may be that AI solutions designed for businesses will prove inadequate or even harmful if implemented in education without deeper reflection. What passes for optimisation in business does not necessarily translate into better results in teaching, especially in areas such as poetry or art - for example, learning more works in less time does not equate to deeper understanding or a genuine fascination with art (Fazlagić, 2022).

According to data compiled by Statista, the artificial intelligence market will reach a value of more than \$184 billion in 2024, an increase of nearly 50 billion compared to the previous year. This momentum is forecast to continue, with the market expected to exceed \$826 billion by 2030 (Zestawienia statystyczne, 2024).

The largest US companies from the healthcare and venture capital sectors are investing heavily in artificial intelligence-based technologies, such as medical diagnostics and remote patient monitoring. A key factor driving these investments is the aging U.S. population.

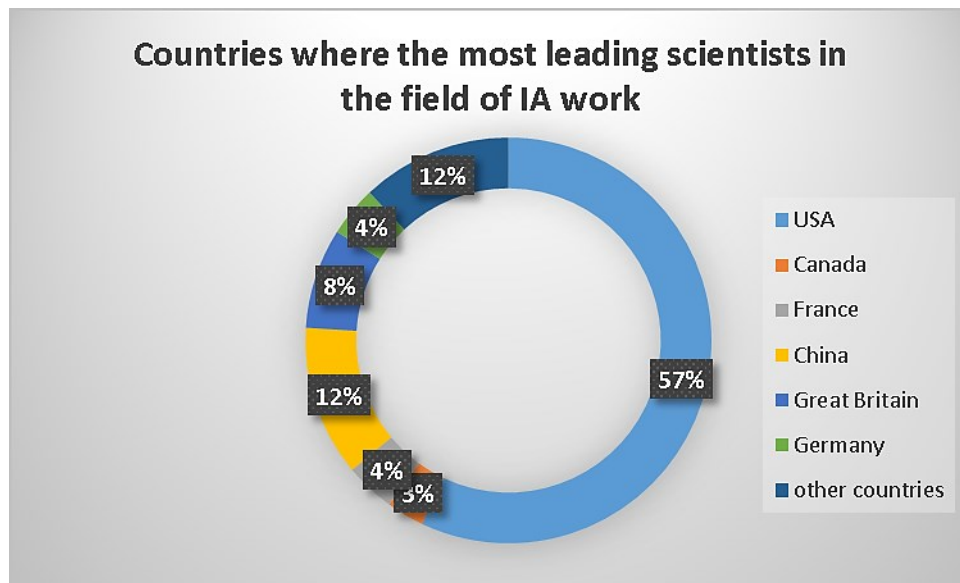


Figure 1. Employment on AI work in the world.

Source: Own work (Platforma projektowa, 2024).

The world's leading AI solutions providers operate in Silicon Valley - OpenAI, Google, Meta and Anthropic. They have developed dominant AI models such as GPT-4, DALL-E 3, Gemini, Llama 2 and Claude 3, and this is where most leading scientists work on artificial intelligence issues (Figure 1). Additionally, American universities such as Stanford, MIT and Carnegie Mellon dominate Macro Polo's ranking of the 25 best AI institutions in the world.

Reports from Stanford University indicate that AI could contribute to US GDP growth of 0.5-1.5% per year in the coming decade, which translates into an additional USD 1.2-3.8 trillion.

Top AI companies in the US:

- Google DeepMind – leader in AI research, creator of AlphaGo and AlphaFold.
- Microsoft – developing Azure AI and cooperating with OpenAI.
- IBM Watson – pioneer of AI for enterprises.
- Amazon Web Services – provider of advanced AI solutions in the cloud.
- OpenAI – creator of the GPT-3 and GPT-4 models (Zestawienia statystyczne, 2024).

In 2020, the Committee of the Council of Ministers for Digitalisation (CRMC) adopted the document 'Policy for the development of artificial intelligence in Poland', which sets goals and actions for the country in the short, medium and long term (Serwis Rzeczypospolitej Polskiej, 2024). One of the six areas identified in the document is education, covering activities from the primary level to higher education, courses for people at risk of losing their jobs due to new technologies and educational grants. In particular, the importance of education as a tool to develop human capital for the economy is emphasised.

The government plans to spend an amount in the order of one billion PLN on Polish artificial intelligence in 2025. Poland is planning to build the PLLuM (Polish Large Language Model), which is expected to strengthen the country's position in the global technological race related

to artificial intelligence. The head of the Ministry of Digitalisation assures that work on this project has already begun and will continue in the first months of 2025.

Rada Funduszu Sztucznej Inteligencji będzie skupiać kluczowe instytucje odpowiedzialne za alokację publicznych środków na rozwój sztucznej inteligencji w Polsce. W jej skład wejdą m.in. Ministerstwo Cyfryzacji, Ministerstwo Nauki, Ministerstwo Obrony Narodowej, Polski Fundusz Rozwoju, Narodowe Centrum Badań i Rozwoju, Narodowe Centrum Nauki oraz Bank Gospodarstwa Krajowego. Rada, pełniąc funkcję doradczą, skoncentruje się na wspieraniu rozwoju i wdrażania rozwiązań opartych na sztucznej inteligencji w kraju (Wiadomości z biznesu, 2024).

In 2024, pupils and especially students are increasingly using applications based on artificial intelligence to support them in learning, organising their time and developing their skills. The most popular are ChatGPT and other text generation tools that help with essay writing, solving assignments or learning languages. Grammarly, with its AI-based features, supports writing correct texts, and apps such as Notion AI help with note management and task planning. Engineering and science students are keen to use tools such as Wolfram Alpha or Mathematica to solve mathematical problems and analyse data. For digital creatives, on the other hand, image-generating applications such as DALL-E and Canva AI, which automate creative processes, are gaining huge popularity. These tools have become an integral part of everyday work and learning, facilitating knowledge acquisition and complex projects models (Zestawienia statystyczne, 2024).

Before we start talking about the real threats associated with artificial intelligence, we should consider when it will be possible to create truly intelligent machines. Visions of future robots that behave like humans and communicate naturally often come from science fiction literature and films. Despite numerous research on humanoid robots, it seems that in the future intelligent machines will not resemble humans in appearance or operation.

Machines should use senses adapted to their functions and environment, which is different from humans. Machine intelligence should be about creating models of the world, gaining knowledge through observation, and learning from guidance from teachers (Rózanowski, 2007).

Artificial intelligence (AI) carries numerous threats that may affect various aspects of social and economic life. One of the main challenges is the possibility of using AI for disinformation, for example by creating realistic false content such as deepfakes, which can be used to manipulate public opinion. Moreover, the development of autonomous weapons systems poses a risk of escalating armed conflicts. Another significant problem is algorithmic bias - AI, based on historical data, may unknowingly reinforce existing inequalities and discrimination. From an economic perspective, AI-driven automation could lead to significant job losses in some sectors, which in turn increases the risk of economic inequality. Finally, the lack of appropriate regulations and control mechanisms over AI creates potential threats related to the privacy and security of personal data (Binns, 2018).

Artificial intelligence (AI) brings many benefits to education, but its use in student life also comes with significant risks. One of the biggest concerns is the potential for AI to be misused for unethical purposes, such as plagiarism or substituting self-generated content for work, which can reduce the level of independence and critical thinking among students. In addition, using AI tools inappropriately can lead to misinformation if algorithms generate erroneous or unverified information (Raport PARP, 2024).

Another challenge is the potential loss of interpersonal skills and the reduction of interpersonal relationships. Over-reliance on AI for learning can negatively impact the development of social skills, which are crucial in professional and personal life. Finally, there are privacy and data security concerns, as AI tools process vast amounts of students' personal and educational information, creating the risk of breaches and abuse (Portal edukacyjny, 2024).

3. AI in student life – research results

The aim of the research conducted was to identify students' opinions on the opportunities and threats associated with the development of artificial intelligence (AI). The study was carried out in early 2024. The survey was aimed at finding out the attitudes, knowledge and concerns of young people who will actively participate in the labour market and make decisions in the context of dynamically developing technologies in the future.

The survey was addressed to students of the Faculty of Management at the Bydgoszcz University of Technology and was conducted electronically using a Google Forms form. The questionnaire contained 10 questions. An invitation to participate was received by 250 students, of whom 210 chose to respond. The survey targeted all students who had already completed their first year of study. The high response rate (84%) demonstrates the interest in the topic and its importance to the survey participants.

The survey questions addressed both positive and negative aspects of AI, such as the impact on the labour market, education, ethical issues and respondents' personal feelings about their future career. The results of the survey aim to enrich the knowledge of students' perceptions of AI and to contribute to a better understanding of how young people perceive the development of this technology in a social, economic and educational context.

In response to the first question regarding knowledge of artificial intelligence, respondents overwhelmingly declared the state of knowledge of artificial intelligence as good, with as many as 60% of students choosing this answer. Such familiarity with the issue among the respondents made it possible to assume that the results of this survey would be meaningful. The distribution of the remaining responses is shown in Figure 2.

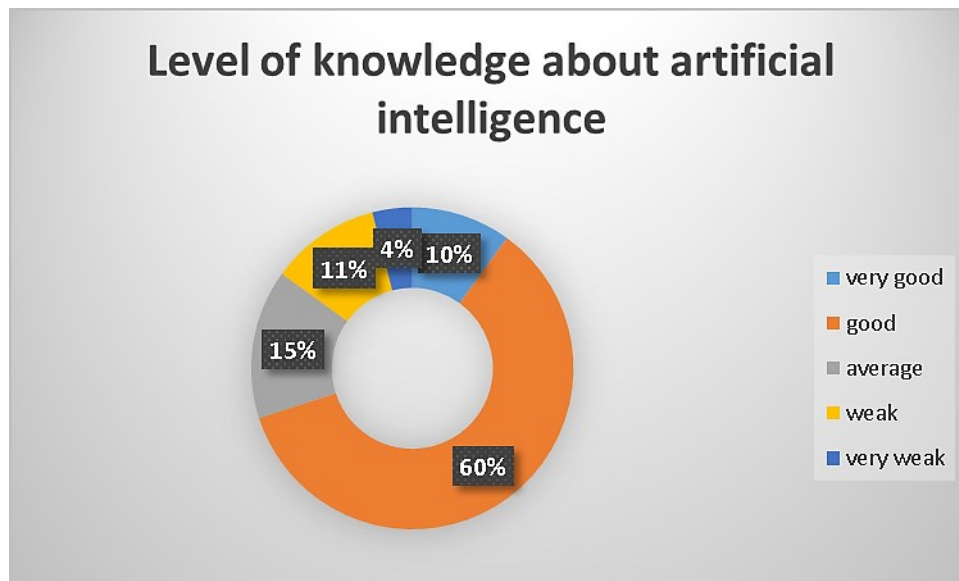


Figure 2. Assessment of the state of knowledge about artificial intelligence.

Source: Survey results – own work.

In response to the question ‘Do you think artificial intelligence will affect the labour market in the next 10 years?’, the majority of respondents (55%) believe that artificial intelligence will positively affect the labour market. On the other hand, around 37% indicated that it will affect it negatively, which may indicate concerns about potential challenges such as automation or changing job requirements. Only 5% of respondents said they had no opinion on the subject, which shows that the topic is widely discussed and of interest.

The remaining respondents are unlikely to believe that artificial intelligence will affect the labour market at all, but this group is much smaller (3%). These results highlight both hopes and fears about the transformative potential of AI.

Among the opportunities, the most frequently selected answers to the question ‘What opportunities do you think the development of artificial intelligence brings?’ were: automation of work and increased productivity, the development of green technologies and new educational opportunities. As many as 70% of respondents chose these 3 answers. There were sheets with the answer ticked that AI would improve medical processes. Respondents most frequently cited improvements in motor vehicle safety as their own examples. This distribution of responses suggests that students recognise the positive impact of AI on technology development.

Among the biggest threats posed by AI, respondents cited increased unemployment, increased social inequality, privacy issues and the development of autonomous weapons.

All respondents agreed that AI should be regulated by law. Which shows a high awareness of the risks and abuses that can occur when using tools supported by this solution.

To the question ‘To what extent are you concerned that the development of artificial intelligence could negatively affect your future career?’, the majority of students answered that they were rather concerned about the negative impact of the solution on their career (52%).

8% of respondents were very concerned and the answer that they were not at all concerned was given by as many as 15%, 5% were rather not concerned and 20% had no opinion.

As many as 83% of students said they regularly use various AI-supported tools, while 11% said they do not use such solutions at all and 6% rather rarely use them. This distribution of responses shows how integral AI-based solutions have become to student learning.

One hundred per cent of respondents believe that artificial intelligence has a positive impact on education and want to further their knowledge in this area. However, only 72 per cent believe that it can be used for ethically questionable purposes.

The results of the survey indicate a high awareness among students of the potential and challenges of artificial intelligence (AI) development. With as many as 83% of respondents regularly using AI tools in the learning process and 100% perceiving their positive impact on education, a wider introduction of AI technologies into higher education curricula is recommended. It is worth focusing on the integration of tools that support the automation and personalisation of learning, such as performance analysis systems, adaptive learning platforms or learning support solutions. At the same time, there should be an emphasis on education about the ethics of using AI and the potential risks, such as privacy issues or the risk of abuse. Such a strategy will not only allow students to be better prepared for the future labour market, but also to develop their competences in a responsible and informed manner towards AI technologies.

On the basis of the literature analysis and the research carried out, the opportunities and threats posed by artificial intelligence to the academic environment are summarised in Table 1.

Table 1.

Opportunities and risks associated with the development of artificial intelligence in the context of students and higher education

Opportunities	Threats
Personalization of learning.	Reduction of standardization in education.
AI enables the adaptation of learning pace and style to individual student needs.	Excessive reliance on AI may lead to a lack of consistent educational standards.
Support in the learning process.	Dependence on technology.
AI solutions, such as adaptive platforms, support more effective knowledge acquisition.	Students may become overly reliant on AI tools, limiting their independence in learning.
Improvement in scientific research.	Risk of reduced creativity.
Automation of data analysis and report generation can support scientific research.	Excessive automation may discourage students from independent thinking and innovation.
Improved accessibility to education.	Privacy issues.
AI enables the development of tools supporting learning for people with disabilities.	The collection of student data by AI platforms poses risks of misuse or inadequate storage.
New opportunities for skill development.	Increased pressure to adapt to changes.
The development of AI technologies forces the creation of new curricula addressing labor market needs.	The dynamic development of AI technologies requires students to continuously improve their skills, generating stress and pressure.
Facilitating international collaboration.	Inequality of access.
AI tools make it easier to collaborate academically between universities worldwide.	Not all universities and students have equal access to advanced AI-based technologies.

Source: Survey results – own work.

In summary, the development of artificial intelligence brings both huge opportunities and significant risks. The key challenge is to strike a balance between benefits and risks, which requires appropriate regulation, education and an informed approach to its use in different areas of life.

4. Summary

With the rapid development of artificial intelligence (AI), its role in education is becoming increasingly important. The introduction of tools to support the automation and personalisation of learning, while taking into account education on the ethics and potential risks of AI, can play a key role in shaping the modern and responsible workforce of the future.

A survey on the opinions of students of the Faculty of Management at Bydgoszcz University of Technology on the development of artificial intelligence (AI) revealed both opportunities and threats associated with these technologies. The results show that the majority of respondents see a positive impact of AI on the labour market, highlighting automation, the development of green technologies and new educational opportunities as key benefits. At the same time, concerns about rising unemployment, social inequality and privacy issues reflect an awareness of potential challenges. These findings are in line with previous studies that point to a dualistic approach to AI - as a source of innovation and risks. For example, a study by Zhang et al. (Zhang, McAreavey, Liu, 2022) highlighted that young people see AI as a driver of change in the labour market, but at the same time fear automation and the associated change in job requirements. The presence of such attitudes in different geographical and cultural contexts indicates the global nature of the challenges and opportunities associated with AI.

However, the use of AI in education raises questions about potential side effects, such as the reduction of standardisation in teaching. Higher education institutions are not only places of learning, but also of socialisation, where students build relationships, shared values and a sense of belonging. They are where the culture that binds society together is formed.

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CULTURAL DETERMINANTS OF CITY MANAGEMENT BASED ON THE ANALYSIS OF GLOBAL CITY RANKING – THE IESE CITIES MOTION INDEX

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Purpose: This study aims to examine the relationships between the culture dimensions defined by Hofstede and the adoption of smart city solutions based on a city's position in the global smart cities ranking (the IESE Cities in Motion Index 2024).

Design/methodology/approach: Multiple regressions were used to identify the relationship between the independent variables (value of culture dimensions defined by Hofstede: power distance, individualism, masculinity, uncertainty avoidance, long-term orientation) and the dependent variable-value of the IESE Cities in Motion Index 2024. The IESE Cities in Motion Index was chosen for its temporal and thematic relevance, as it reflects the current results of several indicators that are priority indicators of the technological and social development of the city. Smart cities were selected based on their rankings in the IESE Cities in Motion Index 2024. Forty-four cities with the highest ranking (high-H and relatively high-RH) were included in the analysis.

Findings: This study has shown that higher values of long-term orientation and individualism and a low level of uncertainty avoidance have a positive impact on the adoption of smart city solutions. On the other hand, the proposed relationship between power distance and adoption of smart city solutions as well as masculinity and adoption of smart city solutions was not confirmed and requires further research. The proposed relationships between some national culture dimensions and the adoption of smart city solutions hold true for cities considered in the IESE Cities in Motion Index 2024.

Research limitations/implications: The main limitation is a relatively low number of cities taken into analysis. Another limitation is the lack of a comprehensive and complete measure that would take into account all of the various phases of the smart city management process. Regardless of these limitations, the study has achieved a part of its main research goal in proving that the proposed relationships between some national culture dimensions and the adoption of smart city solutions hold true for cities considered in the IESE Cities in Motion Index 2024. On the other hand, the study has also opened some new questions regarding the relationship between masculinity and power distance and their influence on the adoption of smart city solutions that require further research.

Originality/value: The literature does not pay much attention to the cultural determinants of smart city management in the form of organisational and managerial solutions during the transition from a classic city to a smart city; therefore, the paper tries to explore the role of cultural factors in city management and urban development. The motivation for this study is to

identify the relationship between Hofstede culture dimensions and the level of smart city solutions adaptation and their influence on a city's position in the global smart cities ranking.

Keywords: smart city, smart city management, smart city solutions, technology adoption, culture dimensions.

Category of the paper: research paper.

1. Introduction

The concept of the smart city represents a novel paradigm in urban development, emerging as a consequence of the current digital era. Driven by rapid advances in information and communications technology (ICT), smart cities offer innovative solutions to overcome various complex urban challenges.

Initially, smart cities were often identified with the use of advanced technology such as sensors, high-speed internet networks, and big data platforms (Angelidou et al., 2018). However, over time, the understanding of smart cities has developed to be more holistic and focused on improving the quality of life of society as a whole (Albino et al., 2019).

The progressive advancement of cutting-edge technologies offers novel prospects for the administration of urban development. In the contemporary era, the transformation of metropolises into smart cities represents a pivotal aspect of enhancing the quality of life for their inhabitants. The objective of the smart city concept is the implementation of contemporary urban management strategies that utilise technological instruments (Wang, Zhou, 2022).

As the cities get more digitalised, it attracts massive emigration of people from the rural areas to the urban areas in search of better living conditions and means of livelihood. Dastbaz, Naudé, and Manoochchri (2018) noted that the predicted 2050 urban surge is most likely in developing countries. Hence, managing this situation is critical. This involves planning for the infrastructure and facilities needed to cater to this emerging population; therefore, a smart city could be described as a city that uses information communication technology (ICT) to upgrade the city's functionality (Okafor et al., 2023).

A significant number of publications seek to conceptualise and define the constituent elements and application domains of smart cities, predominantly through the utilisation of case studies or comparative case study analysis. Nevertheless, it is contended that further research is required to ascertain effective strategies for urbanisation and the enhancement of urban areas.

The literature does not pay much attention to the cultural determinants of smart city management in the form of organisational and managerial solutions during the transition from a classic city to a smart city; therefore, the paper tries to explore the role of cultural factors in city management and urban development.

The motivation for this study is to identify the relationship between Hofstede culture dimensions and the level of smart city solutions adaptation and their influence on a city's position in the global smart cities ranking.

This study aims to examine the relationships between Hofstede's culture dimensions and the adoption of smart city solutions based on a city's position in the global smart cities ranking (the IESE Cities in Motion Index).

The paper is structured as follows: After this introduction, the next section presents the literature review with discussions of the research model and hypotheses development. Then research methodology is presented in detail. Finally, research findings are outlined and discussed, implications are explored, and limitations and future research are described.

2. Literature review and hypotheses development

The concept of the smart city offers many benefits to both governments and their citizens (Almuqrin, 2024), and a strategy of smart city transition has been adopted by many countries over the past couple of decades (Mutambik, 2024). Cities are becoming overcrowded with approximately 66.4% of the world's population expected to reside in cities by 2050 (Lim, Edelenbos, Gianoli, 2024). There is an urgent need for developing and applying innovative smart-city solutions and sophisticated approaches to overcome the challenges of sustainability and urbanisation (Khan, 2022).

The influence of cultural factors on new technology adoption has been recognised as a highly relevant field to be explored by many scientists (Khan, 2022; Blut et al., 2022; Venkatesh, 2022). Scientists using and validating Hofstede's national culture dimensions prove that national culture dimensions are a valid and important construct and that differences in national cultures have a large impact on many different organisational and individual behaviours and outcomes. Hofstede developed a model of five dimensions of national culture that helps to explain basic value differences. This model distinguishes cultures according to five dimensions: Power Distance, Individualism-Collectivism, Masculinity-Femininity, Uncertainty Avoidance, and Long-Term Orientation (Hofstede, 2001).

Shane (1993) was one of the first researchers to analyse the relationship between Hofstede's national culture dimensions and the adoption of new technology in different countries. He found that uncertainty avoidance has the highest impact on the adoption of new technology. Countries that scored low on power distance and high on individualism also showed higher rates of the adoption of new technology and innovation. Kaasa and Vadi (2010) found a negative relationship between power distance, uncertainty avoidance, and masculinity, while there was a positive relationship between individualism and innovation performance in a number of European countries. Woodside, Lars, and Graham (2020) highlight the impact of cultural

factors (power distance, individualism, long-term orientation) on innovative performance and consequently on the economic structure of a country. Similarly, Bukowski and Rudnicki (2019) analyse the dimensions of national culture and innovation, highlighting that the dimension of individualism alone does not fully justify the role of culture. Thus, the authors point out that long-term orientation and flexibility have a positive influence on innovation; however, this study considered only a few East Asian countries.

The first factor to be identified by Hofstede (1980) was power distance, which describes the degree of inequality between people that is still considered acceptable in a given culture. A low power distance shows relatively little inequality, where society does not accept or perceive functional human inequality in power, wealth, and prestige as inevitable (Oyserman, 2006). According to Nikolov and Krumova (2019), power distance even has a strong predictive power within the group of European countries when it comes to a very specific segment of smart cities, the e-Governance.

Power distance is the degree to which a society adheres to formal power and status differences among group members (Van Everdingen, Waarts, 2003). Individuals in low power distance cultures may be more apt to challenge assumptions, procedures, and authority figures. Hofstede (2011) suggested that lower power distance societies exhibit a greater tendency to new technology adoption and innovation.

High levels of centralisation and formalisation have been found to be associated with lower rates of innovation adoption (Rinne, Steel, Fairweather, 2012). Therefore, the first hypothesis of this study is thus as follows:

H1: *Low level of power distance positively influences the adoption of smart city solutions.*

Individualism-collectivism as a spectrum indicates a cultural preference regarding being integrated into a group, whether the people in a given country prefer activities carried out individually or those that are carried out as a member of a group. Individualistic societies prefer individuals who can manage on their own, while in collectivist societies helping each other is important; hence, the individual is supposed to show strong loyalty to the group and community. The conducted studies (Lee et al., 2007) have found that individualism has a direct positive effect on technology acceptance. Other studies (Tarhini et al., 2017) have also highlighted that individualism has not only a positive effect on readiness but also a mediating effect when it comes to other cultural dimensions. According to Masimba, Appiah, and Zuva (2019), individualism has a positive correlation with technology adoption.

Individualistic societies place a higher value on personal goals. Shane (1993) found individualistic societies to be more innovative. Other studies found individualistic cultures were more apt to adopt technologically innovative solutions. In addition, there exists a positive relationship between high individualism and innovation measures (Rinne, Steel, and Fairweather, 2012). It can therefore be expected that more individualistic societies should be more innovative (Khazanchi et al., 2007). The second hypothesis of this study is thus as follows:

H2: *Higher level of individualism positively influences the adoption of smart city solutions.*

Masculinity as a cultural dimension can be well characterised by the behaviour associated with gender roles. Masculine cultures are more achievement-orientated and exhibit less gender egalitarianism. By contrast, feminine cultures are more relationship-orientated.

What is more, in masculine societies, gender roles are more distinct than in feminine ones. Feminine cultures support the adoption of new technology more, through subjective norms and a more positive behavioural intention (Tarhini et al., 2017). In line with this, Sunny, Patrick, and Rob (2019) have also highlighted that masculine societies have a more negative attitude towards technology. Negara and Setyohadi (2020), on the other hand, emphasise that masculinity in itself might not be a good predictor of technology acceptance when it comes to smart city solutions. Contrary to this, other studies (Meyer-Waarden et al., 2021) argue that femininity has a moderating value on uncertainty avoidance and hence has a positive effect on trust towards smart solutions that increase the subjective well-being of individuals. Hofstede (2001) suggests that in organisations in masculine cultures, emphasis is on rewards and recognition of performance, and further, on training and improvement of the individual, both characteristics that are common to innovative organisations. This study proposes a positive relationship between masculinity and innovation:

H3: *Higher level of masculinity positively influences the adoption of smart city solutions.*

Uncertainty avoidance is a cultural dimension that highlights the individuals' needs for structured, regulated situations. A too-high level of uncertainty avoidance usually indicates an anxious, aspiring society, while a society with a lower value is more flexible and easy-going. Based on research data presented by Venkatesh and Zhang (2010), the implementation of new technology is likely to cause a state of uncertainty, which, in cultures with high uncertainty avoidance, causes a higher level of perceived stress and discomfort. Negara and Setyohadi (2020) have found that uncertainty avoidance is a good predictor of technology acceptance when it comes to smart city solutions. In line with this, according to other studies (Meyer-Waarden et al., 2021), users from cultures with high uncertainty avoidance demonstrate higher levels of anxiety in cases of change and implementation of new technologies and have a high need for control.

Uncertainty avoidance differentiates societies on willingness to assume risk. Hofstede (2011) suggested that societies exhibiting low uncertainty avoidance are more willing to take risks and to accept opinions other than their own, both of which encourage innovation and new technology adoption. Therefore, the fourth hypothesis of this study is thus as follows:

H4: *Low level of uncertainty avoidance positively influences the adoption of smart city solutions.*

Long-term orientation is a cultural dimension that has a holistic view of time, regarding not only the past and the present but also looking into the future. In line with this, in a culture characterised by a long-term orientation, the society's time orientation is determined by long-term thinking, judging a technology or a situation both by its present and future effects rather than just seeing the immediate short-term consequences (Van Everdingen, Waarts, 2003).

Long-term orientation is closely related to frugality and perseverance, building lasting relationships, and prioritising future rewards (Chopdar, Sivakumar, 2019). On this note, according to Tran Le Na and Hien (2021), long-term orientation positively affects the functional, social, and emotional values of new technologies; hence, it is positively related to technology acceptance.

Van Everdingen and Waarts (2003) investigated the effects of national culture on the adoption of innovations and new technologies using the Hofstede dimensions. They found that higher degrees of long-term orientation were related to increased adoption of innovations and new technologies. Therefore, the fifth hypothesis of this study is thus as follows:

H5: *Higher level of long-term orientation positively influences the adoption of smart city solutions.*

Innovation management is affected by culture, and numerous studies affirm that culture influences innovation. This influence exists because culture can promote a better or worse innovative environment. Smart cities should aim to improve quality of life, as well as the efficiency and quality of services provided by governing entities and businesses (Mutambik, Almuqrin, 2024). Smart cities are emerging as a strategy to manage the problems generated by urban population growth and rapid urbanisation.

3. Materials and methods

The presented study was conducted in October 2024. Its purpose was to determine the relationship between cultural dimensions defined by Hofstede and the city's position in the global smart cities ranking (IESE Cities in Motion Index 2024).

Multiple regressions were used to identify the relationship between the independent variables (value of Hofstede's culture dimensions: power distance, individualism, masculinity, uncertainty avoidance, long-term orientation) and the dependent variable - the value of the IESE Cities in Motion Index 2024.

A statistical method for figuring out the link between two or more variables is multiple regression analysis. Multiple regression includes a dependent variable that needs to be explained as well as several explanatory factors that are assumed to cause or be connected to changes in the dependent variable.

The IESE Cities in Motion Index is a study published annually by the business school of the University of Navarra (IESE) that aims to evaluate the development of the world's cities. It assesses several socioeconomic aspects of development, including human capital, social cohesion, governance, sustainable development, mobility and transportation, urban planning, international outreach, and technology. The IESE Cities in Motion Index offers a platform for a comprehensive initial diagnosis of the cities and, through comparative analysis, aims to serve as the first point of reference. The index compares 183 cities globally, looking at 114 criteria

grouped into nine dimensions: human capital, social cohesion, economy, governance, environment, mobility and transportation, urban planning, international profile, and technology (Lai, Cole, 2023).

The IESE Cities in Motion Index (CIMI) has been designed with the aim of constructing an indicator (in terms of its completeness, characteristics, comparability, and quality, as well as the objectivity of the information it contains) that makes it possible to measure the future sustainability of the world's leading cities and the quality of life of their inhabitants. The CIMI aims to help citizens and governments understand the performance of cities in nine key dimensions. All of the indicators come together around a strategic purpose, leading to a different kind of economic and social development that entails the creation of a global city and the promotion of entrepreneurship, innovation, and social justice, among other outcomes. Developing an index with the geographic coverage and broad dimensions offered by the CIMI poses significant challenges. The results presented should be treated with caution due to a number of limitations, including data availability and comparability. In addition, the set of variables selected may not fully reflect the complexity of each dimension, and sometimes data is not available. The cities are also grouped according to their performance based on the composite indicator value. The cities are classified by performance as follows: high (H) for cities with an index value over 90; relatively high (RH) for those in the 60-90 range; medium (M) for those in the 45-60 range; and low (L) for cities with an index value below 45. In the IESE Cities in Motion Index 2024, the performance of 24.04% (44) of the cities is classified as H or RH, and the top three cities are London, New York, and Paris (in that order). The performance of 36.61% (67) of the cities is classified as M, and those classified as L account for 37.71% (69) of the selected cities. Finally, three cities (1.64%) score very low (www.iese.edu, 2024).

London tops the ranking, cementing its status as a highly developed and innovative metropolis. The city excels in key areas such as global influence, quality of human capital, government effectiveness, urban planning, and mobility systems, ranking in the top four across all of these dimensions.

New York also occupies a prominent position, ranking second overall. The city stands out for its strong economy, excellent human capital, advanced urban planning, and mobility and transportation systems, where it ranks first, second, second, and third, respectively. Despite these achievements, the metropolis faces significant challenges in terms of social cohesion and environmental sustainability.

Paris has achieved an impressive third place in the global ranking. The city demonstrates its strengths in international influence, quality of human capital, and economic performance. The French capital also stands out for its excellent urban planning and efficient mobility and transportation systems, confirming its status as an outstanding metropolis in several key areas.

Cities that excel in multiple dimensions (economic, financial, technological, cultural, and quality of life) tend to be more influential and competitive at the global level.

Smart cities were selected based on their rankings in the IESE Cities in Motion Index 2024. Forty-four cities with the highest ranking (high - H and relatively high - RH) were included in the analysis. The following cities were taken into consideration: London, New York, Paris, Tokyo, Berlin, Singapore, Oslo, Amsterdam, San Francisco, Chicago, Copenhagen, Zurich, Seoul, Munich, Boston, Hamburg, Washington, Stockholm, Melbourne, Madrid, Beijing, Vienna, Reykjavik, Basel, Rotterdam, Helsinki, Taipei, Sydney, Barcelona, Bern, Seattle, Edinburgh, Toronto, Dublin, Frankfurt, Manchester, Hong Kong, Canberra, Los Angeles, Geneva, Eindhoven, Ottawa, Dallas, Shanghai.

The category of cities with high or relatively high performance consists mostly of European and North American cities and capitals, while the low-performance category is mostly made up of African, Middle Eastern, and Latin American cities.

The IESE Index aims to help citizens and governments understand the performance of cities in nine key dimensions: human capital, social cohesion, economy, governance, environment, mobility and transportation, urban planning, international profile, and technology. All of the indicators come together around a strategic purpose, leading to a different kind of economic and social development that entails the creation of a global city and the promotion of entrepreneurship, innovation, and social justice, among other outcomes.

The IESE Index was chosen for its temporal and thematic relevance, as it reflects the current results of several indicators that are priority indicators of the technological and social development of the city.

4. Results and discussion

Multiple regressions were used to identify the relationship between the independent variables (value of Hofstede's culture dimensions) and the dependent variable - the value of the IESE Cities in Motion Index 2024 for particular cities. The results of the regression analysis have been shown in Table 1.

Table 1.
The results of regression analysis

Independent variables – national culture dimensions	Standardized coefficients	t	Significance level
	Beta		
Low power distance	0.047	0.374	0.650
Individualism	0.472	4.231	0.000
Masculinity	0.043	0.317	0.630
Low uncertainty avoidance	0.268	3.794	0.000
Long-term orientation	0.531	4.523	0.000
Dependent variable: the IESE Cities in Motion Index 2024 $R^2 = 0.798$, $F = 29,563$, significance level = 0.01.			

Source: own study based on The IESE Cities in Motion Index 2024 and Hofstede's Country-Comparison-Tool (<https://www.iese.edu/media/research/pdfs/ST-0649-E.pdf>, 2024; <https://www.hofstede-insights.com/country-comparison-tool>, 2024).

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.

The result shows that R-square was 0.798, which demonstrates that independent variables explain 79.8 % of the variance in the adoption of smart city solutions (the IESE Cities in Motion Index 2024). The linear relationship between Hofstede's cultural dimensions and the adoption of smart city solutions is significant with an F-value of 29.563 at the 0.01 significance level. Therefore, the model fits this study.

According to the results, power distance did not have a statistically significant relationship with the IESE Cities in Motion Index due to the significance levels (0.650) being higher than 0.05. Hence, Hypothesis 1 is rejected.

The significance level of individualism with the IESE Cities in Motion Index was 0.000, which is less than 0.05. Therefore, Hypothesis 2 is accepted. Individualism was the second highest coefficient ($\beta = 0.472$); hence, a higher level of individualism positively influences the innovation adoption.

According to the results, masculinity did not have a statistically significant relationship with the adoption of smart city solutions due to the significance levels (0.630) being higher than 0.05. Hence, Hypothesis 3 is rejected.

The significance level of uncertainty avoidance with the IESE Cities in Motion Index was 0.000, hence, Hypothesis 4 is accepted. The beta value for this variable was 0.268. Therefore, a low level of uncertainty avoidance has a significant positive effect on the adoption of smart city solutions.

The significance level of long-term orientation with the adoption of smart city solutions was 0.000, therefore, Hypothesis 5 is accepted. The test also showed that long term-orientation had the highest coefficients ($\beta = 0.531$) compared to other cultural dimensions. In other words, long-term orientation has the highest positive impact on the adoption of smart city solutions.

Surprisingly, power distance and masculinity were shown to be insignificant in the model. Long-term orientation, individualism, and low level of uncertainty avoidance were the three dimensions of national culture that showed significance in the model. As hypothesised, long-term orientation has shown a positive influence on the adoption of smart city solutions and the value of the IESE Cities in Motion Index. The same goes for low uncertainty avoidance and individualism, which have shown to have a positive and significant impact on the adoption of smart city solutions. Thus, hypotheses 1 and 3 of this research were rejected, while hypotheses 2, 4, and 5 are confirmed.

The results of the study are somewhat surprising. The analysis has shown that power distance does not seem to play an important role in the adoption of smart city solutions because this culture dimension was insignificant in the model.

Similarly, the masculinity dimension was insignificant in the model. Values typical for masculine and feminine cultures influence the smart city solutions in an uncertain way. For example, masculine values, such as achievement and motivation, suggest a positive relationship between the masculinity dimension and innovation adoption and new technology acceptance. On the other hand, feminine societies, where the focus is on people and cooperation, can create a more supportive climate for the adoption of innovation and new technology. Feminine cultures are characterised by values like equality, solidarity, and social relationships; therefore, they can create a more supportive climate for adopting new technologies in city management.

Regarding the relationship between long-term orientation and the adoption of smart city solutions, this study has confirmed that cities from countries with higher levels of long-term orientation have a higher value of the IESE Cities in Motion Index. National cultures with higher values of long-term orientation are more willing to embrace new ideas and solutions and are more pragmatic and problem-solving-orientated, all of the traits that can be beneficial to adopting new technology in city management. The positive hypothesised relationship between uncertainty avoidance and the IESE Cities in Motion Index has also been confirmed. Risk aversion is not the only factor that influences uncertainty avoidance, as it is expected that countries that are riskier should be more innovative and more conducive to the implementation of modern technologies in city management.

The positive relationship between a high level of individualism and the adoption of smart city solutions has also been confirmed. The more individualistic a country is, the more likely its cities will adopt innovative solutions in city management.

5. Conclusion

This study has shown that higher values of long-term orientation and individualism and a low level of uncertainty avoidance have a positive impact on the adoption of smart city solutions. On the other hand, the proposed relationship between low level of power distance and adoption of smart city solutions as well as masculinity and adoption of smart city solutions were not confirmed and require further research. This study has a number of limitations. The main limitation is a relatively low number of cities taken into analysis. Another limitation is the lack of a comprehensive and complete measure that would take into account all of the various phases of the smart city management process. Regardless of these limitations, the study has achieved a part of its main research goal in proving that the proposed relationships between some national culture dimensions and the adoption of smart city solutions hold true for cities considered in the IESE Cities in Motion Index 2024. On the other hand, the study has also opened some new questions regarding the relationship between masculinity and power distance

and their influence on the adoption of smart city solutions that require further research. One of the propositions for future research would be to enlarge the number of national cultures taken into the sample and try analysing different clusters of national cultures.

Future research should explore the impacts of other variables, which can determine the adoption of smart city solutions and city management performance. A future study should try to validate the result by using a wider sample. Finally, as smart city performance cannot be explained by culture alone, future research will analyse other elements that contribute to the development of a favourable environment for improvement of smart city management. Moreover, as this study has demonstrated that applied technological solutions already exist across the selected cities, it would be extremely useful to conduct a wider and more varied comparison involving more other cities with a view to revealing more general trends in city management.

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IMPLEMENTATION OF THE “15-MINUTE CITY” CONCEPT – CASE STUDY OF THE CITY OF PLESZEW

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Purpose: The aim of the article is to identify the practices of implementing the assumptions of the "15-minute city" concept and the areas of its implementation by the city of Pleszew. It is the first medium-sized city in Poland that has successfully developed on the theoretical foundations of this concept.

Design/methodology/approach: The methodology used in the article refers to the methodological canon of management sciences, including, among others, the methodology of qualitative research, which allows the use of the case study method. On their basis, a critical analysis of foreign and Polish literature on the concept of the "15-minute city" was conducted. The descriptive method was used to interpret and analyze the collected material.

Findings: The essence and assumptions of the "15-minute city" concept were recognized. Areas of its implementation were identified using the example of a city reflecting good practice. On this basis, it was shown that the analyzed concept brings many benefits to its residents.

Research limitations/implications: The presented example of the implementation of the "15-minute city" concept can serve as a model and inspiration for other smaller urban units. They, like the city under study, have a chance for sustainable urban development, the basis of which should be research into the needs and expectations of their residents.

Social implications: The identified city practice contributes to focusing activities on social integration, providing support and services to groups at risk of exclusion and taking care of the overall well-being and quality of life of its residents.

Originality/value: Deepening and updating knowledge on sustainable urban development based on the assumptions of the "15-minute city" concept. Popularization of activities related to the studied phenomenon.

Keywords: "15-minute city", cities, quality of life, case study.

Category of paper: A literature review and case study.

1. Introduction

The transformation of cities, taking place as a result of a series of processes triggered by, among other things, the need for sustainable development, is currently undergoing dynamic changes, making this phenomenon an interesting field of research at the same time. Within its framework, it can be noted that the recognition of problems related to the organization of urban space plays a key role, prompting the search for solutions aimed at creating friendly living conditions for city residents. One of them is the concept of the “15-minute city” discussed in the article, which has gained its popularity after 2020, largely influenced by the COVID-19 pandemic, particularly the immobility and social isolation it caused (Sikorska, Lipp, 2021; Khavarian-Garmsir, Sharif, Sadeghi, 2023).

In view of the above, the purpose of the article is to identify ways of implementing the assumptions of the “15-minute city” concept, as well as areas of its actual implementation by means of the case study method. The “good practice” of Poland's first medium-sized city, which is successfully developing based on this concept, was used as a reference point. It is Pleszew, a city located in the central-western part of Poland, belonging to the Greater Poland Province.

The article is of a review-theoretical nature and its structure is created by several parts. After a brief introduction, the key theoretical aspects of the concept of the “15-minute city” are explained. The next part of the article describes its methodological foundations, followed by an analysis and evaluation of the implementation of this concept by the studied city. The last part of the article contains a discussion and main conclusions resulting from the practice presented of activities.

The article was developed based on a critical analysis of the literature on the subject, which included secondary material (including internet sources), as well as research findings based on case study (so-called “good practice”) and observation methods.

2. Theoretical Background

Based on a review of scientific literature, the main goals, objectives, and benefits of applying the studied concept were analyzed. They were considered important for the description and identification of the presented practice of the city studied.

2.1. The concept of a “15-minute city” – idea, goals, and objectives

The pioneer of the “15-minute city” concept is considered to be the French Colombian scientist, urban planning and smart cities specialist Carlos Moreno. It identifies a workable

solution for sustainable urban development of cities that allows for the realization of the goals of this development in combination with measures to shape new ways of living, working, and resting (Moreno et al., 2021). In the opinion of many authors (e.g. Moreno et al., 2020; Beim, 2021; Allam et al., 2022), Paris mayor Anne Hidalgo also contributed to the popularization of the analyzed concept. In 2020, as part of the ongoing re-election strategy „Cities Climate Leadership Group (C40)” It made the concept a central tool of its campaign, recommending it as a key strategy for rebuilding Paris after the COVID-19 pandemic (Moreno et al., 2020; Allam et al., 2022). The premise of the strategy was based on the ideas of proximity, participation, cooperation, and ecology, to the extent that the people of Paris minimize the sense of haste and constant lack of time in their daily lives. In addition, the implementation of the concept described is triggered largely by the global situation (including the promotion of the idea of the immediate neighborhood and the growth of environmental awareness), which encourages actions towards sustainable urban development (Murgante, Patimisco, Annunziata, 2024).

According to Khavarian-Garmsir, Sharif & Sadeghi (2023), the goal of the “15-minute city” concept is to create self-sustaining urban neighborhoods that provide their residents with the basic functions of life, work, commerce, healthcare, education, and entertainment by decentralizing urban functions and services. According to Moreno's theory (Allam et al., 2021), the concept of a “15-minute city” should base its foundation on the four main assumptions detailed in Figure 1.



Figure 1. The main assumptions of the “15-minute city” concept.

Source: elaboration based on Moreno et al. (2021, p. 7).

The first, main assumption of the analyzed concept is “proximity,” which, in the context of the city's functioning, refers to the spatial aspect on the one hand, and the temporal aspect on the other. According to Moreno (Allam et al., 2021), it should take no more than 15 minutes on foot, by bicycle, by public transportation to meet the needs of city residents to access key services (education, health, clerical, professional, retail, food service, etc.). Weng et al. (2019),

emphasize that the increase in physical activity of urban residents due to pedestrian accessibility leads to improvements in their fitness and overall health. A similar opinion is expressed by Kos et al. (2022), stating that the lack of exercise caused by the use of private cars has a significant impact on the health of residents. This condition is affected by traffic noise, poor air quality, high CO levels, and consequently poor environmental quality. Consequently, this assumption, as emphasized by many authors (Knowles, Ferbrache, Nikitas, 2020; Pozoukidou, Chatziyiannaki, 2021; Logan et al., 2022), contributes to the abandonment of private cars, resulting in lower emissions and pollution of the urban environment.

The second assumption, or “density,” relates to the population aspect and, according to Moreno et al. (2021), defines: “the number of people that a neighborhood can comfortably accommodate without straining or under-utilizing available resources, infrastructure and space.” The above assumption makes it possible to plan access to basic public services adequately for the optimal number of people. This aspect is pointed out, among others, by Mouratidis (2017), who shows in his research that population density can provide a critical mass for local services and businesses in the distance, as well as for the creation of local employment opportunities. According to Wisniewski (2021), the optimal way for urban residents to access essential services is one that is as short as possible and takes as little time as possible to travel. The measures proposed under the analyzed urban development concept contribute to sustainable development, the creation of health and social relations, the reduction of car use and the optimal consumption of resources.

The third premise of the “15-minute city” concept is “diversity.” On the one hand, it concerns the residential infrastructure of urban areas, and on the other, the people who inhabit them. The first aspect considers the development of mixed-use neighborhoods in which basic amenities and services are easily accessible. This means that a neighborhood should include at least residential, commercial, government, health, educational and entertainment elements (Moreno, 2020). According to Bibri et al. (2020), cities operating according to the development concept under study should consist of compact neighborhoods characterized by high-density development, which indicates the need for an efficient public transportation system. Underlying its implementation is the assumption that covering distances in an urban area encourages its residents to replace automobile transportation with walking or other forms (such as cycling, scooters, etc.). The second aspect of diversity, on the other hand, refers to the structure of urban residents, which is made up of social groups that are diverse in many ways (e.g., culture, religion, worldviews, income, etc.). In addition, Guzman, Oviedo and Cantillo-Garcia (2024), emphasize in their discussion that affluent segments show a greater preference for retail stores and commercial services. In contrast, the low-income population has a much greater preference for healthcare facilities. According to the concept analyzed, the aspect of diversity requires reference to basic social functions, i.e., entertainment, care, provision, education, work, and housing, which in the context of easy and quick access must be adapted to the needs of diverse social groups.

The fourth premise of the “15-minute city” concept is “digitalization.” According to Viale Pereira et al. (2017), this factor primarily relates to big data and the potential of the Internet of Things (AR). Access to these makes it easier for city residents to take a more active role in planning and making decisions about the energy they consume, while enabling more efficient use of water and electricity resources.

An important requirement of the “15-minute city” concept is to consider the needs and characteristics of the city's residents, which, according to the concept, means designing public spaces for their own benefit. A manifestation of the realization of these needs is, for example, the promotion of investments in pedestrian and bicycle traffic. At the same time, Guzman, Oviedo, and Cantillo-Garcia (2024) emphasize the attractiveness of the “15-minute city” concept, which, based on the assumed “proximity”, allows the connection of three interrelated levels: the city, the neighborhood, and the individual scale of its residents. The main advantages of the concept described, and its benefits are shown in Table 1.

Table 1.

Key advantages and benefits of the “15-minute city” concept

Advantages of the concept under study	The resulting advantages
Proximity to services and attractions	• easy access for city residents to most services, attractions, and workplaces within walking or biking distance of bicycle, • less need to use cars daily
Promoting healthy lifestyle	• shorter distances encourage city residents to walk walking or cycling, which improves their fitness, physical condition, well-being, and health
Less environmental pollution	• ensures a reduction in the number of cars on the road, which means less air pollution and thus translates into a healthier environment;
Greater social interaction	• short distances promote interaction between residents, which can help build stronger communities over time
Smaller infrastructure costs	• reducing dependence on cars may lead to a reduced need to invest in extensive road infrastructure;
Stimulation local economy	• residents are more likely to use local services and stores, which contribute to the local economy;
Greater public space	• freeing up space reserved for cars, such as parking lots, can lead to the creation of more parks, playgrounds, and other gathering places.

Source: elaboration based on Allam et al. (2021), Khavarian-Garmsir, Sharif, Sadeghi (2023), Guzman, Oviedo, Cantillo-Garcia (2024).

The advantages presented in Table 1 should be seen as crucial in terms of benefits for residents, as well as for the cities themselves. In the longer term, which is required to implement the assumptions of the “15-minute city” concept, they indicate the right and, moreover, desirable direction of sustainable development of urban units.

3. Case study - good practice of the city of Pleszew

3.1. Research methodology

The article focuses on the concept of the “15-minute city,” which promotes the creation of friendly living conditions for residents of large and medium-sized urban areas. The main research problem is included in the question: *How is the city of Pleszew implementing the “15-minute city” concept and what are the benefits for its citizens of implementing this concept?* In order to identify the phenomenon under study, qualitative research of a diagnosis nature was carried out. Their goal was to identify ways to implement the assumptions of the “15-minute city” concept, as well as areas of its actual implementation by a medium-sized urban unit. This goal determined the choice of a research method in the form of a case study, involving the analysis and evaluation of an example of good practice in the selected research area.

Accordingly, the research methodology used in the article refers to the methodological canon of management sciences, including qualitative research methodology with scientific case studies. The use of this methodology made it possible to describe the example of the city studied and identify its action practices.

Basic information on the survey conducted are presented in Table 2.

Table 2.

Basic information on the survey conducted

Specification	Characteristic
Research methodology	the analysis of specialized journals, materials on the studied city, websites, participant observation, case study
Sample selection	- targeted selection, - criterion: good practice of activities
Sample size	a medium-sized city of Pleszew, located in the Greater Poland region
Geographical scope	national scale
Time scope	2019- 2024

Source: own elaboration.

3.2. The city of Pleszew as a representative of medium-sized urban units

The city of Pleszew is in the southern part of the Greater Poland Voivodeship in the Kaliska Upland and belongs to the Pleszew District. It is the seat of the urban-rural municipality of Pleszew¹. According to CSO data as of 31/12/2023. Pleszew has a population of 16,599, its population density is 240.6 people/km², and its area is 13.4 km² (CSO, 2024). There are ten residential neighborhoods in its area (Zielone, Wojska Polskiego, Śródmieście, Rodzinne, Jordanowskie, Wokół Wieży, Zachodnie, Królewskie, Reja and Piastowskie). Its central place is the historic market square, around which a coherent and compact development has been created.

¹ With a population of 29,039, Pleszew municipality is home to 45.9% of the population of Pleszew district and occupies 25.3% of its area.

The city of Pleszew is distinguished by its convenient location, including especially easy transportation accessibility provided by the A2 and S11 expressways, as well as convenient rail connections to the capital of Greater Poland - Poznań (80 km), and the nearby larger cities of Kalisz and Ostrów Wielkopolski (30 km). A railroad also runs near the described town, and trains stop at the Pleszew station located in Kowalewo - about 4 km from its center. The station is reached by a narrow-gauge railroad line that has a unique three-rail track weave, on which both narrow-gauge and normal-gauge trains can run² (Koleje wąskotorowe..., 2024, p. 7). In 2021, public transportation was launched in the city area, consisting of buses of lines PL1 and PL2 that circle the entire city and take passengers to the most important points in Pleszew.

As of 2018, Arkadiusz Ptak is the mayor of the city and municipality of Pleszew. From the information provided by him and published by the Institute of Rural and Agricultural Development of the Polish Academy of Sciences (2023), we learn that the implementation of the “15-minute city” concept took place in 2020. Its implementation benefited from consultation and support from the scientific community, as well as a number of quantitative surveys of the city's residents (Table 3).

Table 3.

Studies related to the implementation of the “15-minute city” concept, commissioned by the authorities of the city of Pleszew between 2018 and 2022

Serial number	Name and type of research	Year of survey implementation
1	Analysis and forecast of demographic processes in the municipality of Pleszew	2018
2	Formation of functional links of Pleszew against the background of socio-economic processes in cities and the region	2019
3	Empirical research report: “Factors influencing decisions to live in the city/municipality of Pleszew”.	2018
4	Report on the quantitative and qualitative research conducted within the project “Revitalization of the city of Pleszew”	2019
5	Concept of service of the City and Municipality of Pleszew by public mass transport	2020
6	The “Smart Pleszew” project (funded by EU funds “Human Smart Cities. Smart city co-created by citizens”)	2019-2021
7	Standards for smart management of the city and municipality of Pleszew	2021
8	Mapping the needs of people with disabilities, the youngest residents, and seniors for smart solutions	2021
9	Opinions of residents of the city and municipality of Pleszew on the quality of life in 2021	2021
10	Opinions of residents of the city and municipality of Pleszew on the quality of life in 2022	2022
11	Concept transformation of the center of Pleszew	2022

Source: Based on UMiG Pleszew (2023).

² The three-rail plexus model assumes that one rail serves vehicles suitable for both 750 mm and 1435 mm gauge track, and two oil rails ensure the completeness of the track of each gauge.

The results of the specified quantitative research were decisive for the implementation of the “15-minute Pleszew” concept. It should be added that the city authorities are still looking for inspiration and real opportunities to improve areas that are key to its sustainable urbanism. These stem from the assumptions of the Development Strategy of the City and Municipality of Pleszew 2015-2023, the Urban Renewal Plan (POM) and the further vision of development adopting the wording: “PLESZEW an integrated and competitive center of Southern Wielkopolska” (Strategia miasta...).

3.3. Practice of implementing the “15-minute city” concept by city of Pleszew

Six pillars of action were taken as the basis for the implementation of the analyzed concept in the case of the city of Pleszew, in which specific actions are currently being taken in its urban space. Their summary is shown in Figure 2.

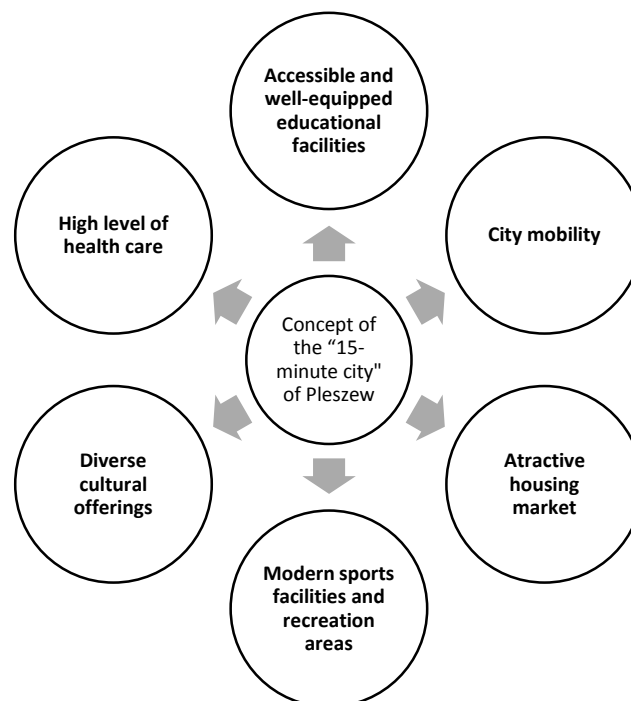


Figure 2. Pillars of the “15-minute city” concept implemented by Pleszew.

Source: Based on Urząd Miasta i Gminy w Pleszewie (2024).

The first pillar, in which activities related to the implementation of the “15-minute city” concept in the urban space of Pleszew are undertaken, involves easy access to the services of well-equipped educational institutions. Their range of services includes nurseries, kindergartens, and friendly schools (including art schools) - Table 4.

Table 4.*Infrastructure and educational service base of the studied city*

Types of educational institutions	Facilities creating educational infrastructure	Number of objects
Nurseries	- network of non-public institutions	3
Kindergartens	a) public	13
	b) non-public	4
Primary schools	a) urban establishments	3
	b) suburban establishments	4
Secondary vocational schools	- establishments offering vocational and secondary vocational education vocational education for youth and adults	3
Secondary schools	a) non-public high school offering interesting profile extensions.	1
	b) public high school	1
University of the Third Age	- Association “Pleszew University of the Third Age”	1
Specialist schools	a) Special Education Complex working with children in need of dedicated learning support.	1
	b) OHP Education and Training Center in Pleszew	1
Arts schools	- State Music School of the First Degree	1

Source: Based on UMiG Pleszew (2024).

It can be seen from the table presented that Pleszew has an infrastructure and base of educational services that can meet the needs of parents, children, as well as young people, which in the vision of the city is still to be expanded. The distribution of facilities has been planned so that everyone from their place of residence can easily access them. This makes it possible to combine raising children with work and save considerable time.

The second pillar of the implemented concept is an attractive housing market. From the website of the Pleszew City and Municipality, we learn that dozens of new apartments are handed over in Pleszew every year. The leading investor is the Pleszew City and Municipality Local Government and the local government company Pleszewskie Towarzystwo Budownictwa Społecznego Sp. z o.o. Private developers are also very active. All this makes the market for buy-to-let and rental housing increasingly competitive, and own housing for city residents is becoming more accessible. An example of these actions is a complex of buildings at the intersection of Poniatowskiego and Mieszka I streets in Pleszew in a new formula: apartments for rent with the possibility of purchase. Offers includes 92 apartments with a total floor area of about 4500 sqm. (from 32 to 74 sqm.) and 98 parking spaces. The buildings consist of 6 overground floors and basements. Associated infrastructure has been designed: playground, green areas for recreation, bicycle racks, underground and above-ground parking. In the immediate vicinity are located: grocery stores, kindergarten, elementary school, high school, transportation stops, service points, sports fields and recreation areas.

The third pillar of “15-minute city” concept is a diverse cultural offer. In order to meet the needs of different social groups, a complex of facilities located in the former buildings of the narrow-gauge railroad station in Pleszew called “Cultural Depot”. It is worth mentioning that the revitalization and functionality of the above complex was awarded in the prestigious competition of the Society of Polish Urban Planners for the best organized urban public space in the country (pleszew.naszemiasto.pl). The structure of the complex consists of a House of

Culture with an auditorium and classrooms, as well as the Municipal Public Library. Various cultural events are regularly held in these facilities and in the open air, i.e.: festivals, concerts, meetings with interesting people, exhibitions, performances, and many others. Their offer includes proposals for people of all ages and interests, tastes: from light popular music to classical music in the thresholds of the modern concert hall of the State Music School in Pleszew. Importantly, admission to many events is free. At the same time, it is an extremely impressive cultural facility in Greater Poland.

The fourth pillar of the “15-minute city” concept implemented by Pleszew is a high level of health care. It is provided by the Pleszew Medical Center with modern equipment and qualified staff, as well as private and public clinics, offices, and laboratories. Pleszew Medical Center ranks at the top of the Ranking “Safe Hospital”, which is organized by the Quality Monitoring Center at the Ministry of Health. In the last edition, it was ranked first in Greater Poland and 3rd on the national list. It was also ranked first in the country in terms of Level II security hospitals (wielkopolskie.naszemiasto.pl). Residents of the city can also take advantage of the services of a number of private and public clinics, the services of offices of qualified specialists, as well as the services of several laboratories, where a variety of tests can easily be performed. In addition, there are more than a dozen pharmacies both in and near the city, allowing residents to purchase medicines quickly.

Another (fifth) pillar of the “15-minute city” concept implemented by Pleszew is formed by modern sports facilities and recreation sites, i.e., sports infrastructure. Its detailed description is provided in Table 5.

Table 5.

Elements that make up the sports infrastructure of the city of Pleszew

Element of sports infrastructure	Offer of facilities forming sports infrastructure
"Planty Water Park"	• sports swimming pool with dimensions of 25 x 16 m, with 6 lanes with a depth from 1.35 m to 1.8 m • recreational pool with numerous attractions: rapid river, jacuzzi, water jets, children's pool • pool for swimming lessons • SPA area with saunas, experience shower, and heated loungers
Sports halls	• 9 objects • the newest of the halls (located on Bolesława Krzywoustego Street) is a full-size facility with a grandstand, which also allows for the organization of music events
Sports fields	• numerous grassy playing fields • 7 training fields with artificial turf and lighting • spaces for play distributed throughout the entire municipality
Trax	• they provide numerous running spots • the thriving Team Pleszew group invites all enthusiasts of this form of exercise, organizing joint training sessions and designating attractive routes • the synthetic surface running track is located at the municipal stadium and is available for public use
Skatepark	• an offer aimed at young people, skateboarding, roller skating and BMX bike enthusiasts, enables them to spend their free time in accordance with their preferred passion, in a safe manner and in suitable conditions for training

Cont. table 5.

Bowling alley	• offers 4 fully automated bowling alleys that guarantee a comfortable and efficient game • guests also have access to billiard tables, darts, table football, and games for the youngest • while waiting for their turn to play, customers have access to the bar services and the catering buffet located on the premises
Tennis courts	• they allow playing tennis regardless of the time of year • 2 covered tennis courts located next to the city stadium • the facility in Lenartowice near city of Pleszew ensures year-round tennis playing
Outdoor gyms	• these offer a proposal for people who prefer physical activity in the open air • there are quite a few of them, and more are constantly being created • they are often combined with playgrounds, creating multi-generational recreation areas
Health Trail	• the passage describes a 2-kilometer path located on the Pleszew Plants, which forms a sports and recreational complex. Some key points • it consists of simple fitness equipment and installations for exercises • it serves as a mini sports and recreation complex • it meets the needs for activities like running, Nordic walking, and various • other forms of outdoor physical activity • it serves as an area for training, sports activities, relaxation, and integration of the local community
Bicycle Trails	• they are integrated into the urban infrastructure, serving recreational and transportation functions • they are built in areas closed off from vehicular traffic • they are equipped with rest and relaxation areas • they connect the city to nearby towns, with particular importance placed on • paths along national roads 11 and 12 • they provide access to tourist attractions like the arboretum park, reservoir, and • museums in Gołuchów City

Source: Own study on Miasto 15' (2024).

Based on the objects to creating the sports infrastructure of the city of Pleszew presented in Table 5, it can be seen that their wide offer allows residents (children, youth, middle-aged and seniors) to actively spend their free time, which is an important element of health prevention. Using the services of these facilities, especially by young people, allows for sports competition, which develops talent and ultimately may contribute to the recruitment of outstanding athletes in the future.

The last pillar of the analyzed concept implemented by the city of Pleszew is urban mobility. The assumption is that every resident can easily reach the most important points of the city on foot, by bicycle or by public transport, while giving up their own vehicles. To implement this assumption, the pedestrian routes and bike paths have been expanded, and a new public transport system has been proposed, which reaches not only the city of Pleszew, but the entire municipality. In addition, the road infrastructure and free parking have been improved. It is worth noting that in 2021, the PL1 and PL2 bus lines were launched, which circle the entire city. Their compactness, frequency of trips and symbolic ticket prices are assets particularly appreciated by seniors and students commuting to school. In January 2024, a new public transport system called PPL was launched, which is an expanded transport network that was created to connect not only the entire Pleszew municipality, but also the neighboring

municipalities. For this purpose, 22 new lines were organized for the Pleszew municipality and the Dobrzyca municipality, and 9 lines to Gołuchów for the Pleszew county. These solutions introduce a new quality of communication, accompanied by wide accessibility to the city center, residential areas, schools, workplaces, parks, and recreational areas.

The presented pillars of action implemented as part of the "15-minute city" concept implemented by city of Pleszew cover the full range of key services for its residents. They contribute to improving the quality of life in the city, enabling the combination of professional work and child-rearing, providing access to cultural events, sports development, and access to the expected housing offer.

4. Discussion

The "15-minute city" concept, the implementation of which is presented in this article, is gaining popularity in cities around the world as an urban model that promotes living near work, services and recreation. However, despite its many advantages, research on the concept has some limitations and weaknesses. These are addressed by the authors of a number of scientific articles and books, for example: Montgomery (2013); Pozoukidou, Chatziyiannaki, (2021); Moreno, Gehl & Thorne (2024); Murgante, Patimisco & Annunziata, (2024), such as the authors of numerous blogs and online portals dealing with urbanism and urban development, such as: "CityLab", "The Urbanist" and "Planetizen". The most frequently mentioned limitations and weaknesses in the implementation of the "15-minute city" concept are presented in Table 6.

Table 6.
Limitations and weaknesses of implementing the "15-minute city" concept

Factors limiting the concept under study	The essence of a given limitation and weakness
Heterogeneity cities	high homogeneity in urban development may not correspond to the reality of many cities, where there are significant differences in infrastructure, population density and availability of services
Lack of consideration of demographics	surveys may not consider the demographic diversity of the population, which can lead to overlooking the needs of different social groups (e.g., the elderly, people with disabilities, families with children, etc.)
Restrictions infrastructure	many cities do not have sufficient transportation infrastructure, making it difficult or impossible to realistically implement the concept, the necessary infrastructure changes may require significant financial investment and time
Economics aspects	implementation of the concept may involve costs that are not always feasible in the context of limited local government budgets
Gentrification	implementation of this concept in some areas may displace lower-income people and change the nature of local communities
Problem of spatial planning	the concept requires integrated urban planning, which can be difficult to achieve in densely built-up cities where existing structures may limit the ability to make changes

Cont. table 6.

Adaptive capabilities	• cities that want to introduce the concept under study must be flexible to adapt to the changing needs of residents and external conditions, which can be a challenge
Sustainability problems	• although the concept prioritizes sustainability, implementing it in practice may face difficulties in balancing various social, environmental and economic aspects

Source: own elaboration based on (Montgomery, 2013; Pozoukidou, Chatziyiannaki, 2021; Moreno, Gehl, Thorne, 2024; Murgante, Patimisco, Annunziata, 2024)

In view of the emerging weaknesses and organics, research on the “15-minute city” concept, should therefore take into account these difficulties to better understand its potential and applicability in different urban contexts. The example of the city of Pleszew presented in the article confirms that this is possible, as well as the practices of many other cities around the world. Research on the concept analyzed has the potential to transform urban life and improve its quality on many levels.

5. Conclusions

The aim of the article was to recognize the practices of implementing the principles of the "15-minute city" concept, as well as the areas of its implementation by the Greater Poland city of Pleszew. The conclusions arising from the analysis of the case study presented indicate that the practice of implementing the "15-minute city" concept by Pleszew is based on six main pillars of action. They provide residents with easy access to basic educational, medical, recreational, cultural, commercial, and residential services. Their offer is fully tailored to the needs and expectations of the local community, to which the local government's cooperation with various business entities (public and private), including investors and developers, contributes.

Thanks to the implemented concept, residents of the surveyed city live better, more comfortably, healthier, and safely. The aspect of "proximity" in accessing basic services is of vital importance here, allowing for considerable time savings, which in today's world is an extremely valuable, scarce, and non-renewable resource. As a result, they can devote their free time to entertainment with their families, recreation, sports, or culture. At the same time the surveyed city has invested in improving public transportation options, including expanding the bus network and implementing measures to encourage sustainable modes of transportation, such as biking and walking. In addition, Pleszew is making efforts to protect the local environment by preserving and expanding green spaces and promoting ecological practices among its residents. The city encourages citizen engagement and active participation in decision-making processes, fostering a sense of community and ownership among the residents. Moreover, an important aspect of the “15-minute city” concept implemented by the city of Pleszew is the active promotion of local cultural heritage through the organization of various cultural events, festivals and initiatives aimed at preserving and showcasing the city's unique

identity. The city works to attract investment, support local businesses, and create employment opportunities, contributing to the overall economic well-being of Pleszew.

The presented example of the implementation of the "15-minute city" concept can serve as a model and inspiration for other smaller urban agglomerations, which, like Pleszew, have the opportunity for sustainable urban development focused on the needs and expectations of their residents. It is the first medium-sized city in Poland that has successfully implemented the theoretical foundations of the described concept. However, its use requires appropriate creativity, engagement, openness to change, flexibility of actions, wise planning, and investment decisions, as well as social dialogue.

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SOCIAL ASPECT OF MANAGEMENT IN LOCAL GOVERNMENT UNITS

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Purpose: The primary objective of this article is to conduct an in-depth analysis of sustainable development within the framework of local government management in Poland. The concept of sustainable development is examined across three fundamental dimensions: social, economic, and environmental. This study specifically addresses the social dimension, providing a focused analysis of its implementation.

Design/methodology/approach: Drawing upon a comprehensive literature review, the research posits the following hypothesis: Which areas of local government management are instrumental in the implementation of the social dimension of sustainable development?

Findings: Sustainability is an important element of management in local government units.

Research limitations/implications: It is limited to discussing only the main social aspects of management in local government.

Practical implications: The social aspects of management in local government are playing an increasingly important role in local government in Poland.

Social implications: Social and environmental education.

Originality/value: The article systematizes the concepts of management and sustainability in local government in Poland.

Keywords: Local government unit. Municipality. Management. Sustainability.

Category of the paper: Theoretical article.

1. Introduction

Local government units make rational decisions that require an analysis of the interrelationships and interdependencies that occur in these business entities. As special subjects of management, these units have: decision-making independence, their own administration, municipal property and funds. They operate not for profit, but instead perform public service activities for the benefit of the residents of the local government community. The need for management arises when performing collective activities in a given community. The ability to coordinate these activities and direct them properly significantly affects the achievement of the set goal. Management is a process that occurs in any organized collective.

Management has always accompanied human activities. It is the process of influencing the organization's resources to achieve its goals.

2. Sustainability in Local Government

Sustainability was first defined in 1987 in the Brundtland Report of the World Commission on Environment and Development under the title "Our Common Future" as "development that meets the needs of the present without compromising the ability of future generations to meet their needs" (<https://eur-lex.europa.eu/PL/legal-content/glossary/sustainable-development.html>, 22.10.2024).

In 2015, the United Nations (UN) defined a model for sustainability in Agenda 2030, which was adopted by 193 countries. The concept of sustainability according to Agenda 2030 is "the modern modernization effort should focus on the eradication of poverty in all its forms, while achieving a range of economic, social and environmental goals" (http://www.un.org.pl/files/170/Agenda2030PL_pl-5.pdf, 22.10.2024).

The 2030 Agenda contains 17 Sustainability Goals and 169 tasks in the economic, social and environmental dimensions. The document is based on the 5 P's principle (People, Planet, Prosperity, Peace, Partnership). (http://www.un.org.pl/files/170/Agenda2030PL_pl-5.pdf, 22.10.2024).

The sustainability goals included in Agenda 2030 are:

- end poverty in all its forms everywhere,
- eliminate hunger, achieve food security and better nutrition, and promote sustainable agriculture,
- ensure healthy lives and promote well-being for all at all ages,
- provide quality education for all and promote lifelong learning,
- achieve gender equality and empower all women and girls,
- ensure access to water and sanitation for all through sustainable management of water resources,
- ensure access to affordable, reliable, sustainable and modern energy,
- promote inclusive and sustainable economic growth, employment and decent work for all,
- build resilient infrastructure, promote sustainable industrialization and foster innovation,
- reduce inequality within and among countries,
- make cities and human settlements safe, stable, sustainable and inclusive,
- ensure consumption and production patterns,

- take urgent action to combat climate change and its impacts,
- conserve and sustainably use the oceans, seas and marine resources,
- protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss,
- promote peaceful and inclusive societies, ensure access to justice for all, and build effective and accountable, inclusive institutions at all levels,
- revitalize the global partnership for sustainable development (<https://kampania17celow.pl/cel-17-partnerstwa-na-rzecz-celow/>)

In Poland, the provision on sustainability was included in the Constitution of the Republic of Poland, and it reads: “The Republic of Poland shall safeguard the independence and inviolability of its territory, ensure the freedoms and rights of people and citizens and the security of citizens, guard the national heritage and ensure the protection of the environment, guided by the principle of sustainability” (art. 5 Konstytucja Rzeczypospolitej Polskiej z dnia 2.04.1997 z późniejszymi zmianami, Dz.U. nr 78 z 1997, poz. 483). One of the objectives of the European Union is sustainability, contained in Article 3 of the Treaty on European Union (<https://eur-lex.europa.eu/PL/legal-content/glossary/sustainable-development-goals.html>, 22.10.2024).

The municipality's own tasks and the sustainability goals from Agenda 2030 overlap at the level of local government units. In June 2023, a report on the implementation of the Sustainability Goals in Poland was adopted by the Council of Ministers. Conclusions and challenges for the future according to the goals from Agenda 2030 on local government were selected (<https://www.gov.pl/web/rozwoj-technologia/monitoring-realizacji-agendy-2030>, 22.10.2024).

- Goal 1 – end poverty – continuing to implement social services for those in need of support in daily functioning (the sick, the disabled), providing care in family or family-like conditions to children and youth deprived of parental care.
- Goal 2 – zero hunger – adapting to climate change, diversifying food sources, expanding stockpiles, excessively exploiting natural sources, reducing food waste (mainly in households - community refrigerators and other local activities to prevent food waste).
- Goal 3 – good health and well-being – promoting proper lifestyle habits (reducing exposure to lifestyle risk factors), preventive measures, encouraging research, reducing disparities in access to medical services.
- Goal 4 – quality education – supporting lifelong learning (upskilling and re-skilling for all, including entrepreneurial skills and digital competencies), developing inclusive education as support for psychological and pedagogical clinics.
- Goal 5 – gender equality – introducing solutions to facilitate reconciliation of work and family life, including facilitating access to institutional forms of child care of

satisfactory quality and at an affordable price (nurseries, children's clubs, day care providers), supporting equality of women in social and public spaces and increasing women's awareness of potential areas of exclusion, institutional measures to support women's entrepreneurship.

- Goal 6 – clean water and sanitation – improving the ecological and chemical status of surface water, preventing environmental disasters, improving access to water for human consumption, especially for marginalized groups.
- Goal 7 – affordable and clean energy – developing low-carbon generation capacity, ensuring security of electricity supply, developing the electricity grid, supporting the development of renewable distributed energy and large-scale RES projects.
- Goal 8 – decent work and economic growth – improving business conditions, effectively stimulating development activity of companies, especially innovative activity, disseminating corporate social responsibility (CSR) principles, supporting employment support for people with different degrees of disability, promoting employment of people aged 50+.
- Goal 9 – industries, innovation and infrastructure – difficult situation of entrepreneurs in the aftermath of the Covid 19 pandemic and inflation caused by the war in Ukraine (suspension or liquidation of SMEs).
- Goal 10 – reduced inequalities – using digital transformation to increase job opportunities that are not tied to location in different regions of the country, local development policies.
- Goal 11 – sustainable cities and communities – adapting all buildings to the requirements of energy efficiency, through thermal efficiency improvement, eliminating transport exclusion of non-urban areas, ensuring consistency of public transport schedules, integrating public transport in cities and their functional areas and ensuring that public transport is cheaper and as much as possible powered by renewable energy, improving conditions for pedestrians and cyclists, ensuring and supporting access to political and economic participation for disadvantaged groups, the exodus of people to the suburbs and chaotic suburbanization are a challenge for large cities in Poland, spatial planning as the basis for sustainability, urban planning, housing needs of large families, adapting to climate change, increasing the living comfort of city residents and their safety, smart transportation systems to improve commuter safety, reducing travel time, using the transportation network more efficiently.
- Goal 12 – responsible consumption and production – reducing consumption of natural resources and use of plastics, reducing the weight of waste sent to landfills, promoting wise use of resources and sustainability of communities in emergency situations by expanding sharing economy and closed-loop economy models.

- Goal 13 – climate action – raising public awareness of emission reduction and adaptation measures and increasing the involvement of residents in implemented local activities for environmental and climate protection, improving cooperation of local and regional authorities with the scientific community to improve the transfer of knowledge and technology, and increasing the participation of residents in activities for the benefit of local communities, increasing public confidence and sense of empowerment in activities for environmental and climate protection, improving access to financial resources for adaptation measures in an amount adequate to the specific needs of regions and municipalities, preserving and successively increasing the area of green areas in cities that fulfill important climatic, thermoregulatory, ventilation or hydrological functions.
- Goal 14 – life below water – managing the marine area sustainably, reducing nitrogen, phosphorus and pesticide emissions from agriculture as part of marine conservation, more effectively targeting agricultural subsidies for measures to prevent eutrophication of watercourses, changing eating habits to more sustainable ones.
- Goal 15 – life on land – improving the state of nature, reducing the increase in the scale of negative phenomena such as: urban heat islands, amplification of heat waves and flash floods or local flooding, by supporting local government units in the correct and reliable implementation of tasks for preserving and expanding green areas in cities, air quality monitoring, natural retention in cities.
- Goal 16 – peace, justice and strong institutions – ensuring an effective process of public consultation and involvement of social partners in the policy-making process in particular through the development of modern mechanisms of public participation, improvement of communication, social dialogue and civil dialogue and development of cooperation between public administration and NGOs requires continuous improvement, digitalization of public services.
- Goal 17 – partnerships for the goals – undertaking activities in areas that have priority for Polish development assistance – i.e. environment/climate and equal opportunities for women and men (<https://www.gov.pl/web/rozwoj-technologia/monitoring-realizacji-agendy-2030>, 22.10.2024).

The new goals outlined above were formulated on the basis of conclusions from the implemented and unrealized sustainability activities in local government in Poland to date.

3. Management in Local Government Units

Management concepts are embedded in a multi-layered social system, and thus are integrated “into a global network of socio-cultural, political, economic and other relationships” (Krzyżanowski 1994). In the developed management concept, the most important elements are the instruments, procedures and rules of management.

Management is the formulation of the purpose of action, planning, organizing, acquiring and deploying needed resources, organizing structures and verifying objectives (Zieleniewski, 1976)

J.A.F Stoner and Ch. Wankel define management as the process of planning, organizing, leading and inspecting the work of members of an organization and using all the available resources of the organization to achieve its goals (Stoner, 2011).

Ricky W. Griffin believes that management is a set of activities (including planning and decision-making, organizing, leading, i.e., managing people, and controlling) directed at the organization's resources (human, financial, material, and informational) and performed with the intention of achieving the organization's intended goals efficiently and effectively (Griffin, 1998). Various definitions of the concept of management emphasize different components of this notion.

According to Stanisław Sudoł, the term "management" can be defined in various ways depending on what is considered the most important aspect of management (the definition should not be too lengthy) while meeting the following conditions:

- management is a professional managerial activity where the source of authority of the manager over the managed individuals is ownership of resources or the right to represent this ownership on behalf of the manager,
- it is a process taking place within an organization (institution) regardless of its legal form, size, spatial structure, or type of activity, which is bound together by a common goal,
- the managed organization possesses the necessary human, material, and non-material resources, which are utilized to achieve the organization's goals,
- the governing body of the organization (the authority) influences its functioning and development by performing managerial functions (Sudoł, 2019).

The residents of the municipality form a self-governing community by law and reside in the relevant territory. The municipality performs public tasks in its own name and on its own responsibility, and has legal personality (art. 1, 2 ustawa o samorządzie gminnym z dnia 8 marca 1990r. z późniejszymi zmianami, Dz.U. nr 721 z 2020, poz. 1465).

The three-tier division of local government in Poland was introduced in 1999. This division distinguishes three units of local government: provinces, counties and municipalities (Polish: *województwa*, *powiaty* and *gminy*). The model of local self-government in Poland is dualistic

(it performs its own tasks and those delegated by the government administration). The municipality performs public tasks in its own name and on its own responsibility (art. 2 ustawa o samorządzie gminnym z dnia 8 marca 1990r. z późniejszymi zmianami, Dz.U. nr 721 z 2024, poz. 1465).

The municipality's own tasks (meeting the collective needs of the community) include:

- spatial order, real estate management, environmental and nature protection, and water management,
- municipal roads, streets, bridges, squares and organization of traffic, waterworks and water supply, sewerage, removal and treatment of municipal sewage, maintenance of cleanliness, order and sanitation, landfills and disposal of municipal waste, supply of electricity, heat and gas,
- transportation activity,
- local public transportation,
- health care,
- social assistance, including centers and care facilities,
- support for families and the foster care system,
- municipal housing construction,
- public education,
- culture, including municipal libraries and other cultural institutions, as well as the protection of and care for historical monuments,
- physical culture and tourism, including recreational areas and sports facilities,
- marketplaces and market halls,
- municipal greenery and tree plantings,
- municipal cemeteries,
- public order and safety of citizens, as well as fire and flood protection, including equipment and maintenance of the municipal flood storage facility,
- maintenance of public municipal facilities and equipment and administrative facilities,
- family-friendly policies (including the provision of social, medical and legal care for pregnant women),
- senior policy,
- support and dissemination of the idea of self-government, including the creation of conditions for the operation and development of auxiliary units and the implementation of programs to stimulate civic activity,
- promotion of the municipality,
- cooperation and activities for NGOs and volunteerism,
- cooperation with the local and regional communities of other countries (art. 7, ustawa o samorządzie gminnym z dnia 8 marca 1990 r. z późniejszymi zmianami, Dz.U. nr 721 z 2024, poz. 1465).

The municipality's own tasks are linked to the sustainability goals contained in Agenda 2030. In the local government units of counties and municipalities, there is an apparent preponderance of men among those in power (Table 1).

For the purposes of further analysis, Goal 5 of the 2030 Agenda, which pertains to gender equality, was selected. In the political domain, regulations mandate that 35% of candidates on electoral lists must be women, without imposing additional requirements. Nevertheless, the so-called "top spots" on electoral lists for local government councils, as well as parliamentary and senatorial elections, are predominantly occupied by men. In municipal council elections within municipalities exceeding 20,000 inhabitants, women secured 32.5% of the mandates. In the elections for mayors, city presidents, and village leaders, women obtained 14.7% of the mandates in the first round. Similarly, 32% of women were elected to provincial assembly councils. Although the percentage of women participating in local elections across various levels of governance demonstrates a gradual upward trend, it still falls short of achieving parity. Consequently, it can be concluded that the governance of Polish local government remains male-dominated.

The issue of gender parity is increasingly recognized as a critical factor in social governance. Noteworthy examples from recent developments include a directive issued by the Mayor of Warsaw, which implements a gender equality plan for municipal employees (<https://um.warszawa.pl/-/warszawa-wprowadza-plan-rownosci-plci>), and a proposal by the Minister of Sport and Tourism in the amended legislation aimed at introducing gender parity requirements in sports associations.

Table 1.

Women and men among chief administrators of groups of villages (wójt), (town and city) mayors, village administrators (sołtys) in 2010-2022

Specification	Years/persons												
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Chief administrators of groups of villages, town and city mayors in total	2478	2478	2477	2477	2479	2476	2478	2475	2477	2476	2477	2477	2476
Women	234	234	238	237	269	270	266	269	298	299	300	304	302
Men	2244	2244	2239	2240	2210	2206	2212	2206	2179	2177	2177	2173	2174
Village administrators – in total	40317	40389	40402	40382	40365	40553	40573	40549	40447	40607	40514	40520	40543
Women	12376	14009	14192	14322	14491	15812	16023	16104	16196	17542	17723	17867	18003
Men	27941	26380	26210	26060	25874	24741	24550	24445	24251	23065	22791	22653	22540

Source: <https://stat.gov.pl>

In 2010-2013, the share of women in the group of chief administrators of groups of villages, town and city mayors was fewer than 250 out of nearly two and a half thousand people. In the following six years, fewer than 300 women held key positions in local government. And, in the last three years (2020-2022), there were 300 or a little more than 300 women in the study group. Among village administrators, the increase in the number of women in 2010-2022

is more pronounced. In 2010, there were 12376 women among them, while in the last year of the 2022 survey - there were already more than 18,000 (an increase of about 1.5 times).

Table 2.

Women and men among chief administrators of groups of villages, (town and city) mayors, village administrators in percentage terms in 2010-2022

Specification	Years/percentages (%)												
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Chief administrators of groups of villages, town and city mayors in total	100	100	100	100	100	100	100	100	100	100	100	100	100
Women	9,4	9,4	9,6	9,6	10,9	10,9	10,7	10,9	12	12,1	12,1	12,3	12,2
Men	90,6	90,6	90,4	90,4	89,1	89,1	89,3	89,1	88	87,9	87,9	87,7	87,8
Village administrators – in total	100	100	100	100	100	100	100	100	100	100	100	100	100
Women	30,7	34,7	35,1	35,5	35,9	39	39,5	39,7	40	43,2	43,7	44,1	44,4
Men	69,3	65,3	64,9	64,5	64,1	61	60,5	60,3	60	56,8	56,3	55,9	55,6

Source: <https://stat.gov.pl>

In the first group analyzed, the increase in the share of women among those in power between 2010 and 2022 is slight, from 9.4% to 12.3%. In the second group, the increase is significant - from 30.7% to 44.4%. At lower levels of local government, women are more likely to be involved in management. That group is nearing gender parity.

The analysis of other goals (beyond Goal 5) can be approached through the lens of financial resource allocation across various sectors within local government units in Poland. This can involve a comparative review of planned versus actual expenditures in the budgets of local government entities. From the perspective of social economics, it is possible to assess the community's specific demands and expectations for various public services. There are significant disparities between local government units (e.g., municipalities) and across geographic regions in Poland regarding the scope and type of social services tailored to local needs.

A comprehensive analysis of a single municipality in the context of all 17 goals of the 2030 Agenda constitutes a complex, time-intensive, and multidimensional task. Beyond financial analysis, qualitative assessments of the implementation and outcomes of other 2030 Agenda goals can be undertaken. In the context of financial analysis, particular attention should be directed toward identifying the root causes of significant discrepancies between planned and actual expenditures. This could provide insights into inefficiencies and areas for improvement in the allocation and utilization of resources.

4. Conclusions

Management in local government units is heavily influenced by the ever-changing and dynamic environment, which poses new challenges to local government, such as the Covid pandemic or the war in Ukraine. Local government is responding to these changes with some delay due to the complexity of public administration mechanisms. The goals of the local government community are realized in many areas. The needs of different social groups and the changing demographic structure of the society are major challenges for local government units, especially for municipalities (which are closest to service recipients). The 17 sustainability goals are a new challenge for local government and the state. The goals in Agenda 2030 are a response to increasingly advanced technological, social and environmental and economic needs. On the one hand, the society is getting richer, while on the other, Poland is one of the fastest aging countries in Europe. All these aspects pose challenges for local government units.

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BUDGET MANAGEMENT IN SOCIAL INNOVATION PROJECTS

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Purpose: In the article, we examine the impact of management effectivity on the budget of a social innovation project. To this end, the following research hypotheses were established: Budget planning depends on the effect of social innovation project management; The form of monitoring and inspection depends on the effect of social innovation (SI) project management; Introduction of product and result indicators depends on the effect of social innovation budget management.

Design/methodology/approach: Based on the literature research, it was decided to conduct face-to-face interviews with leaders of non-profit organizations that have had at least one social innovation project. In order to verify the research hypotheses, semi-structured interviews were conducted with representatives of 11 organizations.

Findings: Our findings confirm the relationship between management effectiveness from the respective phases of budget project and implementation. Respondents noted that they used respective effective management approaches in budgeting during implementation of social innovation projects.

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 make it possible to better tailor budget management to heterogeneous social needs.

Social implications: SI-related projects are highly dependent on the project budget. Budget monitoring and inspection focus primarily on the degree of matching of the implemented project to social needs.

Originality/value: The article systematizes the knowledge of the theory of effectual SI budget management, which directly affects better adaptation of projects to social needs.

Keywords: social innovation, project management, budget management.

Category of the paper: Conceptual paper.

1. Introduction

In today's highly uncertain and rapidly changing social and economic environment, efforts to develop innovative products, processes and services have become a key factor in the sustained success of organizations (e.g. Newman et al., 2020). Much has been written on innovation in the literature. Given the distinctiveness of the subject of social innovation as a special type of innovation, it is necessary to lean into the challenges of the effectiveness of planning, monitoring of implementation, analysis and evaluation of results, decisions made on the basis of social innovation project budgets.

2. Social innovation as a project challenge.

Innovation drives progress in productivity and economic growth. However, it is true that the contribution of innovation is not only economic, but also pursues social goals (OECD, 2024).

The sciences that study innovation focus on two distinct trends.

One examines the organizational and social processes that produce innovation, such as individual creativity, organizational structure, environmental and cultural context, or management and leadership approaches (Stachel, Mussante, 2022, 2023).

The other treats innovation as an outcome that manifests itself in new products, product features and production methods. This branch of research leans into the source and economic consequence of innovation (Yezersky, 2007).

To be considered an innovation, a process or result must meet two criteria. The first one is novelty: while innovations do not necessarily have to be original, they must be new to the user, context or application. The second criterion is to improve an existing solution (process and/or product). To be considered an innovation, a process or result must be either more effective or more efficient than pre-existing alternatives, more sustainable and/or more equitable. Sustainable means solutions that are both environmentally, socially and/or culturally sustainable, as well as organizationally sustainable – ones that can work over the long term. (Phills et al., 2008, pp. 37-39). Moulaert and Nussbaumer (2004) believe that SI goes further than economic and technological innovation because it focuses on the role of transforming human relationships.

It is important to distinguish four distinct elements of social innovation: First, the innovation process is the generation of a new product or solution, which includes technical and economic factors that enhance and influence social change. Second, the product or invention itself – the result is the actual innovation, which will directly affect the social environment, changing

human relations, among other things. Third, the diffusion, scaling or adoption of the innovation, as a result of which it becomes popular. Fourth, the ultimate value created by an innovation that results in lasting social change. Understood this way, it provides the basis for defining social innovation: a new solution to a social problem that is more effective, efficient, sustainable and/or equitable than pre-existing solutions.

Meanwhile, a project is an endeavor carried out to achieve some goal, at a specific time, using specific resources within a specific budget (Knosala, Deptuła, 2018, p. 23). In the subject literature (e.g. Wirkus et al., 2018; Świtalski, 2005) the basic parameters of a project are time, cost and quality - the so-called Iron Triangle (Pollack et al., 2018; Baloyi, Bekker, 2011). The Institute (2017) pointed out that time in itself does not directly affect project implementation and budget, and it only affects the schedule. Accordingly, a schedule was introduced as part of project management. The developed schedule is a detailed plan in which the activities needed for implementation will be the links between the respective activities and the time needed to perform them and the estimated expenses and results within the budget (Perić et al., 2021).

A social innovation project focuses primarily on social goals, the solution to which should be more sustainable and/or equitable. Therefore, when creating a social innovation project, it is necessary to face the specifics of the goal taking into account the available social and economic resources embedded into the project budget plan in the schedule.

3. Social Innovation Budget Project

Any innovative endeavor must demonstrate the economic viability of its implementation. This is why the budget is so important as a financial plan for the project, created as a result of the required cash to meet the needs during and after implementation – scaling the project.

A budget is a document that deals with future decisions to be made at a certain time and under certain conditions and assumptions. A budget is a plan expressed in numbers for the term of the project.

The numerical presentation of the plan imposes a kind of order, making it possible to see what money and by what organizational units will be spent, where and what costs will be incurred, and what revenues will be received. The budget combines the functions of planning and control (Adamowicz, Łuniewska, 2015).

Budget determination is the process of aggregating the estimated costs of the respective activities or work packages to establish an authorized cost baseline. A key advantage of this process is that it establishes a cost baseline against which project performance can be monitored and verified. This process is done once or at defined moments (milestones) in the project (Institute, 2017).

An additional feature of the budget is to show the economic equilibrium determining the activities of the entities. In every organization, the process of planning takes place on a continuous basis. As a result, there are always patterns of action and patterns of evaluating task performance. A feature of a good budget is flexibility, which entails mutual variability of economic quantities. The budget report, on the other hand, presents outcomes that result from the decisions actually made. As a result, budgeting is a process involving specific management activities in an organization. These activities are based on phases and are arranged in the following sequence of stages: budget creation, budget implementation and budget verification. The separation of these stages and their implementation depend on each individual decision, cannot be imposed (Sojak, 2010), and should be adapted to the current needs of the organization. The social innovation budget must also result from meeting the needs, of the beneficiaries who are the recipients of the innovation, at a satisfactory level. It must not just result from the need of the innovating organization itself.

Christensen et al. (2006) warns of social change as a “primary goal” that “largely creates an unintended byproduct” of disrupting or preventing SI. The author points out that wrong orientation of innovations reduces the social value added. Expanded support is needed for organizations that approach social sector problems in fundamentally new ways and create scalable, sustainable, systems-changing solutions. SI disruption is called catalytic innovation, where current players in any sector have the resources, processes, partners and business models designed to support the status quo. This makes it difficult for them to challenge the dominant way of doing things, and is unattractive to them. Organizations are created to support their existing business models. Since implementing a simpler, cheaper, more accessible product or service could sabotage their current offerings, it is almost impossible for them to disorganize themselves. Therefore, catalytic innovations that will bring new benefits to most people are likely to come from outside the group of established players. Features of catalytic thinking include (Christensen et al., 2006):

1. They create systemic social change through scaling-up and replication.
2. They satisfy a need that is either over-satisfied (because the existing solution is more complex than many people need) or not satisfied at all.
3. They offer products and services that are simpler and less costly than existing alternatives, and may be perceived as having a lower level of efficiency, but users consider them good enough.
4. They generate resources, such as donations, grants, volunteer labor or intellectual capital, in ways that initially seem unattractive to existing competitors.
5. They are often ignored, disregarded or even supported by existing entities for whom such a business model is unprofitable or otherwise unattractive and who therefore avoid or withdraw from this market segment.

An interesting approach to project management, including budget management, which can prevent catalytic innovation, was proposed by Sarasvathy (Chandler et al., 2011; Sarasvathy, 2001), who defined four principles of efficiency of project management while translating them into socio-economic needs, namely: (1) being guided by available means, not by predetermined goals; (2) affordable loss, not expected gains; (3) adaptability and recognition of the unexpected instead of using the existing knowledge, and (4) partnership instead of competitive analysis.

The basic idea of **the means-oriented approach** is to focus on the available resources and experiment to create business opportunities for the unpredictable future, rather than formulating specific goals and targets to forecast the future. The available resources can take the form of financial support or free resources, such as skills or equipment that are not currently in use. The means-oriented approach allows the decision-maker to explore alternatives, without the constraints of an expected outcome, and then evaluate multiple options and test different approaches through experimentation. Using effective reasoning and relying on available resources in the context of a project can enable a decision-maker to use their identity, skills and network while considering the inventory of available resources to achieve an outcome. The project budget will only consist of a plan of available tangible and social resources at a certain time and under certain conditions. The implementation and inspection of the project budget will be driven by the need to evaluate the alternatives tested.

The principle of **affordable loss rather than expected gains** takes into account the potential risk of investing in a project and bases decisions on an acceptable amount of loss, while focusing on experimenting with as many strategies as possible with the resources available. An affordable loss promotes the creation of more options in the future, rather than maximizing short-term profits. The principle of affordable loss takes into account the available resources, as well as the risks associated with their use. Decisions are made taking into account the level of possible loss to ensure that any loss does not exceed a level that is “affordable”, i.e. does not lead to an unacceptable level of negative consequences (Berends et al., 2014; Blauth et al., 2014).

In the context of project management, traditional causal decision logic begins with project planning and uses methods such as business plans or forecasting to calculate and minimize risks, as well as calculate expected returns (Salomo et al., 2017) including social value added. Applying the principle of affordable loss to project management could increase the emphasis on assessing the potential risks or drawbacks of project investment and reduce the emphasis on financial calculations of the expected returns. This can be especially beneficial in highly innovative, high-risk project environments.

Adaptability means the degree to which one recognizes the unexpected and the ways to take advantage of opportunities. Effectuation focuses on the controllable aspects of unpredictable future, and the underlying logic is this: to the extent that we can control the future, we do not need to predict it. Consequently, under the principle of adaptability, unforeseen events and surprises are not seen as risks, but rather as sources of opportunity. In contrast, causal

logic focuses on the predictable aspects of uncertain future. The basic logic of causation is: to the extent that we can predict the future, we can control it. Unforeseen events and surprises are avoided or overcome in order to achieve project goals.

The logic of causation may be suitable for decision-making in projects with low levels of uncertainty, since flexibility is not required (Brettel et al., 2012). Thus, the project budget will be a reserve that will allow rapid adaptation in case of unpredictable events or opportunities. The adaptability of the project budget activates and creates social participation in the creation of social innovation. The flexibility of project implementation and budget control is essential for organizations to thrive in a constantly changing environment. Agile project management methodologies and flexible budgeting practices enable organizations to adapt quickly to unforeseen circumstances, ensuring responsiveness and effective resource allocation.

Partnerships instead of Competition play an important role in many project environments. “A successful approach is only associated with risk concerning resources that can be lost profitably; thus, it also drives partnerships as the main method of resource augmentation” (Saravathy et al., 2017). Effective logic focuses on early collaboration with stakeholders and beneficiaries to extend resources and measures, reduce or share uncertainty, and obtain decision support and funding for social innovation activities. Partnerships enable a higher level of control in the future; each partner brings new resources and capabilities that can be combined to shape a future project. In addition, stakeholders may be able to provide information to reduce ambiguity and uncertainty. Besides, the partnership of different communities also provides the budget with intangible resources, expanding the reach, knowledge and access to new communities of beneficiaries.

4. Hypotheses

In this section, we develop hypotheses on the relationship between project factors such as goal, schedule and socioeconomic qualitative result, and the sequence of budgeting stages in project management effectuation. Therefore, management provides the structure through which project goals are set, the means to achieve those goals, and the monitoring of results. Our study focuses on two mechanisms of budget management and their relationship to effective decision-making: the use of available funds (resources) and the degree of budget monitoring. Economic and social justification is created to evaluate budget management and plays a crucial role in supporting strategic decision-making. Budget monitoring takes into account the day-to-day inspection of the project and is therefore crucial in deciding what to do next in project implementation.

Our hypotheses combine planning, monitoring and inspecting, as well as evaluating the social innovation budget, to decision-making with four principles of effectuation: “means-oriented approach”, “affordable loss”, “adaptability”, and “establishing partnerships”. The conceptual model is shown in Figure 1.

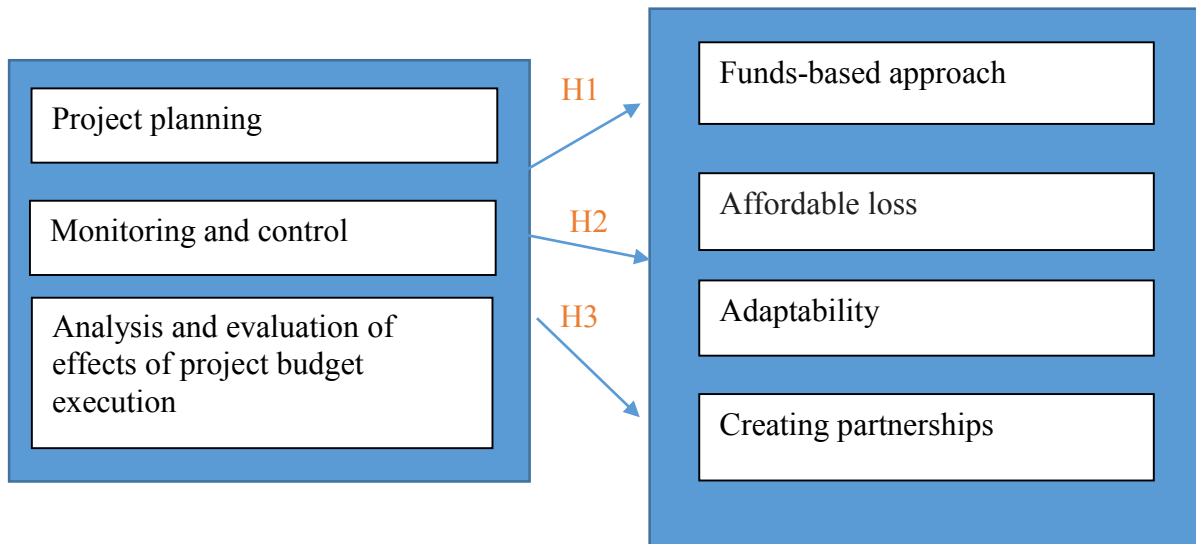


Figure 1. Framework for the Study.

Source: Own study.

4.1. Project budget planning

Budget planning is an important introductory element for initiating projects. Planning methods are called ways of preparing and making decisions, while planning techniques include a set of accounting, statistical, information, optimization, etc. activities that are the basis for preparing and making decisions (Grabińska, Stabryła-Chudzio, 2010).

There are also several methods for developing budgets, depending on the assumptions made and the budgeting procedure (Czubakowska, 2004, pp. 83-92):

- top-down budgeting – involves preparing a budget taking into account the amount of subsidies or grants,
- bottom-up budgeting – the budget is drawn up according to project needs,
- incremental budgeting – the budget is adjusted for anticipated changes in a future period,
- budgeting from scratch – budgets are drawn up from scratch, based on new assumptions and procedures, making this method more efficient than the incremental method, as it consciously abandons past data and assumptions where errors may exist,
- static budgeting – involves not taking into account the impact of the time factor on budgeted items,
- dynamic budgeting – mainly applies to budgets in which the impact of predictable but rapid changes is specified; with this method, it is important to specify terms and conditions.

Meanwhile, project management textbooks distinguish three basic methods of project cost planning (Institute, 2000, pp. 88-89):

- planning by analogy – involves using information about the actual costs of similar projects and adjusting these values based on differences between projects,
- parametric modeling – planning project costs using fixed cost parameters, specifying unit costs set for selected relevant variables characterizing the project,
- planning from scratch – determining the cost of projects without reference to actual data from other projects, most often focuses on planning the need for the respective resources required to carry out the project.

Based on the demonstrated divergence of approaches to budget development, we propose that the method of cost planning should depend on the effect of project management.

H1: Budget planning depends on the effect of social innovation project management.

4.2. Budget monitoring and inspection

Monitoring and controlling the work on a project is the process of tracking, reviewing and reporting overall progress to meet the performance goals outlined in the project management plan. The key benefits of this process are that it allows stakeholders to understand the current status of the project, recognize activities undertaken to address any performance issues, and have insight into the future status of the project with cost and schedule projections (Institute, 2017).

Inspection includes determining corrective or preventive measures or re-planning and tracking action plans to determine whether the measures taken have resolved the performance problem.

The work process for the Monitor and Control project involves:

- Comparing actual project performance with the project management plan.
- Periodically evaluating performance to determine whether any corrective or preventive measures are indicated, and then recommending such measures as necessary.
- Checking the status of the respective project risks.
- Maintaining an accurate, timely database of information on project product(s) and related documentation until project completion.
- Providing information to support status reporting, progress measurement and forecasting.
- Providing forecasts to update current cost information and current schedule.
- Monitoring the implementation of approved changes as they occur.
- Appropriately reporting on project progress and status to program management when the project is part of an overall program.
- Ensuring that the project remains in line with community needs.

Hence, we pose the following hypothesis:

H2: The form of monitoring and inspection depends on the effect of social innovation project management.

4.3. Analysis and evaluation of the effect of the implementation of the social innovation project budget.

The project budget includes expected revenues and cost plans for the respective activities defined by the project schedule. In addition, additional quantitative items indicating the size of the activities are entered for each activity in the budget. In this way, the cause-and-effect links between the three important aspects are clearly visible in the project budget:

- the value of the project – the scope, quality and timing of the expected results as a cumulative effect of the planned size of the activities,
- the course of project implementation – the distribution of the respective activities over time, taking into account the existing constraints,
- project costs – resources used for carrying out subsequent activities.

Thanks to such a data approach, the project budget prepared across activities provides a suitable basis for analyzing the effectiveness of the project and seeking a wise compromise between the value and cost of the project (Łada, 2007, pp. 37-40), and the effectiveness of the activities carried out.

When analyzing and evaluating the effects of implementation, they should be directly linked to the goal and the effect of achieving the intended purpose. Therefore, measurable indicators should be put in place to achieve sub-goals – milestones, and to assess the final goal of the project.

In projects supported by European Funds, two groups of indicators are stated, i.e.:

- product indicators– specify the direct, actual effect of project implementation, measured by absolute quantities,
- result indicators – describe the changes in the situation of the beneficiary or final recipients of the project, which occurred as a result of its implementation.

Therefore, we suggest:

H3: The introduction of product and result indicators depends on the effect of social innovation budget management.

5. Methods

The study employed a qualitative method using a flexible research project approach. For this purpose, semi-structured interviews were conducted with leaders of NGOs, lasting between 30 and 45 minutes. The purpose was to achieve an in-depth understanding of the

objectives, issues and processes affecting the principles of project management efficiency, in the area of the implemented project budget. The study involved eleven organizations (affiliated with the Association) from the Silesian province. A prerequisite for selection of the organization was that it implemented at least one project related to social innovation. During the interview, respondents were asked to indicate what management effect principle they chose in the respective specific phases and activities related to the budget, and then the interviewer would elaborate and check the appropriate box. Summarized responses are included in the table (Table 1).

Table 1.
Summary of the aggregated responses of respondents

Item	Funds-based approach	Affordable loss	Adaptability	Creating partnerships
How did you budget the social innovation projectweb?				
Planning by analogy	5	0	0	0
Parametric modeling	1	0	0	0
Planning from scratch	2	0	0	3
Do you monitor and inspect the budget during implementation of the social innovation project?				
Comparing actual project performance with the project management plan	6	2	1	2
Performing periodic performance evaluations to determine whether any corrective or preventive measures are needed	5	1	5	0
Checking the status of the respective risks	2	9	0	0
Maintaining an accurate, timely database of information	0	0	0	0
Providing information to support status reporting	0	2	0	0
Providing forecasts to update current information	9	2	0	0
Monitoring the implementation of approved changes	6	1	1	3
Ensuring adequate reporting on project progress and status	0	1	2	0
Ensuring that the project remains in line with social needs	10	0	1	0
Has the analysis and evaluation of the effect of implementation of the budget of a social innovation project included social value in the indicators? If so, how much and in which indicator				
Product indicators	3	5	1	0
Result indicators	1	3	3	5

Source: Own study based on the responses given.

This approach was considered to be the legacy. Qualitative research benefits from a flexible research project rather than a fixed procedure (Maxwell, 2012). Denzel and Lincol (2018) believe that *...There is no one way to do critical interpretive, qualitative inquiry. We are all interpretive bricoleurs stuck in the present, working against the past, as we move into a politically charged and challenging future.*

6. Results

6.1. Budget planning depends on the effect of social innovation project management

When planning the budget for a social innovation project, respondents mainly used the available funds (73%), while the rest established partnerships. During the interviews, project leaders mainly noted the funds raised to implement the project. They believed that programs that support the implementation of social innovation largely determine the project budget and this forms the basis for projecting budget values.

Table 2.

Social innovation budget planning by project management effect

Item	Funds-based approach	Affordable loss	Adaptability	Creating partnerships
Planning by analogy	45%	0%	0%	0%
Parametric modeling	9%	0%	0%	0%
Planning from scratch	18%	0%	0%	27%

Source: Own study.

It should be noted that if the respondents declared a plan management approach based on available resources, the planned budgets were determined by analogy (45%) of project cost planning. The choice of forming partnerships as an outcome of project management influenced budget planning from the bottom up. In project budgeting, respondents were not following affordable loss and adaptability.

Based on the results of the study, it can be confirmed that the budget planning of a social innovation project is determined by effective management: a means-oriented approach and the establishment of partnerships.

6.2. The form of monitoring and inspection depends on the effect of project management

The purpose of hypothesis 2 is to establish the relationship between the phases of project implementation and the conduct of monitoring and inspection. The implemented social innovation projects were carried out by non-profit organizations operating in the Silesian province. These entities implemented monitoring and inspection primarily using an approach based on free resources (Table 3). Monitoring of project compliance with social needs was conducted in 92% of the cases. Respondents also noted the inspection of updating forecasts (82%), and implementing changes (55%). Another important issue was the comparison of project budget implementation with the plan (55%).

Table 3.

The effects of social innovation project management and the phasis of budget monitoring and inspection

Item	Funds-based approach	Affordable loss	Adaptability	Creating partnerships
Comparing actual project performance with the project management plan	55%	18%	9%	18%
Performing periodic performance evaluations to determine whether any corrective or preventive measures are needed	45%	9%	45%	0%
Checking the status of the respective risks	18%	82%	0%	0%
Maintaining an accurate, timely database of information	0%	0%	0%	0%
Providing information to support status reporting	0%	18%	0%	0%
Providing forecasts to update current information	82%	18%	0%	0%
Monitoring the implementation of approved changes	55%	9%	9%	27%
Ensuring adequate reporting on project progress and status	0%	9%	18%	0%
Ensuring that the project remains in line with social needs	91%	0%	9%	0%

Source: Own study.

What is interesting from the point of view of the adaptive effect of project budget management is that 45% respondents indicated performance evaluation to assess the need for corrective and preventive measures.

To sum up, leaders operating social innovation projects introduced monitoring and/or inspection in all the management outcomes, in phases: comparing the actual budget with the planned one, and monitoring the implementation of approved changes. In the remaining cases, budget monitoring and inspection depended on the adopted management outcomes, which is consistent with the second research hypothesis.

6.3. The introduction of product and result indicators depends on the effect of social innovation budget management

Allocation of funds for projects and initiatives that aim to solve social problems in an innovative way depends on the effect, the measurement of which is expressed in indicators. To ensure efficiency and transparency in spending the funds recorded in the form of numbers in the project budget, it should be reflected in the product and result indicators. Based on the result of the study (Table 4.), it is clear that the introduction of product indicators related to social innovation was the result of management of the so-called affordable loss (45%).

Table 4.*The effect of project budget management, and the number of product and result indicators*

Item	Funds-based approach	Affordable loss	Adaptability	Creating partnerships
Product indicators	27%	45%	9%	0%
Result indicators	9%	27%	27%	45%

Source: Own study.

It should also be noted that all organizations planning and implementing projects related to social innovation applied different budget management effects in the project and measurement of the result indicator, which demonstrates a high degree of flexibility in its definition and measurement.

7. Discussion and Conclusions

The purpose of this article was to explore the use of budget management effectuation in decision-making in project environments. Considering factors both at the project budget level, we bring new findings to whether and how the logic of effects impacts the management of social innovation projects. Our findings show that the effects of social innovation project management are closely linked to the phases and activities of project budgeting. In different phases, respondents use analogous management effects that enable them to better align activities with social goals and needs.

These results are consistent with the findings that effectuation is applied to the product innovation processes of small organizations, where the approach can be described as means-oriented, staged and open (Berends et al., 2014), which is also appropriate for social organizations. Our results suggest that in innovative projects, project leaders oversee the evolution of projects and project changes as opportunities arise. The budget should be flexible enough to adapt to changes in the environment.

Another important finding is that budget monitoring and inspection focuses on the degree to which the implemented project matches the social needs. The decision-makers mainly noted monitoring during budget implementation for any discrepancies between the plan adopted in the schedule and the actual needs. The logic of SI is to fulfill social needs in a changing environment in a more efficient way. The approach presented makes it possible to detect any errors or omissions during project implementation. Awareness of the goal related to social needs is an important element related to SI.

All respondents point to the important roles of projecting product and result indicators. Uncertainty in innovative projects is high, so estimating and mitigating the risk of possible losses is more appropriate than predicting expected gains when measuring the effectiveness of social innovation indicators.

Our research clearly indicates that SI projects have different sensitivity regarding effectuation. Analysis of the phenomenon of the effect of project budget management led to findings that should indicate follow-up work on IS. The relatively small sample size does not allow generalizing the results, but is becoming an inspiration for further research on social innovation projects in Poland and the world.

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HEALTHCARE FINANCING SYSTEM IN POLAND AGAINST THE BACKDROP OF OTHER EU COUNTRIES

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Purpose: The aim of the article is to outline the healthcare financing systems in Poland and other EU countries, taking the level of budgetary resources and other conditions associated with the financing of healthcare services into account.

Design/methodology/approach: The article draws on a review of literature and online sources. The analysis time frame covers the years 2021-2023.

Findings: The article provides a description of selected models of healthcare financing, as well as presents the basic sources of said financing. Based on the presented analyses, recommendations have been developed, indicating the need to expand the health insurance premium base and eliminate the privileges associated with the obligation to enroll in the National Health Fund [Polish: Narodowy Fundusz Zdrowia (NFZ)] and the premiums paid.

Practical implications: The article presents the characteristics of healthcare financing system evolution in Poland, taking the current limitations involved in sustaining fiscally effective care financing under the changing macroeconomic and social conditions into account.

Originality/value: The results of the analyses carried out are of cognitive value. The article compares healthcare financing models, presenting current trends in the search for sources of healthcare financing consistent with the priorities of national socio-economic policy.

Keywords: healthcare financing, health insurance premium.

Category of the paper: General review.

Introduction

Currently, the healthcare system in Poland operates on the basis of a universal health insurance. The compulsory health insurance premium equaling 9% of the insured's income is paid through the Social Insurance Institution [Polish: Zakład Ubezpieczeń Społecznych (ZUS)] to the National Health Fund, which finances the health services provided to the insured and reimburses the costs of medication. Since the beginning of the systemic transformation in Poland, the healthcare system has been subject to many profound changes and numerous modifications. The key change came on January 1, 1999, when the 'budgetary' system was replaced by a new 'insurance-budgetary' financing model, with the healthcare system grounded

in the principles of social solidarity, universal health insurance, and equal access to publicly funded healthcare services. The adoption of a mixed source of healthcare financing in no way exempted the state from its obligation to support the healthcare system. The state budget still finances, *inter alia*, preventive programs (including protective vaccinations), highly specialized medical procedures (e.g. transplants), health policy programs, medical personnel training, scientific research and central investments, blood donation stations and sanitary and epidemiological stations (Gorzałczyńska-Koczkodaj, 2017).

In reforming the Polish healthcare system, an important role was also assigned to local government structures as founders of healthcare facilities, including mandatory transformation thereof from budgetary units into independent facilities. Consequently to this process, healthcare facilities were restructured into independent public healthcare institutions, but also units of a local-government and non-public nature were established. The principle of separating the function of healthcare payer from that of healthcare organizer and provider became binding. The financing of specific packages of health services and benefits was taken over by institutions previously non-existent in post-war Poland, i.e., health insurance Funds. An internal market for services developed, with entities of different legal status (public, private, cooperatives, etc.) applying for contracts. As part of the universal health insurance system, 16 Regional Health Insurance Funds, operating at the voivodeship level, and a Trade Union Health Insurance Fund for Uniformed Services, were established. These were independent and self-governing institutions, pooling and managing funds from the premiums paid by those assigned to a given Fund, entering into agreements with healthcare providers to deliver healthcare services – both preventive and curative (Mitek, 2016).

The changes introduced were intended to ensure that ‘money follows the patient.’ What this meant was that everyone could choose their doctor, clinic and hospital of treatment. Further changes to the healthcare system followed in 2003. After four years of operation, the Health Insurance Funds were transformed into the National Health Fund [Polish: Narodowy Fundusz Zdrowia (NFZ)] (Central Office and Regional Branches). The legal status of the payer also changed: the Health Insurance Fund was a self-governing institution, whereas the National Health Fund is a state organizational unit with legal personality (Mitek, 2016).

Poland currently maintains a system of universal, compulsory health insurance, regulated by the Act of August 24, 2004 on publicly funded healthcare services. The National Health Fund (NFZ) finances healthcare services and the reimbursement of medication, medical device or orthopedic item costs, *inter alia*, from premiums and other sources listed in the Act, under contracts concluded with healthcare providers. The financing process is based on the Fund's financial plan. Healthcare services can be financed from two sources: public and private funds. In most OECD countries, healthcare is financed from a variety of sources, in varying proportions (Mitek, 2016). Public sources comprise mainly state, regional and local budgets, public insurance funds and extra-budgetary funds. Private sources primarily consist of individual healthcare consumers' income, private health insurance, employers and charities (Journal of Laws No. 210, item 2135).

Healthcare financing models

Finding the right model of financing such an important area of life as healthcare is extremely difficult. Paradoxically, technological and medical development contributes to this, forcing the use of increasingly better, more effective, but at the same time much more expensive, medical equipment and supplies. The demographic changes (longer life expectancy and aging population) that have been taking place in Poland for many years are not without significance in this matter either. In addition to the income aspect, borne in mind should be that healthcare financing not only entails accumulation of funds for this purpose, but also appropriate allocation and spending thereof, meeting the healthcare needs of the society (Lenio, 2018).

Healthcare constitutes a highly complex element of every country's policy. What is more, healthcare system functioning translates into many other social and economic challenges. In practice, no perfect healthcare system which would solve all the problems of today's societies exists. The following models of healthcare financing are practically implemented (Łuniewska, 2014):

- Beveridge model,
- Bismarck model,
- residual model,
- Semashko model.

The Beveridge model entails the creation of a National Health Service, financed from the taxes paid to the state and local authority budgets. Health care in this model falls under the responsibility of the state, which must facilitate access to a basic package of services for its citizens. Since only basic medical services are provided, voluntary health insurance is necessary. The model originated in the UK and is currently implemented in the healthcare systems of Denmark, Portugal, Spain, Greece, Sweden, Finland and Norway (Borkowska, 2018).

Another health care model is the Bismarck model. The source of funding is the insurance premiums paid by employees and employers to independent health insurance funds. Special-purpose funds are established, not general tax-funded funds, as in the previous model. The party responsible for organizing insurance coverage is the public authorities. Health services are provided by public and private medical facilities. The financing is contract-based. Wealthy individuals are not covered by the insurance system and are referred to private facilities in case of illness. This model underpins the healthcare systems of Germany, Austria, Belgium, the Netherlands, Switzerland and France (Borkowska, 2018).

In the residual model, in contrast, the state is relieved of the obligation to provide citizens with access to health services, with only residual subsidies from public funds. The main source of funding is private insurers, operating under strict supervision by medical organizations. The public takes responsibility for their own health, and only assistance programs for those

with low or no income are available. This model is implemented in the USA (Borkowska, 2018).

The next model is the Semashko model, standing in complete contrast to the residual model, with the state taking full responsibility for the health of the public. The only source of funding is the state budget, healthcare facilities are state-owned, there is no private healthcare sector, and citizens enjoy free access to comprehensive healthcare services. This model prevailed in socialist countries, including in Poland until 1998 (Łuniewska, 2014).

The role of the National Health Fund (NFZ) in the healthcare system

The current healthcare financing system evolved from the many changes it was subject to in the past, with its present form reflecting the systemic reform of 1999. As a result of the aforementioned reforms, universal health insurance was introduced in Poland as the main tool and source of healthcare services financing. The main assumption behind the new concept implemented entailed a decentralization of the healthcare financing system and application of purpose-specific insurance, involving local governments in new responsibilities (Mitek, 2016).

The newly established units became responsible for organizing the provision of services, as well as for contracting and financing these services. Ultimately, the reform led to the establishment of a centralized institution, the National Health Fund (NFZ), which reintroduced central distribution of the funds, collected from health insurance premiums, to the regional branches. Subsequent statutory amendments strengthened the position of the NFZ as a decision-making body and a party in the entire process of contracting health services with healthcare providers (Bromber, 2014). Currently, the NFZ plays a substantial role in financing the healthcare system. Its main task is to finance healthcare services as well as contract these services with public and non-public healthcare providers. The institution primarily functions as the organizer and coordinator of the entire process of healthcare provision and financing. It is also involved in the entire process of financing, and public funding of these services is not possible without its participation (Bromber, 2014).

In addition to the National Health Fund, two other entities play an important role in the system, namely the Ministry of Health and local governments. The main task of the Ministry of Health (in cooperation with the Ministry of Finance) is to control the activities of the National Health Fund and supervise its financial management. Local authorities are responsible for identifying the health needs of the population, estimating the supply of health services, financing investments and exercising control in this area. The health care financing system is partly supervised and managed top-down by the NFZ Head Office and the Ministry of Health. Local problems are more effectively recognized at the voivodeship, county or commune levels, also owing to the activities of the respective local governments. The system is additionally

subsidized from the state budget and local government budgets, but universal health insurance remains the main source of healthcare services financing (Mitek, 2016).

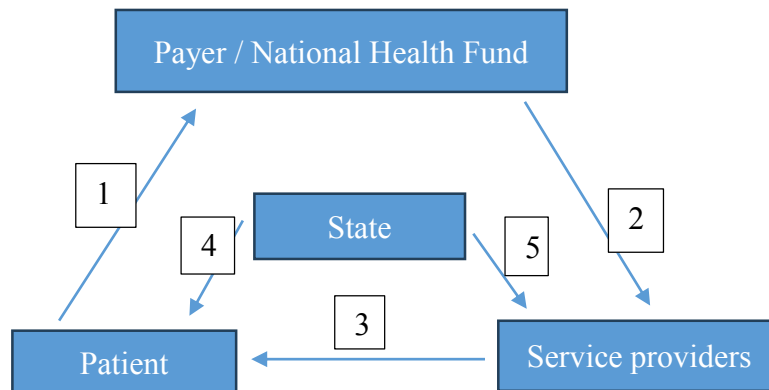
The social security system provides access to healthcare services on the basis of health insurance premiums deducted from wages. In legal terms, insurance is defined as “an institution regulating the rules of health services provision to entitled recipients, in accordance with specific criteria and requirements defined in detail in the regulations” [translation my own] (Journal of Laws No. 210, item 2135). Health insurance entails issues pertaining to a specific dimension of risk, taking the likelihood of illness or loss of health into account. It is therefore imperative to observe the principles of equal rights and social solidarity, as well as to ensure free access to healthcare services and free choice of healthcare providers for the insured (Act, 2003). Thus, the functioning of universal health insurance excludes an individual approach to each type of risk, with a greater focus on the principle of compulsory commonality and solidarity of all insured persons (Journal of Laws of 2003, No. 45, item 391).

In the overall social security system, the risk of illness is covered twofold. The social security system is designed to cover the risk of illness through two spheres: through social security and health insurance. Sickness insurance, operated by the Social Insurance Institution (ZUS), is provided in the form of sickness benefits and serves to protect employees against the loss of part of their income due to incapacity for work, caused mainly by the insured person's illness, without taking the treatment process into account. This function falls within the scope of health insurance providing appropriate direct benefits. Under this coverage, financing is provided for health services mainly, including treatment, rehabilitation services, reimbursement of medication, diagnostics, health promotion and prevention, as well as financing of treatment abroad (Mitek, 2016). The services covered by health insurance include not only direct treatment, but also many other activities affecting health. The main difference between the various insurances consists in the fact that social insurance, administered by the ZUS in the form of a sickness benefit, secures the sphere of the employee's income, while the health insurance sphere directly secures the insured person's state of health (Mokrzycka et al., 2012).

Health insurance as the main source of health services financing forms part of a system in which various contractual parties interact and different terms and conditions of cooperation apply. The structure of and relations within a universal health insurance system are based on the activities of three main parties: the insured, the insurer and the service provider. The cooperation and activities thereof form the so-called insurance relationship triangle (Figure 1). Each party is subject to obligations and holds rights towards the other parties, which are realized when a risk event occurs, mainly due to illness or an unhealthy condition (Beda et al., pp. 2-15).

The NFZ serves as an intermediary between the insured and the service provider, acting as the payer for the services provided. It accumulates, manages and administers the funds from the premiums paid by the employer as part of the insured's salary. It then covers the costs of the medical services provided by the service providers contracted to deliver the services specified

in their statutes. On this basis, the service providers deliver medical care to the insured under the health insurance program, under the terms of the applicable contract.



- 1 - Premiums deducted from wages.
- 2 - Payment for service providers for services provided under contracts with the NFZ.
- 3 - Provision of services to patients.
- 4 - State funding of e.g., highly specialized treatments.
- 5 - Transfer of funds to service providers.

Figure 1. Party-to-party relationships in health insurance system.

Source: own elaboration based on Mokrzycka, Kowalska, 2012, p. 102.

The existing tripartite division of tasks among different parties is an unusual arrangement. The present division of tasks, responsibilities and rights results in one party needing medical care, another party financing it, and yet another party providing it and managing the funds. This can lead to problems and complications in the relations between the parties, as well as in their objectives. Appropriate cooperation between entities and responsiveness to needs is essential, not only in terms of infrastructure and new services, but also in terms of the adequacy of service financing to the needs. Unquestionably, this is problematic due to the human factor, mainly because the subject of insurance is human health, which is difficult to assess and to estimate in terms of optimal and commensurate costs. The important role of the state should also be mentioned, as the state budget finances highly specialized treatments for patients while public funds are allocated to service providers (Mitek, 2016).

The structure of the health insurance system is therefore supported by three different pillars – parties, including the cooperating party or the party providing additional coverage for difficult cases, namely the employer and the state (state budget). The system as a whole is designed to provide comprehensive services. The system as a whole is designed to provide comprehensive services. Nevertheless, it needs to be continually analyzed, adapted to new needs and adjusted to new requirements (Mitek, 2016).

Sources of healthcare system financing in Poland

Formally, the healthcare financing system adopted in Poland is insurance-based. In practice, it has developed into a mixed system, combining features of both insurance and budgetary systems, both in terms of the collection and allocation of funds. The legislator has provided for a number of deviations from the ‘classic’ insurance-based model of healthcare financing. The most substantial of these are (NIK, 2019):

- 1) the amount of the insurance premium is not calculated based on the insured person's health risk, but rather on his/her formal ability to pay, although this applies to some professional groups only,
- 2) insurance premiums for some social groups are covered from the state budget,
- 3) the financing of wage increases for medical personnel has been increasingly financed from the insurance premiums transferred to the National Health Fund in recent years,
- 4) the costs of specialist training for doctors are covered by the Labor Fund.

The structure of the National Health Fund's revenues from health insurance premiums indicates that a significant portion of these revenues is transferred by public finance sector entities. This means that the sector largely finances the functioning of the healthcare system, and thus is not significantly different from systems in which services are financed from budgetary funds. Insurance systems are also characterized by a strict correlation between the payment of premiums and entitlement to medical services. This correlation is absent in the Polish system. Entitlement to healthcare services is granted by the very fact of registering with the compulsory health insurance scheme (Supreme Audit Office, 2019).

According to the provisions of the Act, funds in the amount of not less than 7% of the gross domestic product are allocated annually to finance health care, with the reservation that the amount of funds allocated to finance health care in 2019–2026 cannot be lower than (Journal of Law, 2004):

- 1) 4.86% of gross domestic product in 2019,
- 2) 5.03% of gross domestic product in 2020,
- 3) 5.30% of gross domestic product in 2021,
- 4) 5.75% of gross domestic product in 2022,
- 5) 6.00% of gross domestic product in 2023,
- 6) 6.20% of gross domestic product in 2024,
- 7) 6.50% of gross domestic product in 2025,
- 8) 6.80% of gross domestic product in 2026.

The methodology of calculating healthcare expenditure used by the Ministry of Health has been strictly defined in Article 131c of the Healthcare Benefits Act (Journal of Law, 2004). The above limits are accounted for by the Council of Ministers in draft budget acts or draft acts on provisional budget, and in no way correspond to the SHA 2011 methodology, upon which the National Health Account [Polish: Narodowy Rachunek Zdrowia (NRZ)].

Since April 2003, the main source of financing for the healthcare system has been the National Health Fund (NFZ). It covers more than 80% of public healthcare expenditure and almost 60% of total expenditure. The second main public source of funding is the state budget and local government budgets. The funds, available to the National Health Fund (NFZ), come mainly from the insurance premiums collected by the Social Insurance Institution (ZUS) and the Agricultural Social Insurance Fund [Polish: Kasa Rolniczego Ubezpieczenia Społecznego (KRUS)]. Capital expenditures are primarily covered by local government units and the state budget. Account data, current public expenditure on the healthcare system amounted to PLN 241.6 billion in 2023 (7.1% of GDP) and were higher than in 2022 by approximately PLN 45.4 billion - compared to preliminary data for 2022, amounting to PLN 196.2 billion (Polish Central Statistical Office). An increase in expenditure was observed in public spending, with a decrease in private spending. Table 1 shows healthcare spending and its GDP share between 2021 and 2023.

An increase in current expenditure was observed in public spending, which amounted to PLN 197.8 billion in 2023 and was PLN 53.2 billion higher than in 2022, with a GDP share of 5.8%. Current private expenditure (including household expenditures) decreased by 7.8 billion PLN and amounted to 43.8 billion PLN in 2023, despite an increase in direct household expenditures amounting to 38.6 billion PLN, i.e., 1.6 billion (4.4%) more than in 2022.

Healthcare expenditure is the largest or one of the largest items within the structure of public, and often private, expenditure in European countries. This will certainly not change in the coming decades, due to current demographic, epidemiological, technological and cultural trends, and securing a fiscally efficient and stable means of financing health expenditures will remain one of the most important challenges for modern societies. The solutions implemented in different countries vary mainly, though not exclusively, in the dominant streams feeding the system. Many European countries have decided to finance healthcare expenses from central taxes (e.g., the UK) or local taxes (e.g., Scandinavian countries), supplementing the funds from these streams with funds from private health insurance and direct household expenses. Others (e.g., Germany, Austria, the Netherlands) have based their systems on the model of universal health insurance, with the payer institution detached from the public finance system. This model, called the Bismarck model, has also been implemented in Poland (Rudawska et al., 2023).

There is no clear answer as to whether the tax-based or Bismarck-based insurance approach to healthcare financing is more advantageous, although the insurance system seems more resistant to macroeconomic shocks and crises in the sphere of public finances. In assessing the financing system, however, one cannot be limited to evaluating its stability and efficiency. No less important is its compatibility with the declared normative principles, and the principle of social solidarity in particular, as emphasized in numerous scientific and expert studies. Article 65 of the Act on publicly funded healthcare services also states: “Health insurance is

based, in particular, on the following principles: equal treatment and social solidarity”. Although the specific nature of this principle is not specified, it can be inferred from the structure of the health insurance contribution that the Polish legislator is referring to two basic dimensions of social solidarity discussed in scientific literature: risk solidarity and income solidarity. The first is expressed through implementation of the premium regardless of individual risk of illness. People with a higher health risk (e.g., due to previous illnesses or age) do not have to pay higher insurance premiums (as with private health insurance). People with a lower health risk receive no premium discount. Income-based solidarity, in turn, links the amount of individual premium obligations to the amount of individual income (Rudawska et al., 2023).

According to the authors of a study on the search for additional sources and mechanisms of healthcare system financing at the Polish Academy of Sciences [Polish: Polska Akademia Nauk (PAN)], it is urgently imperative to introduce changes within the scope of defining the insurance obligation and calculating the health insurance premium base. At least three main arguments speak in favor of the proposed changes (Rudawska et al., 2023):

- 1) the need to maintain a fiscally effective method of healthcare financing even under changing macroeconomic and social conditions,
- 2) strengthening of the principle of income solidarity,
- 3) the need to minimize the adverse allocation effects of income-based premiums.

Each of these arguments indicates the need to expand the health insurance premium calculation base and eliminate the privileges associated to the obligation of enrolling with the National Health Fund (NFZ) and the premiums paid. Currently, the National Health Fund does not cover all Polish residents, and some social groups are excluded from the benefits and/or obligations defined by the principle of social solidarity. Such exceptions to the insurance obligation are not substantively justified. Although the number of these exceptions has decreased over the past decades, it remains significant. Even if those who are not insured with the National Health Fund are entitled to certain basic health services in some cases (which should be paid for by the state budget), they are still excluded from the principle of social solidarity within the National Health Fund.

The argument of income solidarity likewise represents a key argument in favor of extending the health insurance premium calculation base to include capital and asset income. This is also justified for reasons of basic fairness, which in essence indicates individual (or household-related) financial capacity as the basis for calculating individual health insurance premiums. Financial capacity certainly does not hinge on the origin of the insured person's income, but rather on the amount of disposable income. A fair premium should be charged equally to all income of the insured persons, and not only to income from paid employment (and derivatives - pensions, etc.) or self-employment, as is the case in Poland. The extension of the health insurance premium calculation basis to include capital income, and thus the strengthening of the financial foundation underpinning the functioning of the healthcare system,

are also justifiable by the changes observed over the past decades in the technologies of goods and services production, as well as by the demographic changes leading to a growing deficit of qualified production personnel the changes leading to a significant increase in the share of capital in the functional distribution of national income (Rudawska et al., 2023).

An urgent reform is needed with regard to the rules of premium payments by individual farmers. The current solution practically exempts this large occupational group (and their family members) from the obligation to pay premiums, with full entitlement to benefits financed by the National Health Fund. A contribution of PLN 1 per hectare of land owned (collected from farmers for a minimum of 6 so-called ‘equivalent hectares’) can hardly even be considered symbolic. Other professional groups, such as clergymen, have also been granted unjustified privileges in Poland when it comes to the obligation to pay health insurance premiums, privileges that need to be abolished. The only premise for exemption from paying health insurance premiums while retaining the right to benefits should be inability to pay, i.e., lack of sufficient disposable income. Introduction of universal insurance and extension of the health insurance premium calculation basis to all sources of income would relieve the state budget of the obligation to finance the premiums of those who have no income (Rudawska et al., 2023).

Lastly, this extension of the insurance obligation and the health insurance premium base is also justifiable by an allocation argument. Every fiscal burden – be it a tax or a compulsory social security premium – affects the taxpayer's decisions regarding the commitment of his resources, especially labor resources. The higher the marginal tax rate, the stronger the expected negative reactions from the taxpayer and the lower the motivation to contribute to the national income. Although an isolated health premium of a few to several percentage points should not generate negative allocation effects, analyzing these effects, it must be recognized as part of a larger whole, which includes income tax and other social security premiums. The marginal tax rate in Poland is very high, forcing many self-employed people to cease their business activities. Further increases in the marginal tax rate through higher health insurance premiums should therefore be considered a serious threat to the country's economic development. This threat can be mitigated by substituting a broader tax base for further increases in the premium rate (Rudawska et al., 2023).

Conclusions

Regardless of the adopted model of healthcare financing, the system should primarily aim to maximize the health effect with the effective use of available treatment funds. To achieve this goal, priorities for the development of the entire healthcare system in Poland, arising from demographic and epidemiological challenges, must be defined. Apart from activities within the scope of prevention and education, the system should be restructured to increase transparency,

better meet the healthcare needs of patients, and improve financing. For many years, experts and the Supreme Audit Office [Polish: Najwyższa Izba Kontroli (NIK)] have been emphasizing the need for a comprehensive, coherent, and long-term strategy of healthcare development in Poland. Adoption of a strategy will discontinue the practice, widespread over the last 20 years, of making often random and ad hoc changes leading to, for instance, contradictory regulations and difficulties in their interpretation. Lack of a strategy may adversely affect the functioning of healthcare institutions and discourage healthcare investment decision. In this context, it is crucial to properly plan the increase in healthcare expenditure in Poland, which for years has fallen short of the levels observed in most European countries, both as a GDP share and in comparison to per capita spending.

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**STATISTICAL ANALYSIS OF 2022 RESEARCH AND DEVELOPMENT
ACTIVITIES IN THE KUYAVIAN-POMERANIAN VOIVODESHIP**

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Purpose: The purpose of the article is to analyze the state of 2022 research and development (R&D) activity in the Kuyavian-Pomeranian region, taking the structure of outlays, the sources of funding as well as the involvement of individual sectors and human capital into account. The study aims to assess the region's current standing, with reference to previous years, outlining its position relative to the entire country as well as identifying its R&D activity strengths and weaknesses.

Design/methodology/approach: The study's objectives have been achieved through the use of descriptive statistics methods, including structure analysis of location and dynamics measures. The focus was mainly on research and development (R&D) expenditure and personnel data for the Kuyavian-Pomeranian region. The data published by Poland's Central Statistical Office and the Patent Office of the Republic of Poland were used.

Findings: The analysis showed that R&D activity in the Kuyavian-Pomeranian region is characterized by increasing outlays, particularly in the business sector playing a dominant role both in terms of carrying out and financing R&D activities. Significant differences have been identified in the level of funding across individual fields of science, with the predominance of engineering and technical sciences accounting for over half of all outlays. The region, nevertheless, remains below the national average in terms of total R&D expenditures and the number of R&D personnel. What is more, the voivodeship has been noted to excel in its interdisciplinary approach to R&D activities, covering a broad spectrum of scientific fields, which presents an important advantage. High consumption of research equipment, however, as well as insufficient investment in such key areas as agricultural sciences and shortage of patent applications pose challenges to further innovation development in the region.

Originality/value: The article uniquely integrates statistical analysis with qualitative assessment, showing the dynamics and structure of R&D expenditures in the Kuyavian-Pomeranian region, within the context of its interdisciplinarity and innovation potential. One interesting solution consists in the synthetic presentation of changes in the voivodeship

data on R&D workforce in 2016-2022, using positional measures of location, with reference to the Kuyavian-Pomeranian voivodeship data in this context.

Keywords: research and development (R&D) activity, Kuyavian-Pomeranian voivodeship, statistical analysis.

Category of the paper: Literature review.

1. Introduction

Research and development (R&D) activity is a key component of modern economies, playing a vital role in innovative technology development, increasing competitiveness and generating economic advantage at the local and global levels. In the Polish context, regional variations in R&D expenditures, employment structure and resource efficiency are of particular importance. The Kuyavian-Pomeranian region, although not one of the leaders in terms of the scale of outlays, is characterized by interesting development dynamics and an interdisciplinary approach to R&D activity.

The present article analyzes the R&D activity in the Kuyavian-Pomeranian voivodeship both in 2022 as well as over the years, with focus on outlays, workforce and the effects of the activity, i.e., publications and patents. Descriptive statistics tools of structure analysis were used, in focus on central measures of the so-called position, taking a classical and positional approach. Dynamics analysis was carried out for the measures selected in the form of time series, using indices and calculations of the average rate of phenomena changes over time.

The article contributes conclusions of substantial relevance to regional R&D policy, indicating both the Kuyavian-Pomeranian region's strengths, such as interdisciplinarity and the dynamic development of the business sector, as well as its challenges, e.g., the shortage of funding for certain fields of science or the limited number of R&D personnel, compared to national leaders. The analysis presented comprehensively depicts the state of R&D in the region, which can serve as a valuable basis for further research and formulation of strategies to support R&D and innovation activity development at the regional level.

2. Evolution of the research and development sector in the Kuyavian-Pomeranian region

In the post-war years, the priority had been to rebuild the economy, which led to the emergence of the first scientific and industrial institutions of an R&D nature (Jarocińska, 2024; Wrochna, 2020). The origins of the research and development (R&D) sector in the Kuyavian-Pomeranian voivodeship can be traced to the activities of traditional academic centers and

scientific institutes, which had sprang up in the region as early as the 20th century. Universities, such as the Bydgoszcz University of Science and Technology (Politechnika Bydgoska im. Jana i Jędrzeja Śniadeckich), founded in 1951 as the *Evening School of Engineering*, or the Nicolaus Copernicus University in Toruń, founded in 1945, and the Kazimierz Wielki University in Bydgoszcz, founded in 1969, played a key role in educating specialists and conducting scientific research (Redakcja KIMP, 2023). The first research activities in the region were centered around traditional fields of science and technology, with support for the sector sourced mainly from the state budget. In the post-war years, the emphasis had been on the development of industry and technology, which fostered the development of research institutes collaborating with local businesses (Redakcja KIMP, 2023).

The post-1989 political transformation brought new challenges and opportunities for the R&D sector, as the introduction of a market economy called for changes in the structure of research funding and organization. The introduction of free market principles and the restructuring of industry led to far-reaching consequences, including the liquidation of numerous state research institutes, which until then had been the backbone of research for industrial purposes (Gryzik, Warzybok, 2012). The Kuyavian-Pomeranian voivodeship began to advance international cooperation and invest in modern technologies, which paved the way for a more dynamic development of R&D, especially after Poland's accession to the European Union in 2004. From that moment, the region's R&D sector began to benefit from EU funds, which allowed implementation of numerous research projects, development of scientific infrastructure, as well as greater cooperation of universities and research institutes with industry.

Initiatives supporting competitive research funding also began to emerge. The introduction of state and European-funded grants and programs contributed to increased interest in applied research. The emergence of programs to support innovation was particularly vital in the context of the developing market economy, with R&D coming to be viewed as a key element in the competitiveness of the economy (Płasek, 2016).

Those were also times of intense social change, increasing the demand for innovative products and technologies. As the market economy began to stabilize and foreign investment increased, new opportunities arose for the R&D sector in Poland. Foreign companies began to site their research centers in Poland, taking advantage of the availability of highly qualified scientific personnel, which sparked the development of the country's technology sector. The shift to competitive financing and access to European funds paved the foundation for the dynamic development of Poland's R&D sector in the 21st century (Popiński, 2022).

Since the country's accession to the European Union in 2004, Poland's R&D sector has received significant financial support from EU structural funds. Programs such as the 'Innovative Economy' (2007-2013) and the 'Intelligent Development' (2014-2020) Operational Programs have enabled the financing of R&D projects, supporting industrial innovation, technological development and cooperation between science and business.

The growth of the research and development sector in the Kuyavian-Pomeranian voivodeship is fostered by a number of regional strategies and programs. The key document is the *Economic Development Program for the Kujawsko-Pomorskie Voivodeship* [Polish: *Program rozwoju gospodarczego województwa kujawsko-pomorskiego*], serving as a roadmap for the implementation of comprehensive measures aimed at activating the region's economy, with emphasis on innovation and cooperation between science and business (Zarząd Województwa Kujawsko-Pomorskiego 2021b). In addition, the *Development Strategy for the Kuyavian-Pomeranian Voivodeship until 2030 - Acceleration Strategy 2030+* [Polish: *Strategia rozwoju województwa kujawsko-pomorskiego do 2030 roku – Strategia Przyspieszenia 2030+*] defines the goals and direction of the region's development, including in R&D, emphasizing the growth of economy innovativeness and development of entrepreneurship (Zarząd Województwa Kujawsko-Pomorskiego, 2021a).

The Bydgoszcz University of Science and Technology is one of the key players in the development of R&D sector in the Kuyavian-Pomeranian voivodeship. Its activities contribute to raising the level of innovation in the region, through the implementation of research projects, cooperation with industry, training of specialists and development of modern research infrastructure. The University operates as a technical university, providing engineering education with a focus on cooperation with industry, which is in line with the core assumptions of *Acceleration Strategy 2030+*.

3. Political framework for R&D sector development

In the past, the field of science and technology in Poland was segmented into three separate sectors: the Polish Academy of Sciences [Polish: Polska Akademia Nauk (PAN)], universities, and research and development institutes. Cooperation between these sectors was limited, while science funding was managed centrally, which contributed to bureaucracy and low efficiency. The so-called 'Law on Science,' introduced in January 1991, established three key principles: autonomy, recognition of scientific merit and openness. The coordination of science policy was entrusted to the State Committee for Scientific Research [Polish: Państwowy Komitet Badań Naukowych (KBN)], whose members and committees - in basic and applied research – were elected by the scientific community via two-round elections. The new model of research management and funding was aimed at more efficient utilization of budget funds for scientific activity in Poland (Karczewski, 1993). In his article: "Innovation policy during the transformation process in Poland: is it effective? [Polityka innowacyjna w procesie transformacji w Polsce: czy skuteczna?]", Professor Andrzej Jasiński distinguished 6 phases of innovation in 1990-2015, presented in the table below (Table 1).

Table 1.*Phases of innovation policy in Poland during 1990-2015*

Phases of Poland's innovation policy in 1990-2015		
Phase	Years	Policy characteristics
1	Through 1990	In the late 1980s and early 1990s, a fairly broad set of financial incentives in the form of legal solutions targeted at companies, especially small ones, was in place, to stimulate those entities' research and innovation activities.
2	1991-1994	Under the so-called Balcerowicz Plan, with the widespread belief in the role of the 'invisible hand of the market,' the vast majority of these stimulators were removed.
3	1995-1999	At the beginning of 1995, however, some of the 'old' incentives for R&D and innovation activity were reinstate; the list of tax preferences was even quite extensive.
4	2000-2004	In early 2000, hamstrung by difficulties with the state budget, the number of incentives was again reduced, and no new ones were introduced.
5	2005-2007	In 2005, following the accession to the European Union, several significantly new solutions/instruments were introduced and some of the previous tax tools were reinstated.
6	2008-2015	New instruments building on significant use of EU funds.

Source: Jasiński, 2018.

Research and development (R&D) plays a key role in the shaping of innovative knowledge-based economies. The *Triple Helix* shift from the three elements of the so-called actors: science, industry, government to the concept of three areas: knowledge, innovation, consensus (government, local government) - highlights the significance of the environment and mutual interactions, placing R&D within the domain of knowledge (Jasiński, 2014). Appropriate targeting of innovation policy, both by the government and local authorities, is expected to advance R&D activities and secure knowledge transfer, which can take place bi-directionally between science and industry. Both the government and local authorities are responsible for the building of adequate research infrastructure, supporting innovative enterprises and stimulating cooperation between science and industry, enabling focus on R&D activity. Over the years, the significant role of regional centers has been recognized, and emphasis begun to be placed on the importance of harmonious cooperation between the government and regional authorities, which are able to adapt central government policies to region-specific, voivodeship conditions (Gust-Bardon, 2011; Czerniak, 2013; Churski, 2018). In the Polish context, the differences across regions in terms of innovation potential are considerable. Consequently, without dedicated programs to level out these differences, peripheral regions may find it difficult to achieve higher levels of R&D and innovation development. Synthetically, the Mazovian and Lesser Poland voivodeships are leaders in terms of Polish regions' innovativeness on a national scale (Instytut Badań nad Gospodarką Rynkową, 2024). The Kuyavian-Pomeranian voivodeship ranks 9th, with average and low scores in the various categories of innovativeness; the exception is enterprise R&D activity, rated highly, placing the voivodeship in the 5th place in this category alone. Overall, as a country, Poland ranks among the Emerging Innovators, nearing the European average (European Commission, 2023).

The National Science Policy [Polish: *Polityka Naukowa Państwa*] (2022) as well as the activities of the National Science Center [Polish: Narodowe Centrum Nauki (NCN)] and the National Center for Research and Development [Polish: Narodowe Centrum Badań i Rozwoju]

(NCBR)] provide the central mechanisms supporting the country's research activities, with the NCN focused on basic and the NCBR on applied research, enabling its commercialization and further experimental development (Journal of Laws 2024, item 1571, Article 4). Voivodship governments play a key role in adapting nationwide strategies to local conditions. It is these authorities which are responsible for the elaboration and implementation of regional research and development strategy (RDS), regional innovation strategy (RIS), and regional research and innovation smart specialization strategy (RIS3), which are intended to increase the innovative capacity of regions. RSI, RIS3 are operational documents based on a thorough analysis of the region's potential, the identification of key industries and the implementation of programs supporting R&D and innovation in sectors identified as most crucial (Golejewska, 2019; Ciołek, Golejewska, 2022). In the Kuyavian-Pomeranian voivodeship, for instance, special emphasis is placed on the development of innovation within the agri-food sector, in correspondence with the specificity of the region's economy. Smart specializations for the Kuyavia and Pomerania encompass: healthy and safe food, health and health tourism, advanced materials and tools, transportation and mobility, as well as cultural heritage and creative industries, with an emphasis on design (Zarząd Województwa Kujawsko-Pomorskiego, 2022). From the perspective of the regional policy implemented in the Kuyavian-Pomeranian voivodeship and the goals contained in *Acceleration Strategy 2030+*, it is essential to establish local partnerships among the science, business and administration sectors, to facilitate absorption of funds and implementation of research and development projects. Apart from the aforementioned food industry, of major importance for the region are the electrical machinery industry, the chemical and plastics processing industry, the pulp and paper industry, including wood processing.

4. The state of research and development activity in the Kuyavian-Pomeranian region throughout 2022

R&D outlays

- **Key data on research and development activity in Poland**

Gross domestic 2022 research and development outlays amounted to PLN 44702.4 million, with the ratio to GDP reaching 1.46%. In per-capita terms, this value translates to PLN 1182. The number of R&D-registered entities in 2022 was 7431 - the highest in the preceding five years, 1585 of which financed their R&D activities with foreign funds, accounting for 21% of the total. Foreign funds as the share of GERD (Gross domestic expenditure on R&D), in turn, amounted to 8.1%. Intramural expenditures on R&D, financed from the 'rest of the world' sector, amounted to PLN 3625.3 million in 2022 (Statistics Poland, 2023).

The European Commission funds transferred to Poland for R&D in 2022 totaled PLN 2973 million, which is the highest compared to previous years (Figure 1). The share of European Commission funds in gross domestic outlays on R&D activity was only 6.7%, however. The number of entities benefiting from European Commission funds totaled 1417, accounting for 19.1% of all entities (Statistics Poland 2023).

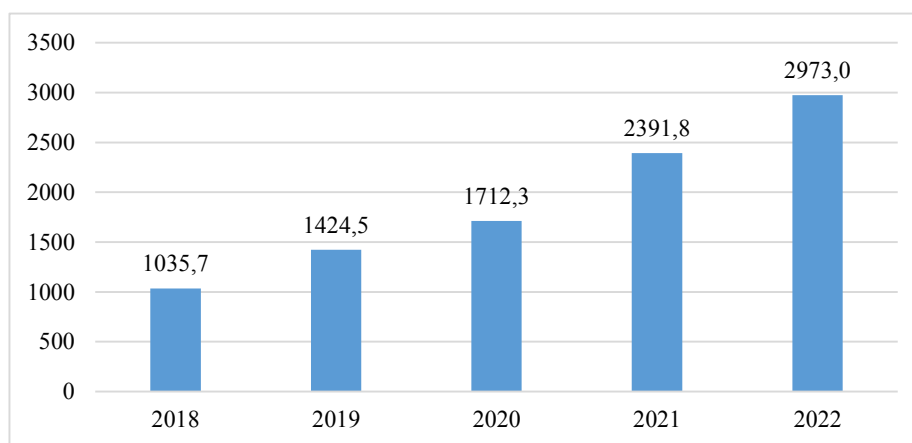


Figure 1. European Commission funds financing R&D in Poland during 2018-2022.

Source: Own elaboration based on the “Research and experimental development in Poland in 2022” report, Statistics Poland, 2023, 10.10.2024.

- **Intramural expenditures on R&D activity in the Kuyavian-Pomeranian voivodeship**

The number of R&D entities by voivodeship is presented in Figure 2. The Kuyavian-Pomeranian voivodeship ranked in the second half of the list, with 340 registered entities, which is below average.

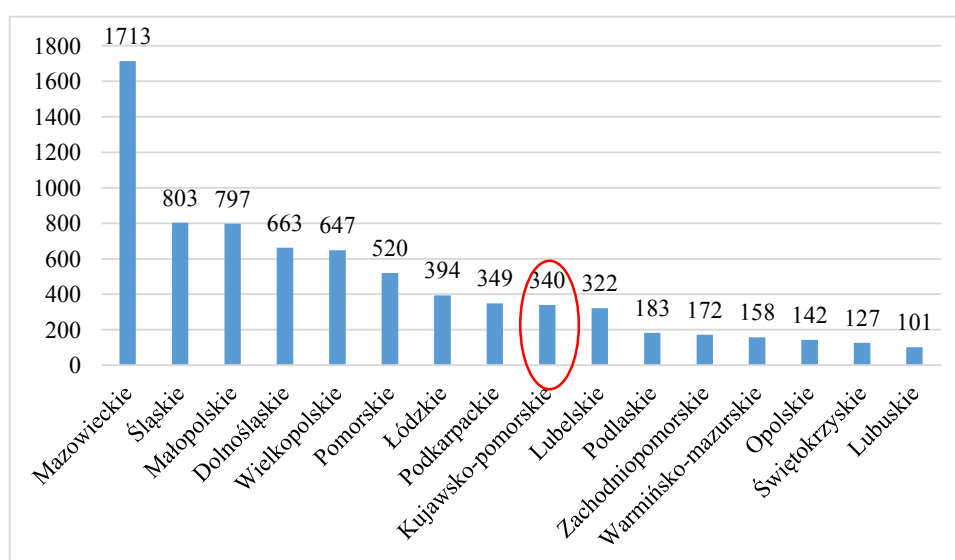


Figure 2. Number of entities in R&D, as of 31 December 2022.

Source: Own elaboration based on the “Research and experimental development in Poland in 2022” report, Statistics Poland, 2023, 10.10.2024.

In 2022, the Kuyavian-Pomeranian voivodeship was equipped with a scientific and research apparatus worth PLN 522538.5 thousand. The apparatus wear rate was 69.3%. Only 20% of all R&D entities in the region (68 out of 340) were equipped with scientific and research apparatus in a given year. The gross value of the voivodeship's apparatus, relative to the gross value of apparatus nationwide, is 2%.

The statistics on R&D activity include entities the main activity of which is assigned to subcategory 72 of the 2007 Polish Classification of Activities [Polska Klasyfikacja Działalności (PKD)], i.e., scientific research and development, as well as those entities which carry out R&D activities in parallel with other dominant activities. The key breakdown of R&D entities entails classification by executive sector, distinguishing between the business enterprise sector (BES), the government sector (GOV), the higher education sector (HES) and the private nonprofit institutions sector (PNI).

The 2022 intramural outlays on research and development in the Kuyavian-Pomeranian voivodeship reached PLN 1218116.3 thousand, of which PLN 246096.5 thousand were investment expenditures. The current expenditures thus absorbed as much as 80% of the total outlays (Figure 3). In breakdown by executive and financing sectors, the outlays formed as follows – see Table 1.

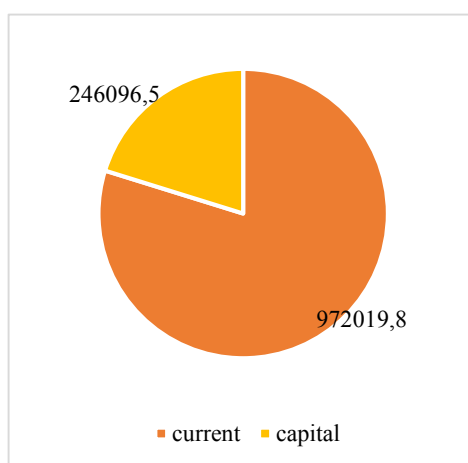


Figure 3. Intramural expenditures on R&D by cost type in 2022 (Kuyavian-Pomeranian voivodeship).

Source: own elaboration based on Statistics Poland data, 25.10.2024.

The executive sector encompasses entities carrying out R&D activities directly, i.e., conducting scientific research and experimental development, therefore, the table shows R&D funding from these entities under the executive sector. The sector is the one responsible for carrying out practical research-project activities, by creating new technologies, conducting experiments, implementing innovations. In effect, specific research results, prototypes, scientific publications or new technologies emerge. The funding sector includes entities or organizations providing funds to carry out R&D activities without engaging in this part of research themselves. A given sector (e.g., business, higher education, government) simultaneously serves two functions within the R&D system. As an executive sector -

it implements a certain percentage of R&D activities, using funds to conduct research and development work. In other words, it engages in the actual execution of R&D projects. As a financing sector - it allocates a certain percentage of its funds to finance R&D activities carried out by other sectors. This can involve transferring of funds for research projects carried out by external institutions (e.g., universities, research institutes) or subsidizing of specific activities. Table 2 shows the value of outlays by sector and function, as well as the percentage ratio in the total amount of outlays in the Kuyavian-Pomeranian voivodeship.

Table 2.

2022 intramural expenditures on R&D by funding sectors and sectors of performance (Kuyavian-Pomeranian voivodeship)

Sector	Outlays value (in PLN thousand)		Percentage in total outlays	
	Executive	Financing	Executive	Financing
enterprises (BES)	781664	647261.8	64.17%	53.14%
government (GOV)	4881.8	433035.2	0.40%	35.55%
higher education (HES)	430683.8	33685.3	35.36%	2.77%
private nonprofit institutions (PNI)	886.7	1202.2	0.07%	0.10%
rest of the world	-	102931.8	-	8.45%
TOTAL	1 218 116.3		100%	

Source: own elaboration based on Statistics Poland data, 10.10.2024.

The highest value of outlays, as an executive sector, was in the BES sector, i.e., the enterprise sector, amounting to PLN 781 664 thousand in 2022, accounting for as much as 64.17% of the total outlays in the voivodeship. Simultaneously, the enterprise sector likewise achieved the highest result as a financing sector (53.14% of the total outlays in the voivodeship). The higher-education sector, as an executor of R&D activities, covered 35.36% of total outlays, which is the second-highest result after the enterprise sector. Compared to the enterprise sector, however, it lags behind in equally high outlays as a financing sector, accounting for only 2.77%. The second-highest result, as a financing sector, was realized by the government sector (GOV) contributing PLN 433035.2 thousand to R&D activities, i.e., 35.55%. The 'rest of the world' accounted for only 8.45% of the value of total R&D funding.

Intramural R&D outlays can also be categorized by the type of activity. The distinction is made into basic research, applied research and experimental development. Table 3 shows the values for each type, in PLN thousands, including the percentage in the total outlays on R&D activities in the voivodeship. Moreover, notable is that basic research in the Kuyavian-Pomeranian region accounts for 3.6% of basic research outlays in Poland as a whole. Applied research, compared to the data on applied research outlays nationwide, equaled 1.2%. The remaining group, i.e., outlays on experimental development in the Kuyavian-Pomeranian voivodeship, totaled 2.7% of all outlays on experimental development in Poland.

Table 3.*2022 intramural expenditures on R&D by type of R&D (Kuyavian-Pomeranian voivodeship)*

Expenditure on: (in PLN thousand)		Percentage in total voivodeship expenditures	Percentage in total nationwide expenditures
Basic research	440864.2	36.2%	3.6%
Applied research	77252.9	6.3%	1.2%
Experimental development	699999.2	57.5%	2.7%

Source: own elaboration based on data from Statistics Poland, 10.10.2024.

Figure 4 shows the breakdown of intramural outlays by the scientific fields in which the funds were implemented. Intramural R&D outlays include the expenditures incurred for the R&D carried out at the entity in the reporting year, regardless of the source of funding. They include current costs and R&D fixed asset investments, excluding depreciation. Consistent with the OECD (Organization for Economic Co-operation and Development) classification, these expenditures can be categorized into six main fields: natural sciences, engineering, medical, agricultural, social sciences, as well as humanities and the arts. R&D work consists of systematic creative activity aimed at expansion of knowledge and its practical application (Statistics Poland, 2023).

By far the dominant sciences are engineering and technical sciences, absorbing 57% of all outlays. Next are natural sciences (15%), humanities and the arts (9%), as well as social sciences (8%). Medical and health sciences rank merely fifth in the Kuyavian-Pomeranian voivodeship, with PLN 80205.1 thousand, i.e., 7% of the total. The least amount of funds was realized in agricultural and veterinary sciences - PLN 49235.9 thousand, i.e., 4% of the total R&D expenditures in the region under review.

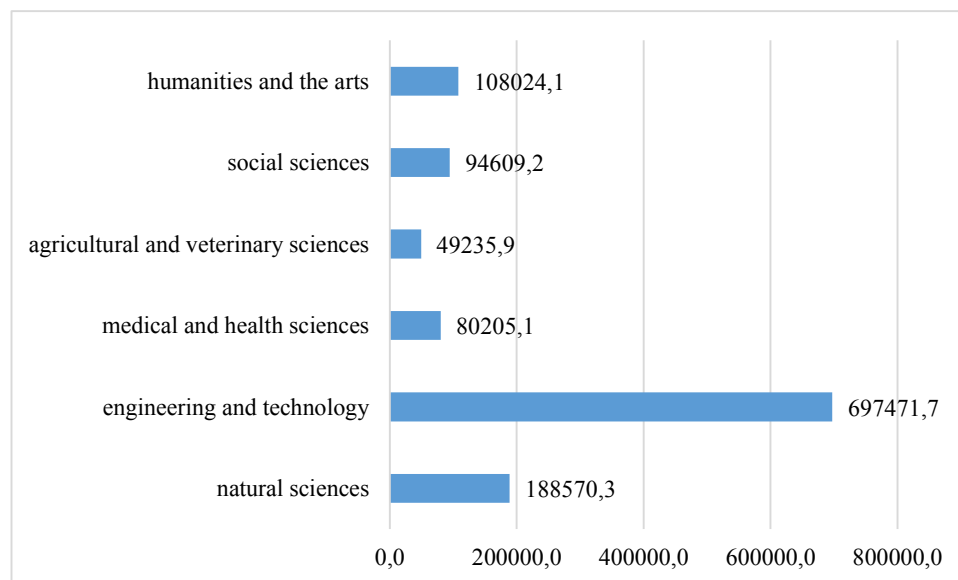


Figure 4. 2022 intramural R&D expenditures by fields of R&D in (Kuyavian-Pomeranian voivodeship). Source: own elaboration based on Statistics Poland data, 20.10.2024.

Worth noting is the fact that not every voivodeship is outlaid in every R&D field. Apart from the Kuyavian-Pomeranian voivodeship, in 2022, the following are among those voivodeships: Lubusz, Lesser Poland, Masovian and Pomeranian. Although the Kuyavian-

Pomeranian voivodeship does not rank among the highest in terms of the value of R&D expenditures, it represents one of the five most interdisciplinary regions in terms of funds allocated to scientific activity. This, however, was not a year-to-year pattern, thus, in order to show the distribution of costs over the years, data for previous periods were collected (Table 4). Years in which the outlays equaled zero or the office, for some reason, failed to measure those values and enter the results in the database were noted (marked as: -).

Table 4.

Analysis of 2008-2022 dynamics in intramural R&D expenditure changes in the Kuyavian-Pomeranian voivodeship, in distribution by field of science

Fields of R&D years	natural sciences	engineering and technology	medical and health sciences	agricultural and veterinary sciences	social sciences	humanities and the arts
	in PLN million					
2008	33.8	55.5	0.0	5.7	-	-
2009	36.5	67.9	0.0	0.0	-	-
2010	52.6	76.6	7.2	0.0	29.5	0.0
2011	0.0	79.1	0.0	0.0	15.6	11.6
2012	69.8	121.6	0.0	11.5	21.0	0.0
2013	59.6	104.5	11.7	13.6	20.6	19.0
2014	46.4	156.5	14.6	8.2	16.1	13.9
2015	92.5	218.6	17.8	6.6	14.2	14.8
2016	40.2	181.6	22.0	9.5	17.5	19.2
2017	66.9	272.9	32.7	10.2	27.3	27.2
2018	94.2	340.6	61.9	16.9	44.7	47.9
2019	108.1	399.0	0.0	25.3	63.7	0.0
2020	126.5	492.5	0.0	25.3	72.1	0.0
2021	0.0	623.4	102	42.6	0.0	0.0
2022	188.6	679.5	80.2	49.2	94.6	108.0
Sum	1015.7	3869.8	350.1	224.6	436.9	26.6

Source: own elaboration based on Statistics Poland data, 22.10.2024.

The field of engineering and technical sciences shows annual average increases of 20% (4) (Figure 5), although years in which the outlays were lower than in the preceding year have also been noted, i.e., 2013 - a decrease by 14%, and 2016 - a decrease by 17% (Table 4).

$$T = \sqrt[15-1]{\frac{697\,471.7}{55\,444.8}} - 1 = \sqrt[14]{12.58} - 1 = 0.1982 \quad (1)$$

The field of medical and health sciences (Figure 6) repeatedly suffered a repeated failure to allocate financial outlays for research and development in the Kuyavian-Pomeranian voivodeship. The highest intramural expenditures were recorded in 2021, in the amount of PLN 102005.6 thousand.

Agricultural and veterinary sciences is another R&D field in which research and development expenditures have been increasing at an average annual rate of 17% (5). Only in 2009-2011 no values were recorded. These expenditures, however, reach the lowest values among all fields in the voivodeship.

$$T = \sqrt[15-1]{\frac{49235.9}{5647.5}} - 1 = \sqrt[14]{8.71} - 1 = 0.1673 \quad (2)$$

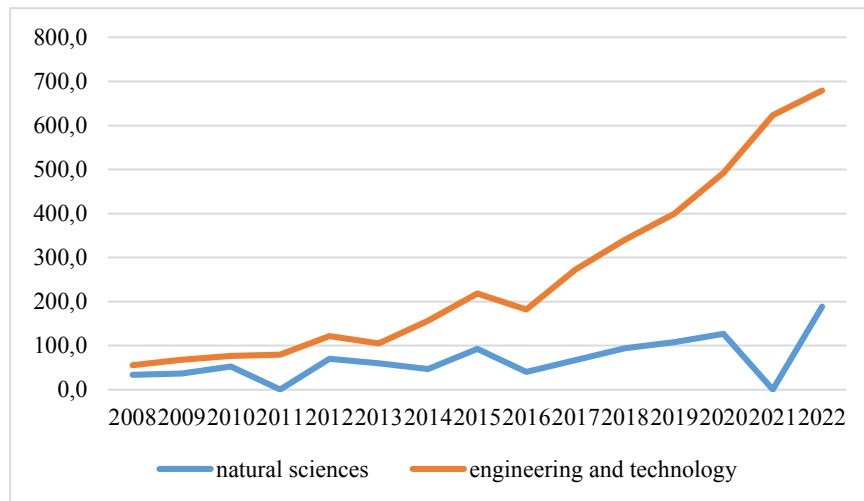


Figure 5. 2008-2022 R&D expenditures in the Kuyavian-Pomeranian voivodeship – natural sciences & engineering and technology.

Source: own elaboration based on Statistics Poland data, 23.10.2024.

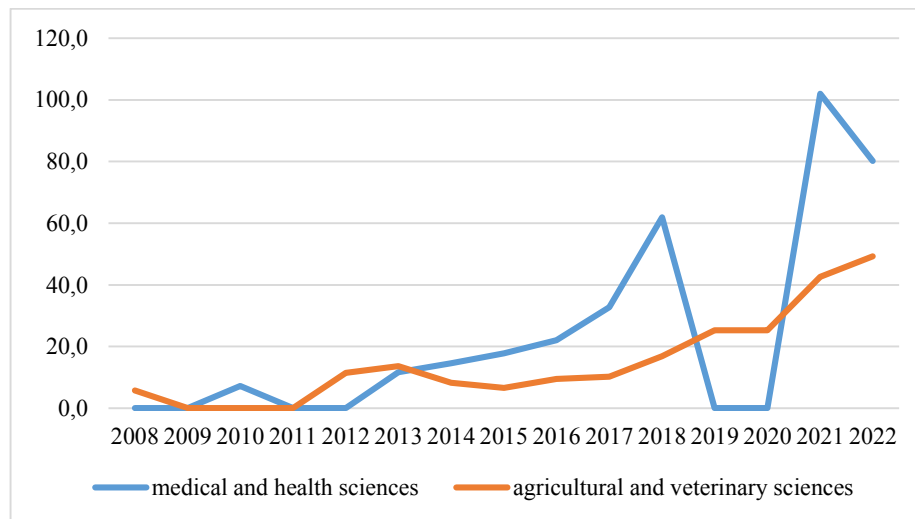


Figure 6. Expenditures on R&D in the kuyavian-pomeranian voivodeship in the years 2008-2022 – medical and health sciences & agricultural and veterinary sciences.

Source: own elaboration based on the data from Statistics Poland, 23.10.2024.

The data available for the field of social sciences begins in 2010. Throughout the following years, 2011-2016, R&D expenditures in this field of sciences were more or less leveled out. This is followed by several years of growth and a sudden drop to 0 in 2021. In 2022, however, R&D expenditures in this discipline reached an all-time high (Figure 7).

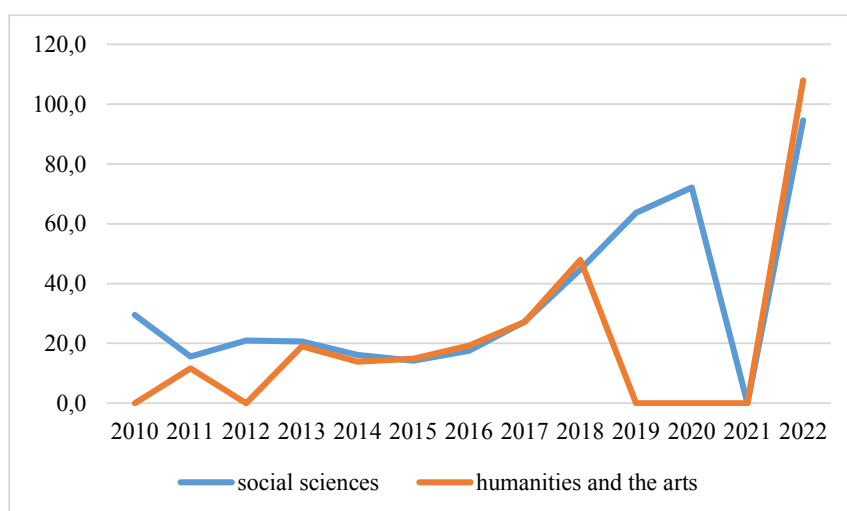


Figure 7. 2008-2022 R&D expenditures in the Kuyavian-Pomeranian voivodeship – social sciences, humanities and the arts.

Source: own elaboration based on Statistics Poland data, 23.10.2024.

• R&D expenditures over the years

The line chart presented (Figure 8) illustrates the dynamics of research and development (R&D) expenditure changes in the Kuyavian-Pomeranian region, from 2002 to 2022. An upward trend is evident, though with a few periods of decline, analyzed in detail in Table 5 via calculations of growth-rate and dynamics indicators.

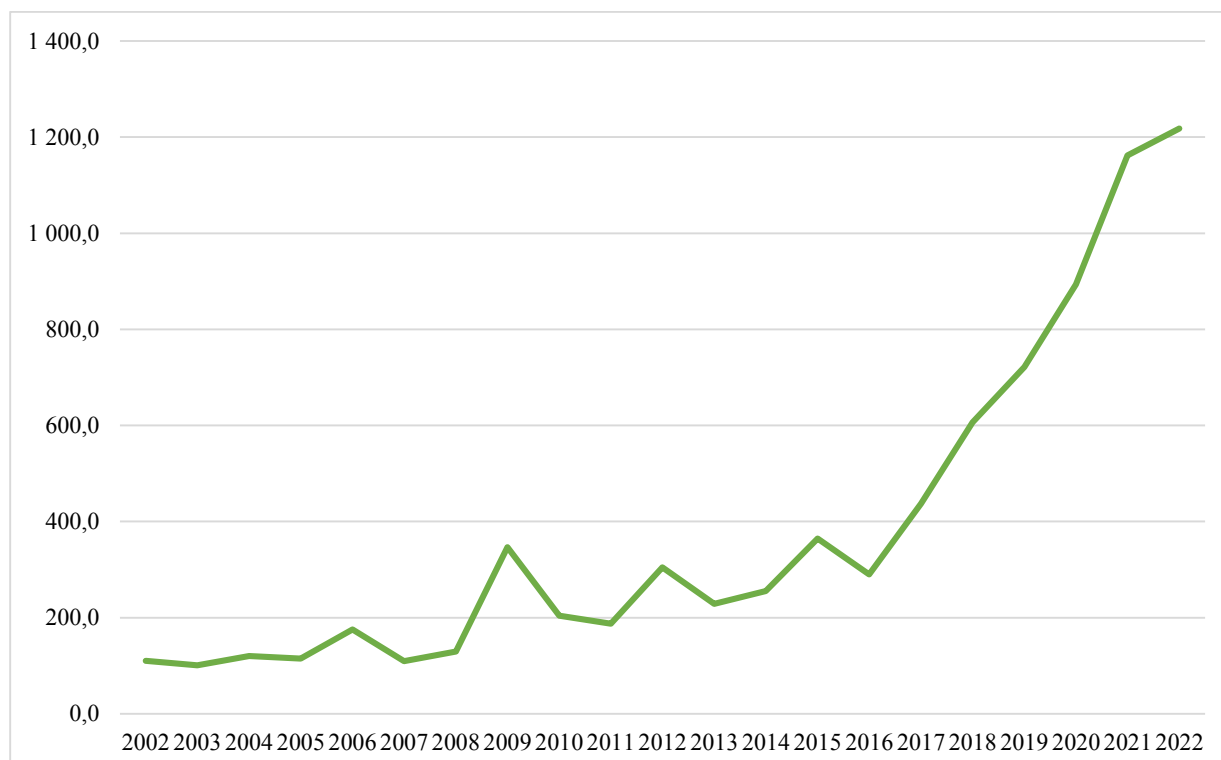


Figure 8. 2002-2022 dynamics of intramural R&D expenditures in the Kuyavian-Pomeranian voivodeship.

Source: own elaboration based on Statistics Poland data, 20.10.2024.

From 2002 to 2016, periods of decline were recurring more or less regularly. In 2003, the outlays amounted to PLN 9.4 million less than in the previous year, indicating a decline of 8.5%. Another decline followed in 2005, and was lower than in the previous year, amounting to a 4.7% (PLN 5.7 million) reduction in the value of R&D expenditures. Two years later, the expenditures decreased by as much as 37.5%, from PLN 175.3 million to PLN 109.5 million. This decline was compounded by a reduction in the funds allocated from the budget and business entities. The crisis years in Poland showed increases. Year 2009 saw the largest increase in the analyzed period - by PLN 217.4 million, i.e., 168% of the 2008 amount. In 2010, however, the amount of research and development outlays decreased once again, by 41%. The downward trend recurred the following year, albeit with a lesser impetus, by 8.2%. It is the only time between 2002 and 2022 when the decline recurs a second year in a row. This was possibly caused by the crisis, which in the specifics of the analyzed characteristics is observable with a time lag. The 2013 outlays represent 75% of the value of the previous year's outlays. The last decline in the period under study, in turn, recurred in 2016 (Table 5).

Table 5.

Analysis of 2002-2022 dynamics of changes in intramural R&D expenditures

Year	[PLN million]	Absolute chain increase	Relative chain increase	Chain index
2002	110.4	-	-	-
2003	101.0	-9.4	-0.0851	0.9149
2004	120.4	19.4	0.1921	1.1921
2005	114.7	-5.7	-0.0473	0.9527
2006	175.3	60.6	0.5283	1.5283
2007	109.5	-65.8	-0.3754	0.6246
2008	129.4	19.9	0.1817	1.1817
2009	346.8	217.4	1.6801	2.6801
2010	204.2	-142.6	-0.4112	0.5888
2011	187.3	-16.9	-0.0828	0.9172
2012	304.4	117.1	0.6252	1.6252
2013	228.9	-75.5	-0.2480	0.7520
2014	255.6	26.7	0.1166	1.1166
2015	364.4	108.8	0.4257	1.4257
2016	289.9	-74.5	-0.2044	0.7956
2017	437.1	147.2	0.5078	1.5078
2018	606.3	169.2	0.3871	1.3871
2019	721.5	115.2	0.1900	1.1900
2020	893.2	171.7	0.2380	1.2380
2021	1 162.1	268.9	0.3011	1.3011
2022	1 218.1	56	0.0482	1.0482

Source: own elaboration based on Statistics Poland data, 22.10.2024.

Years 2016-2022 is the period of the longest increase. The average rate of phenomenon change from 2016 to 2022 is 27%, meaning that, on average, research and development expenditures in the Kuyavian-Pomeranian voivodeship increased by 27% year on year. The value was calculated as follows:

$$T = \sqrt[n-1]{\frac{y_n}{y_1}} - 1 \quad (3)$$

$$T = \sqrt[7-1]{\frac{1218.1}{289.9}} - 1 = \sqrt[6]{4.2} - 1 = 0.2702 \quad (4)$$

i.e., after rounding off, presented as a percentage value of 27%.

Additionally, calculated was the average annual growth of R&D expenditures in the Kuyavian-Pomeranian voivodeship throughout the analyzed period, i.e., from 2002 to 2022:

$$T = \sqrt[21-1]{\frac{1218.1}{110.4}} - 1 = \sqrt[20]{11.03} - 1 = 0.1276 \quad (5)$$

i.e., after rounding off, presented as a percentage value of 13%.

To better illustrate the scale of increases and decreases, a chain index chart was also plotted - with the base reference to the previous year. The value of outlays has been increasing successively in recent years. The smallest increase was observed in 2022, which amounted to merely 4.8%, compared to 2021. All chart values (Figure 9) below 1 indicate decreases relative to the previous year; all values above 1 suggest increases. An index taking a value equal to 1 represents an unchanged given characteristic in the following year, i.e., remaining at the same amount. The indexes can also be interpreted in percentage terms, e.g., in 2021 the index was 1.3011, meaning that the volume of outlays was 30.1% higher in 2021, relative to 2020.

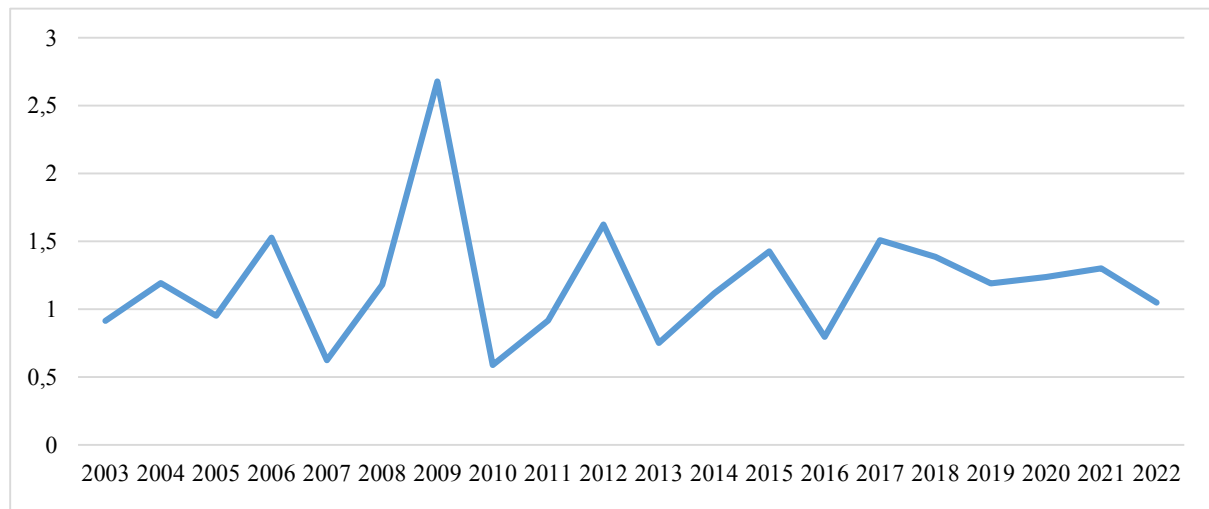


Figure 9. Index notation with variable bases – 2002-2022 expenditures in PLN million in the Kuyavian-Pomeranian voivodeship.

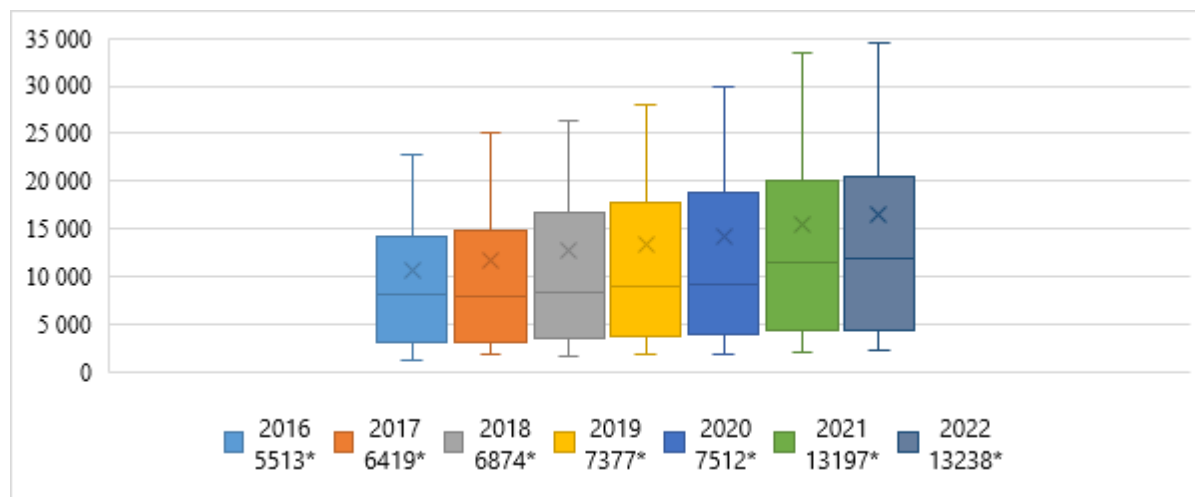
Source: own elaboration based on Statistics Poland data, 21.10.2024.

Employment in the R&D sector

According to the Central Statistical Office [Polish: Główny Urząd Statystyczny (GUS)] data for 2022, the Kuyavian-Pomeranian voivodeship ranks eighth in the country in terms of the number of persons employed in the R&D sector. The data from 2016 onward covers the personnel directly involved in the R&D activities carried out at reporting entities, with a distinction between internal and external personnel, broken down into researchers and support staff. Taking researchers alone into account, the Kuyavian-Pomeranian region ranked 7th,

and 9th in terms of women in R&D. Relative to 2016-2020, this represents a two-to-three position leap in the ranking. Such a spectacular increase was prompted by the greater number of entities, which declared research and development work, reporting employees devoting a minimum of 10% of their time to R&D activities. Internal employees account for about 85% of all declared R&D personnel.

Figure 10 illustrates the distribution of internal R&D personnel by provinces in 2016-2022. For readability purposes, the chart shows no outlier observations (the Mazovian voivodeship, with the size of internal R&D personnel more than double that of the Lesser Poland voivodeship, ranked second). These data have instead been included in the calculation of central (location) measures, both classical and positional. Noted should be that the outliers, i.e., the extreme observations included in the calculation of the arithmetic mean (classical measure), ramp up the value of this parameter of distribution, thus it is worth using positional measures, such as a dominant feature and quartiles, in the interpretation. All the distributions obtained exhibit right-handed asymmetry, indicating that the arithmetic mean was reached by a small proportion of voivodeships. Half of the voivodeships are characterized by a number of employees well below the average, with the predominance of a small number of R&D personnel, up to 5 thousand employees. The number of R&D employees in the Kuyavian-Pomeranian voivodeship was below the average in all the years analyzed, and below the median in 2016-2020. Only in 2021-2022 this established value, splitting the collective in half, was exceeded, advancing the region to the top eight, i.e., to 7th position.



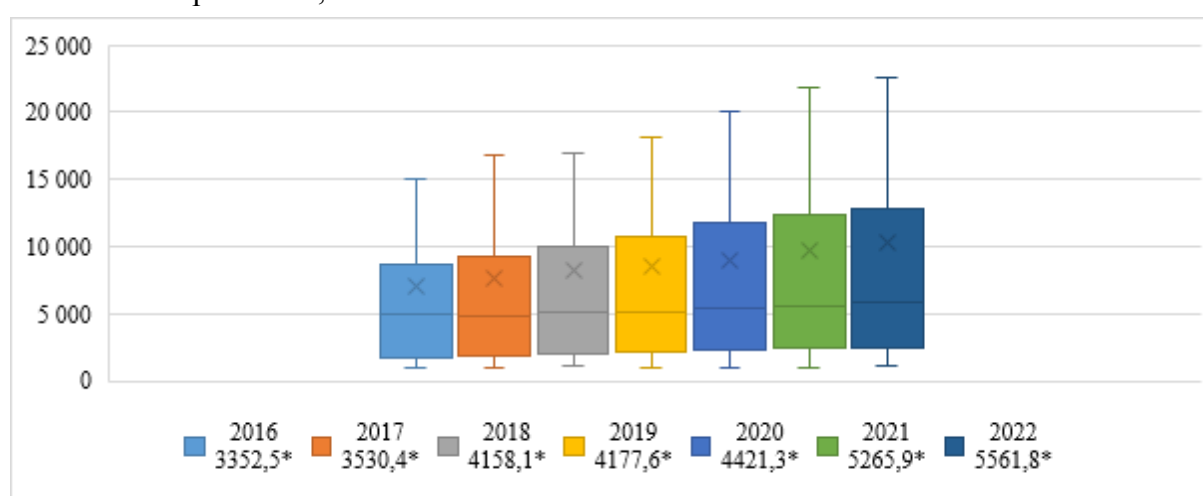
* Number of R&D employees (internal personnel) in the Kuyavian-Pomeranian voivodeship.
x Average, Median.

Figure 10. 2016-2022 distribution of R&D personnel (internal personnel) in the Kuyavian-Pomeranian voivodeship.

Source: own elaboration based on Statistics Poland data, accessed: 21.10.2024.

Analysis of actual employee involvement in R&D work entails the use of data in FTE (full-time equivalent) measurement. On a per-FTE basis, i.e., full-time, 40-hour per week work in a given year, the Kuyavian-Pomeranian voivodeship ranked 9th in the country in 2022, which is an uptick by one position, compared to 2016-2021. Throughout the entire period under

study, the data on internal R&D personnel by FTE remain below the average and median values (Figure 11). Worth noting is that the dynamics of changes in the average is higher, compared to the median, which indicates a continuous increase in the disproportion across voivodeships, in absolute terms. On a relative scale, a 46.8% increase in R&D working time, from 111789.3 to 164098.7, was recorded in Poland in 2022, compared to 2016, while the average rate of changes was 6.61% year-on-year between 2016 and 2022. The Mazovian and Lesser Poland voivodeships proved to be the growth locomotives. The Kuyavian-Pomeranian voivodeship is catching up to the leaders at a rate of 8.8% year-on-year, which is the second result, after the Lower Silesian voivodeship at 9.43% year-on-year. Internal workers in the business sector (in FTE) are of key importance in the Kuyavia and Pomerania region, with a growth rate of 14.7% year-on-year during the period under review. In 2106, they accounted for 41.5% of all internal R&D personnel, and 56.9% in 2022.



* Internal R&D personnel by FTE in the Kuyavian-Pomeranian voivodeship.

x Average, Median.

Figure 11. 2016-2022 distribution of internal R&D personnel by full-time equivalent in the Kuyavian-Pomeranian voivodeship.

Source: own elaboration based on Statistics Poland data, 21.10.2024.

In 2022, R&D employees (in FTE) in the higher education sector of the Kuyavian-Pomeranian voivodeship accounted for less than 4.1% of the national total of university personnel engaged in R&D (9th position in the country). The indicators of the voivodeship's development, in terms of innovation (Zarząd Województwa Kujawsko-Pomorskiego 2022), include the number of researchers per 1000 economically active persons (in FTE) and R&D employees per 1000 economically active persons (in FTE). The benchmark values in 2019 were set at 3.6 and 4.6, respectively, with a target of 5 within the time horizon through 2029. In 2022, the indicators for the Kuyavian-Pomeranian voivodeship were precisely 4.2 and 4.6 (based on Statistics Poland data, 21.10.2024).

5. Effects of research and development activity

The National Research Institute [Polish: Państwowy Instytut Badawczy] published a report titled “Nauka w Polsce 2023 (Science in Poland, 2023),” collating, inter alia, the numbers of scientific publications reported in 2018-2022 by voivodeship (Figure 12) and the numbers of scientific articles published in the most prestigious journals in 2019-2022, including the percentage thereof in the total number of articles by voivodeship (Figure 13). The number of scientific publications in the voivodeship accounts for up to 5% of the total number of publications in Poland, and amounts to 18237 throughout the analyzed years 2018-2022. By contrast, the number of articles published in prestigious journals during those years is 2825, ranging between 30% and 40% of the total number of publications in the region.

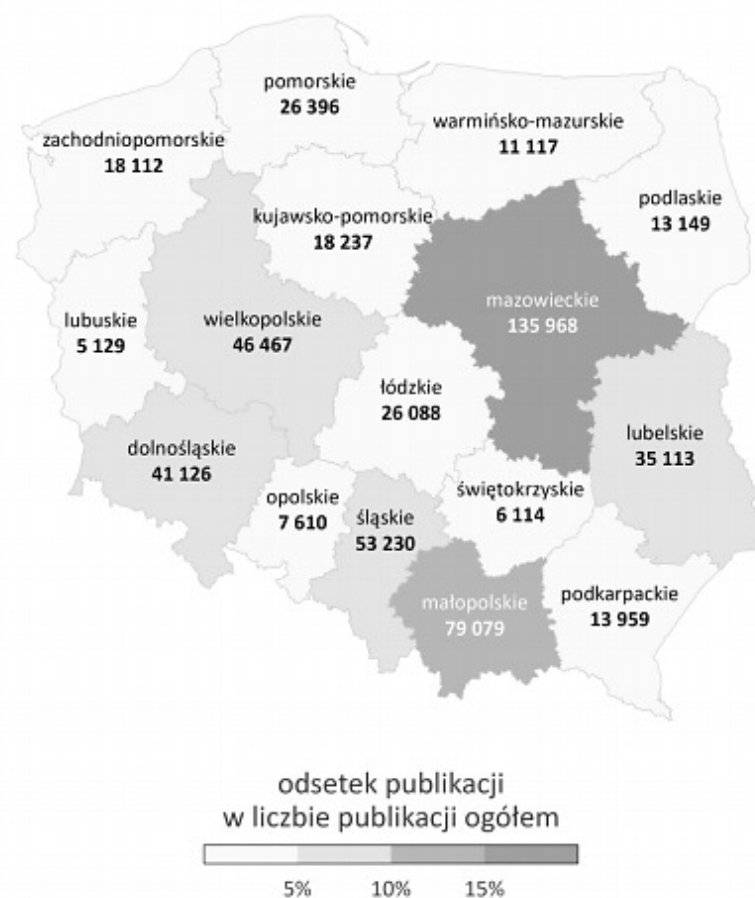


Figure 12. Number of scientific publications reported in 2018-2022 by voivodeship.

Source: Information Processing Center. National Research Institute [Polish: Ośrodek Przetwarzania Informacji. Państwowy Instytut Badawczy], Nauka w Polsce 2023 (Science in Poland, 2023).



Figure 13. Number of scientific articles published in most prestigious journals throughout 2019-2022 and the percentage in total articles by voivodeship.

Source: National Research Institute [Polish: Ośrodek Przetwarzania Informacji. Państwowy Instytut Badawczy], Nauka w Polsce 2023 (Science in Poland, 2023).

Research and development activity leads to increased knowledge and its utilization in new application, whereby protection of the rights to intangible assets arising from scientific, research, development and economic activity becomes crucial. The system ensuring such protection of rights and reporting in this regard is overseen by the Patent Office of the Republic of Poland [Polish: Urząd Patentowy Rzeczypospolitej Polskiej (UPRP)]. According to the data presented in annual reports, the Kuyavian-Pomeranian voivodeship is characterized by poor results with respect to the protection of industrial property objects: inventions, utility models, industrial designs, trademarks. Voivodeship data by the categories reported and granted by the Office are presented in Table 6.

Table 6.

2016-2023 domestic application and protection of granted industrial property object rights (Kuyavian-Pomeranian voivodeship)

Kuyavian-Pomeranian voivodeship		2016	2017	2018	2019	2020	2021	2022	2023
Domestic application	patents	167	141	135	159	171	103	104	132
	utility models	79	52	49	76	44	48	31	22
	industrial designs	37	40	116	58	57	43	30	25
	trademarks	470	466	375	398	485	521	429	466
Granted rights of protection	patents	105	90	93	100	68	101	92	70
	utility models	29	28	52	34	42	39	35	22
	industrial designs	28	22	110	58	39	48	32	20
	trademarks	239	453	362	298	211	484	358	331

Source: own elaboration based on the Patent Office of the Republic of Poland data, 14.10.2024.

Analysis of the Kuyavia and Pomerania data collected provides no basis for formulating an opinion that the region's standing in terms of industrial property has been improving. There are no clear trends observable, and a certain time lag from the filing for and receipt of rights protection should be taken into account. The most time-consuming, labor-intensive and costly is the procedure involved in obtaining a patent, followed by the so-called 'small patent,' i.e., utility model, which takes up to 3 years. Registration of an industrial design spans over six months and costs roughly PLN 5000 for the entire 5-year protection cycle. Of relevance is also the period of protection, which in the case of trademarks extends over 10 years, with the possibility of renewal; for utility models it likewise covers 10 years, whereas for industrial designs, the period is 25 years, subject to cyclical payments. Considering such key data as filed inventions and received patents, as well as filed and protected utility models, the Kuyavian-Pomeranian voivodeship ranks much better than other regions in utility models, falling consistently within the top eight, ranking typically at 5th or 6th place. Patents generally rank 11th.

6. Conclusion

Analysis of the 2022 data shows that, although the Kuyavian-Pomeranian voivodeship lags behind the top regions in terms of total R&D expenditures, it stands out with its significant interdisciplinarity and efficient allocation of resources to a variety of scientific areas. Investments cover six key scientific fields (predominantly engineering and technical sciences), which allows for development of diverse research projects addressing both regional and national needs. The pursuit of interdisciplinarity promotes increased cooperation among various research centers and economic sectors.

The field of agricultural and veterinary sciences, despite its significance to the agriculturally oriented region, receives the least outlays of all the fields analyzed. Increased investment in this area could foster local innovation and competitiveness of the agri-food sector.

R&D expenditures in the region flow from a variety of sources, including the business sector, the government sector, higher education and foreign funds. Between 2002 and 2022, the voivodeship saw a steady increase in R&D investment, with particularly strong growth in recent years, supported by the public and private sectors. The business enterprise sector (BES) plays a key role both as a contractor and as a funder of R&D activity, which highlights the importance of industry-science cooperation and pinpoints the key role of the BES in the region's innovation development.

Although basic research accounts for a significant portion of the voivodship's outlays (36.2%), the share of applied research and experimental development (a total of 63.8%) remains insufficient, relative to industry needs. A strengthening of these areas could accelerate implementation of research results into business practice.

In 2022, the number of entities conducting R&D activity reached 340, which is a significant increase, compared to previous years. The increase in the number of entities declaring R&D activity indicates the region's growing efforts in this area.

The value of R&D apparatus in the region accounted for only 2% of the national value in 2022. The high degree of apparatus wear (69.3%) is indicative of the urgent need for investment in research infrastructure modernization.

While the voivodeship ranks 8th in the country in terms of the number of R&D employees, this value still fails to meet the needs of the sector. Measures should be taken to increase the number of qualified professionals, including initiatives to attract young scientists to the region. Although the region ranks 9th in the country in terms of the share of women in R&D activity, an upward trend is noticeable in this area. Promotion of gender equality in science and technology should receive priority in regional development strategies.

The executive sector is focused on research implementation, while the funding sector provides funds to conduct this research. The executive sector engages in practical R&D activities. The financing sector provides the financial and organizational conditions for R&D activity. Dominant in the executive sector are such research entities as universities and institutes. The funding sector includes governments, international organizations, foundations and private investors. The funding sector supplies resources and strategic support, while the executive sector transforms these resources into practical results, such as innovations, publications or new technologies. Cooperation between these sectors is essential for effective development of science and technology.

Achievement of the Acceleration Strategy 2030+ and smart specializations (RIS3) goals is crucial to increasing the region's innovativeness. The support for the R&D sector should be closely tied with identification of the region's local needs and strengths.

The Kuyavian-Pomeranian voivodeship holds the potential for further advancement of the R&D sector, nonetheless, it requires more sustainable investments, reinforced scientific personnel and intensified international cooperation. One key element will entail implementation

of innovative strategies and establishment of synergy among science, industry and administration.

The Kuyavian-Pomeranian voivodeship remains below the national average in several key indicators, such as the number of R&D employees or the per-capita value of outlays. Dedicated equalization programs are in demand, to help reduce the disparity to more developed regions such as the Mazovia and Lesser Poland.

Continued investment in R&D infrastructure is crucial to maintaining positive trends. The strengthening of the science, industry and government partnerships can increase the efficiency of research results commercialization. Further efforts should be geared towards developing the R&D personnel's competencies, as well as attracting talent through training programs and incentives.

Ongoing support for the R&D sector in the Kuyavian-Pomeranian voivodeship is essential for its development and increased competitiveness, in the context of a knowledge-based economy.

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BENEFITS AND CHALLENGES OF OUTSOURCING FINANCIAL AND ACCOUNTING SERVICES FOR CONTEMPORARY ENTERPRISES

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Purpose: The purpose of this article is to identify the key benefits and challenges of outsourcing financial and accounting services for modern enterprises. In addition, an analysis of the motives for implementing the outsourcing of financial and accounting services, the forms of outsourcing used by the surveyed companies and the type of tasks to be outsourced is presented.

Design/methodology/approach: The survey covered SME companies operating in various industries that have decided to transfer their financial and accounting processes to a specific external service provider. The research method was an online survey. Among the data analysis methods, structure analysis and cross tabulation were used.

Findings: The surveyed companies cited minimizing the risks associated with their business area as the main motive for working with an external provider. The most frequently used form of outsourcing financial and accounting services was full outsourcing, and the most frequently outsourced task was general accounting. The most important benefit of outsourcing financial and accounting services for respondents was saving time and resources, and the most significant challenge was delays in paying taxes.

Research limitations/implications: The survey was limited only to a small group of SME companies using the services of the selected accounting firm, so future research may include a broader group of companies.

Practical implications: The article provides information on companies' perspectives on the motives, benefits and risks of outsourcing financial and accounting services.

Originality/value: The article provides empirical evidence of the importance of outsourcing financial and accounting services to SME companies.

Keywords: outsourcing, management, financial and accounting services.

Category of the paper: Research paper.

1. Introduction

In today's business world, companies are forced to constantly increase their flexibility and to respond and adapt quickly to changing market conditions. To this end, an increasing number of companies are opting for outsourcing, which involves the outsourcing of internal processes not directly related to their core business for execution (Trocki, 2001; Foltys, 2018; Ambos et al., 2021; Gilley, Rasheed, 2000). Outsourcing allows companies to focus on their core competencies while supporting them with global resources, technology and expertise (Ciesielska, Radło, 2014; De Vita, Wang, 2006).

The main benefits driven by organizations choosing to outsource are cost factors (Weverka, 2022). However, the implementation of outsourcing can result not only in cost reductions, but also in increased flexibility (Choi et al., 2018; Li et al., 2017; Lahiri, 2016; Sardar, 2016) and improved efficiency in responding to market changes, which can positively impact the success of a business (Sonfield, 2014; See-Kwong et al., 2017; Ambos et al., 2021; Gilley, Rasheed, 2000). Other benefits perceived by business owners who use outsourcing services are reduced time to market for new products and the strengthening of competitive advantages (Raldo, 2020). The basis for implementing outsourcing, however, is a thorough process analysis, through which it becomes possible to identify areas, tasks and functions that need to be transferred outside the organization's structures (Hätönen, 2008; Click, Duening, 2005; Power et al., 2010).

However, the use of outsourcing is not a simple recipe for success and carries certain risks for businesses. Among them, the most commonly cited in the literature are: increased dependence of the outsourcing organization on the external provider, loss of control over the management of outsourced functions, potential price changes in terms of outsourced services, and consequently increased costs for the outsourcing company (Kolodziejczak, Cecelak, 2013).

A common solution among today's enterprises, especially in the SME sector, is to use outsourcing of financial and accounting services. Outsourcing of financial and accounting services usually involves entrusting these functions to an external entity (e.g., to an accounting firm), in order to increase efficiency and reduce costs and gain access to scarce skills or competitiveness (Rogosic, 2019). However, before deciding to implement outsourcing of financial and accounting services, companies should first familiarize themselves with the existing legal and organizational conditions of outsourcing financial and accounting services, as well as understand the nature of the entities offering the services in question and how they function, including the functioning of accounting offices, among others (Maszczak, 2019; Van Puyvelde, 2021). In the context of financial and accounting services, outsourcing can take various forms, depending on the scope and specifics of the transferred functions. The main forms of outsourcing in the financial and accounting sphere are full outsourcing, partial outsourcing, outsourcing of specialized processes, insourcing and offshoring. Full financial and

accounting outsourcing involves outsourcing the entire range of financial and accounting functions to an external provider. Partial outsourcing, on the other hand, involves only some of the financial and accounting tasks, while leaving the most essential tasks to be performed internally. Outsourcing of specialized processes is related to outsourcing of highly specialized and advanced financial and accounting processes. Examples of tasks carried out under this form of outsourcing include auditing, financial risk management, or conducting advanced financial analysis by external entities. Inshoring, on the other hand, is the delegation of financial and accounting processes to other, internal structures of a company. Offshoring, on the other hand, refers to the transfer of financial and accounting processes for execution by an external provider located outside the country in which the principal's business is registered (Contractor et al., 2021; Oshri et al., 2022).

One of the main benefits of outsourcing finance and accounting services is cost reduction. Instead of maintaining an in-house finance and accounting team, companies can reduce operating costs by using specialized providers (Bagienska, 2016). The cost optimization made possible by engaging an external provider also results from the elimination of the need to finance the training of employees from the finance and accounting department and the purchase of new hardware or software, as well as from the transfer of partial responsibility for possible errors to an external partner, which also results in a reduction in the burden of their possible commission (Dominquez, 2009; Kawa, 2017). Moreover, outsourcing allows companies to increase flexibility, as the services can be scaled according to current business needs. By using an external provider for financial and accounting services, companies also save time and resources. These savings enable companies to leverage resources in key aspects of their business, which can translate into increased profits, improved profitability, improved customer service, and maintaining a high competitive position (Agburu et al., 2017; Kotabe, Mol, 2009).

While there are numerous benefits to outsourcing financial and accounting services, it also comes with a number of challenges that companies should consider. One of the main risks is the potential unreliability of the service provider. This can manifest itself in a variety of forms, from poor quality of services provided to regulatory violations, which can lead to serious financial and legal consequences for the outsourcing company. A particularly risky aspect is the possibility of financial fraud, which can threaten the stability and reputation of the company (Egiyi, Florence, 2020). Financial and accounting outsourcing also brings additional challenges. First and foremost, handing over sensitive financial data to an outside provider raises questions about information security and the protection of confidential data. In addition, companies face the challenge of managing the relationship with the supplier to ensure that processes meet their own standards of quality and transparency. It is also important to monitor the performance and quality of the supplier's services to avoid potential losses due to possible errors or delays (Kotabe, Mol, 2009; Handley, 2016). When listing the negative aspects of outsourcing financial and accounting services, it is important to mention other issues that can shatter the principal's trust in the contractor. Among the risks mentioned in the literature are:

surveillance of sensitive data by outsiders, potential leakage of confidential data, discovery of undisclosed expenses or their unexpected increase, weakening of oversight of important areas of the company's operations, and complete loss of control over them (Czubakowska, 2007). In addition, one of the most common risks is the lack of communication during outsourcing cooperation, which can lead to inadequate execution of the subject matter of the contract (Cisielska, Radło, 2014).

The purpose of this article is to identify the key benefits and challenges of outsourcing financial and accounting services for modern enterprises. In addition, to complete the picture, the presented section of the study focuses on analyzing the motives for implementing the outsourcing of financial and accounting services, the forms of outsourcing used by the surveyed companies and the type of tasks to be outsourced.

2. Research methodology

The survey was conducted in June 2024. The scope of the study was to analyze the importance of outsourcing financial and accounting services in enterprises using a selected accounting firm. The study identified the forms of outsourcing of financial and accounting services used by the surveyed companies. The motives for implementing outsourcing in the surveyed companies were also analyzed. A key element of the study, however, was the identification of the benefits and risks associated with the implementation of outsourcing of financial and accounting services in the surveyed companies.

The subjects of the study were companies that use outsourcing of financial and accounting services. The survey covered enterprises from the SME sector operating in various industries, which decided to transfer financial and accounting processes to a specific external service provider. The group of enterprises subjected to the study were those using the services of the accounting office Liber Monika Dalewska in Bydgoszcz. A sample of the entire population, which amounted to 196 enterprises, was made. The request to complete the survey questionnaire was therefore addressed to all 196 enterprises. Returns of fully completed questionnaires were received from 53 enterprises, which accounted for 27% of the surveyed population.

A research technique in the form of an online survey was used to collect primary data. Thus, the CAWI method was used. The research tool was an online survey questionnaire, consisting of 18 questions. The questions in the questionnaire were prepared based on literature studies. Among the questions were single-choice, multiple-choice, and with a measurement scale. The questionnaire was secured so that it could be completed only once. The choice of a particular method of data collection was supported by its accessibility, ease of dissemination and speed of data collection from respondents. In addition, by using an online survey

questionnaire, the anonymity of respondents was preserved. This article presents only an excerpt from the implemented survey.

The data obtained in the survey was analyzed, which made it possible to identify the leading aspects within the issues studied. Structure analysis and cross tabulation were used to analyze the data. Structure analysis involves identifying and interpreting the regularities present in the structure of the community from the point of view of a particular characteristic. Structure analysis used structure indicators expressed in percentages. Cross tables are used to study the relationship between two or more categorical variables. Data are presented in the form of a pivot table. In the context of this study, cross-tabulation analysis was used to identify how different types of companies differ with respect to the use of different forms of outsourcing of financial and accounting services, and what tasks are outsourced in cooperation with the supplier. Additionally, through cross-analysis, the frequency of use of outsourcing for different tasks was compared between different types of companies.

The surveyed enterprises are mainly service enterprises (56% of respondents), which offer a variety of services, including: consulting, financial, or technology. Commercial enterprises accounted for 21% of respondents (11 enterprises). On the other hand, service-commercial enterprises accounted for 4% of the respondents (7 enterprises), manufacturing-service enterprises accounted for 6% of the respondents (3 enterprises), and manufacturing-commercial enterprises accounted for 4% of the respondents (2 enterprises).

Another characteristic included in the survey was the length of time the surveyed enterprises used the services of the selected accounting firm. A total of 58% of the surveyed enterprises declared cooperation with a given third-party provider lasting longer than 3 years. The use of outsourced financial and accounting services from one to three years was indicated by 23% of the surveyed enterprises, while 19% of the surveyed enterprises used the services of the bureau for less than one year.

3. Empirical results and Discussion

First, respondents were asked about the motives for implementing outsourcing of financial and accounting services in their enterprise. Respondents were asked to evaluate all motives indicated in the answer cafeteria. The surveyed companies first indicated whether a particular motive occurred in their enterprise, while if the answer was affirmative, respondents indicated how important the motive was to their enterprise. The data presented in Figure 1 indicate that for the surveyed enterprises most of the indicated motives for implementing outsourcing of financial and accounting services were either very important or moderately important. On the other hand, however, among the indications of respondents, one can also notice indications that a given motive did not occur at their enterprise at all. However, these were few indications of respondents.

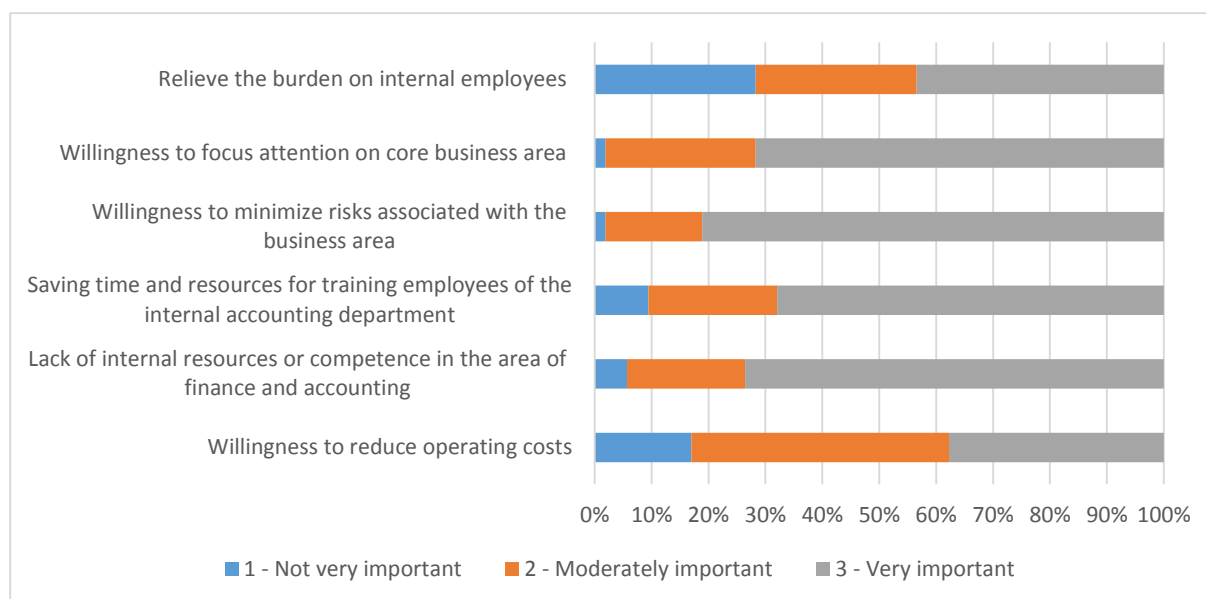


Figure 1. Motivations for implementing outsourcing of financial and accounting services in the surveyed companies.

Source: own study.

Analyzing the most significant motives of the surveyed enterprises for starting the process of implementing outsourcing of finance and accounting services, it turned out that the organizations were most often (in 81% of cases) driven by the desire to minimize the risks associated with their business area. Other important motives for entering into cooperation with an external provider were cited by the surveyed companies as 74% lack of internal resources or competence in the area of finance and accounting, 72% the desire to focus attention on the core area of their business, and 68% the need to save time and resources for training employees of the internal accounting department. A fairly important aspect identified by 43% of respondents in favor of implementing outsourcing of finance and accounting services was found to be the desire to relieve the burden on employees of the outsourcing organization. The least important aspect, on the other hand, was the reduction of operating costs, as indicated by only 38% of the surveyed companies.

The presented data partly coincide with the results of a survey conducted by the KPMG team, where among the main reasons for implementing outsourcing of financial and accounting services, the respondents indicated: ensuring security in accounting, legal and tax issues, providing solutions always in compliance with current regulations, quality of services and access to the expertise of specialists, providing a wide comprehensiveness of service and saving time (KPMG, 2018). In addition, it should be noted that the results obtained are also partially similar to the results of scientific studies carried out in this area. In comparison, the study realized by A. Jużwicka and A. Zakrzewska-Bielawska showed that the most common reason for outsourcing accounting was the lack of knowledge in this area, the small scale of the company's operations and reluctance to do accounting on their own. The least important reasons for the decision to outsource the accounting function were the lack of financial and

organizational capacity to hire accounting specialists and to increase the scale of operations and turnover of the company (Jużwicka, Zakrzewska-Bielawska, 2014). Slightly different results, on the other hand, were obtained by W. Molenda and D. Burzyńska. The results of their study indicate that among the reasons for implementing financial and accounting outsourcing, the respondents indicated the desire to reduce operating costs, the desire to use modern technology, the desire to acquire expertise and specialized competence of human resources, the desire to offset the negative consequences of the lack of expertise in the enterprise, the desire to increase the value of the enterprise and the desire to increase customer satisfaction (Molenda, Burzyńska, 2023).

The forms of outsourcing of financial and accounting services included in the survey were full outsourcing, partial outsourcing, specialized process outsourcing, insourcing and offshoring. Each of the aforementioned types of outsourcing has specific characteristics, and their choice is influenced by the unique needs of the outsourcing company. The cross-tabulation therefore summarizes data on the forms of outsourcing, the specific financial and accounting tasks that the surveyed companies indicated as being most often outsourced to a third-party provider, and the type of business being conducted (Table 1).

Table 1.

Summary data on the tasks, forms and types of activities of the surveyed companies

Tasks	Type of activity				
	Trading enterprise	Service enterprise	Production and trading enterprise	Production and service enterprise	Service and commercial enterprise
General accounting	82%	93%	100%	100%	100%
Invoicing and billing	82%	43%	50%	50%	29%
Taxes and tax declarations	91%	73%	50%	50%	100%
Financial analyses	18%	0%	50%	50%	14%
Financial liquidity management	9%	3%	0%	0%	0%
Payroll and human resources	73%	27%	50%	50%	43%
Forms					
Full outsourcing	37%	77%	100%	100%	43%
Partial outsourcing	54%	23%	0%	0%	57%
Outsourcing of specialized processes	0%	0%	0%	0%	0%
Insourcing	0%	0%	0%	0%	0%
Offshoring	9%	0%	0%	0%	0%

Source: own study.

When choosing a form of outsourcing for financial and accounting services, 54% of the trading enterprises opted for a partial outsourcing relationship with the supplier. 37% of the surveyed trading enterprises declared full outsourcing, while only 9%, or exactly one of the enterprises in question, used offshoring. Service companies were the opposite of trading companies. Their most common form of outsourcing of financial and accounting services was full outsourcing indicated by 77% of the surveyed service enterprises, while partial outsourcing

was chosen by only 7 enterprises, or 23% of the surveyed service enterprises. Manufacturing and trade enterprises (2 enterprises) and manufacturing and service enterprises (3 enterprises) as to the form of outsourcing were in agreement and indicated full outsourcing. Service-commercial enterprises, on the other hand, split almost evenly between using partial outsourcing (57% - 4 surveyed service-commercial enterprises) and full outsourcing (43% - 3 surveyed service-commercial enterprises). Among all the companies surveyed, it was noticeable that there was not much interest in insourcing and offshoring. This may mean that the surveyed companies tend to prefer local suppliers, suggesting a desire to avoid problems associated with language and cultural barriers and the need for geographic proximity to suppliers.

Conducting a cross-analysis of outsourced financial and accounting services showed that regardless of the business profile, each of the companies surveyed used general accounting services. A given aspect of cooperation consists in the provider's maintenance of the outsourcer's books of account, recording of business events, preparation of balance sheets and profit and loss statements. Other frequently outsourced tasks in the outsourcing of financial and accounting services were invoicing and billing activities. These tasks involve issuing invoices, maintaining control over the timeliness of payments and settlements with contractors. The most common use of the services in question was made by the surveyed trading companies - 82%, 43% of the surveyed service companies, and half of the surveyed manufacturing and trading companies and half of the surveyed manufacturing and service companies, as well as 29% of the surveyed service and trading companies. In contrast, the provision of tax and tax return services by an external provider involves the preparation of cyclical tax returns, calculation of tax liabilities and dignified representation before tax authorities. These tasks were outsourced by all surveyed service and trading enterprises, 91% of surveyed trading enterprises, 73% of service enterprises, and half of surveyed manufacturing and trading enterprises and half of surveyed manufacturing and service enterprises. Less frequently, surveyed enterprises indicated using an outsourcing provider for financial analysis. Outsourcing of these tasks was indicated by half of the surveyed manufacturing and trading enterprises, as well as manufacturing and service enterprises. The use of outsourcing of financial and accounting services in this area was indicated least frequently by the surveyed trade and service and commercial enterprises (18% and 14%, respectively). The least frequently indicated services outsourced under an outsourcing contract were activities related to liquidity management. Services in this area include both cash flow monitoring and optimization of the outsourcing company's capital structure. Outsourcing in this regard was used only by the surveyed trading companies (9% of these companies) and service companies (3% of these companies). Payroll and HR tasks, on the other hand, were often indicated by respondents as outsourced activities. Each of the surveyed companies indicated that they use the given services of an external provider to a greater or lesser extent. The offer of the services in question here is based on creating recurring payrolls, managing personnel records, ensuring compliance with labor laws, creating civil law

contracts and employment agreements with the principal's employees, and calculating Social Security contributions. The use of these provider services was declared by 73% of commercial enterprises, 27% of service enterprises, half of the surveyed manufacturing and commercial enterprises and half of the surveyed manufacturing and service enterprises, and 43% of the surveyed service and commercial enterprises.

Respondents were then asked about the benefits and risks of outsourcing financial and accounting services (Figure 2 and Figure 3). As in the case of the question on motives for outsourcing financial and accounting services, respondents were asked to evaluate all the benefits and risks indicated in the answer cafeterias. The surveyed companies first indicated whether a particular benefit or threat occurred at their company, while if the answer was yes, respondents indicated how important a particular benefit or threat was to their company. The data presented in Figure 2 indicate that the indicated benefits occurred in almost all surveyed enterprises. In addition, most of the benefits were rated by respondents as very important or moderately important. Only a few respondents indicated single benefits that did not occur at them (single indications).

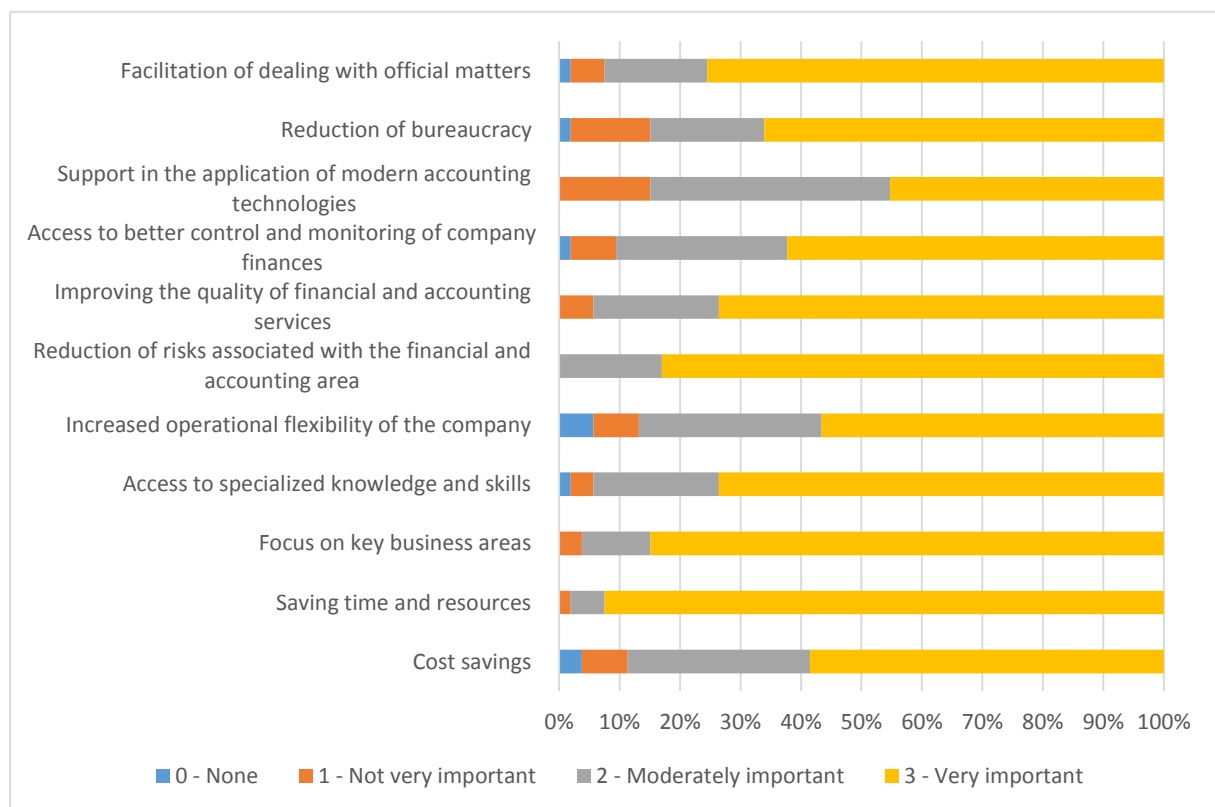


Figure 2. Benefits obtained by the surveyed companies from the use of outsourcing of financial and accounting services.

Source: own study.

Analyzing the data obtained from the companies participating in the survey, the most frequently indicated benefit of using outsourcing of financial and accounting services, with the greatest importance, was saving time and resources. This benefit was indicated by 93% of respondents. By delegating tasks in the finance and accounting area, the surveyed companies

freed up additional resources previously dedicated to these activities. In addition, they gained more time that was previously devoted to these tasks. Thus, depending on individual needs, the surveyed enterprises were able to direct the gained resources to the implementation of the organization's key activities. The companies were also able to reallocate the resources in question, for example, to intensify marketing activities, or implement market research and analysis. The benefit in terms of resource and time savings is also closely related to the area of strategic planning in enterprises to prepare for future challenges and opportunities arising from changing market conditions. This has enabled companies to adapt more quickly to new conditions while maintaining competitiveness. The other most frequently cited benefit observed by surveyed companies after implementing outsourcing of financial and accounting services was the ability to focus on key areas of the business. The given benefit, as very important, was indicated by 85% of respondents. This benefit combines with the previous benefit of saving time and resources. When activities in the financial and accounting area are performed by an experienced, competent third-party provider, entrepreneurs can focus fully on the core competencies of their business. Focusing attention on core business areas has also allowed respondents to improve their offerings and bring new products or services to market, which has contributed to an increase in their profits. By shifting their attention to the more important aspects of their business, companies were also able to streamline their operational processes to increase efficiency and lead to cost reductions. Another benefit identified by 83% of respondents was the reduction of risks associated with the financial and accounting area. This means that the surveyed companies, after implementing the outsourcing of financial and accounting services, were assured that the implementation of tasks by an external provider is aimed at reducing potential risks that could negatively affect the principal's finances and accounting. Companies indicating this benefit simultaneously confirmed that by establishing cooperation with an external provider, the risk of errors, non-compliance with regulations and other problems that could lead to financial or legal losses was significantly minimized. By outsourcing financial and accounting activities at companies, the security and integrity of financial data has increased through the use of appropriate IT security and data protection policies. In addition, companies indicating the occurrence of a given benefit noted that by minimizing the risks associated with the area, the occurrence of potential risks of official inspections or problems from the bank when granting loans was also reduced.

A similar study was conducted by W. Molenda and D. Burzyńska, but the results obtained are slightly different from those presented above. In the aforementioned study, the surveyed companies indicated the following as benefits associated with the use of outsourcing of financial and accounting services: improvement of the quality of financial and accounting processes, access to expert knowledge and increased competitiveness of the company (Molenda, Burzyńska, 2023). On the other hand, the results presented above are partially similar to those obtained by M. Grzeszczak, who indicates that the most important advantage of financial and accounting outsourcing services was saving entrepreneurs' time and access to

expert knowledge, i.e. receiving current information on changes in legal, tax and accounting regulations (Grzeszczak, 2024). In turn, the results presented by the KPMG team indicate three benefits of permanent cooperation with an accounting, tax and legal team, and these are: a sense of security in business operations, time and cost savings in decision-making regarding accounting, tax and legal issues, and the ability to respond quickly to risks and opportunities identified by the combined team dealing with business (KPMG, 2018).

As mentioned earlier, outsourcing financial and accounting services brings benefits to companies, but it also comes with some challenges. Based on the data presented in Figure 3 on the risks of outsourcing financial and accounting services, it can be seen that some enterprises have not noticed the occurrence of the risks indicated in the survey in their enterprise. In addition, for the majority of respondents, a significant part of the indicated threats are threats of low or medium importance.

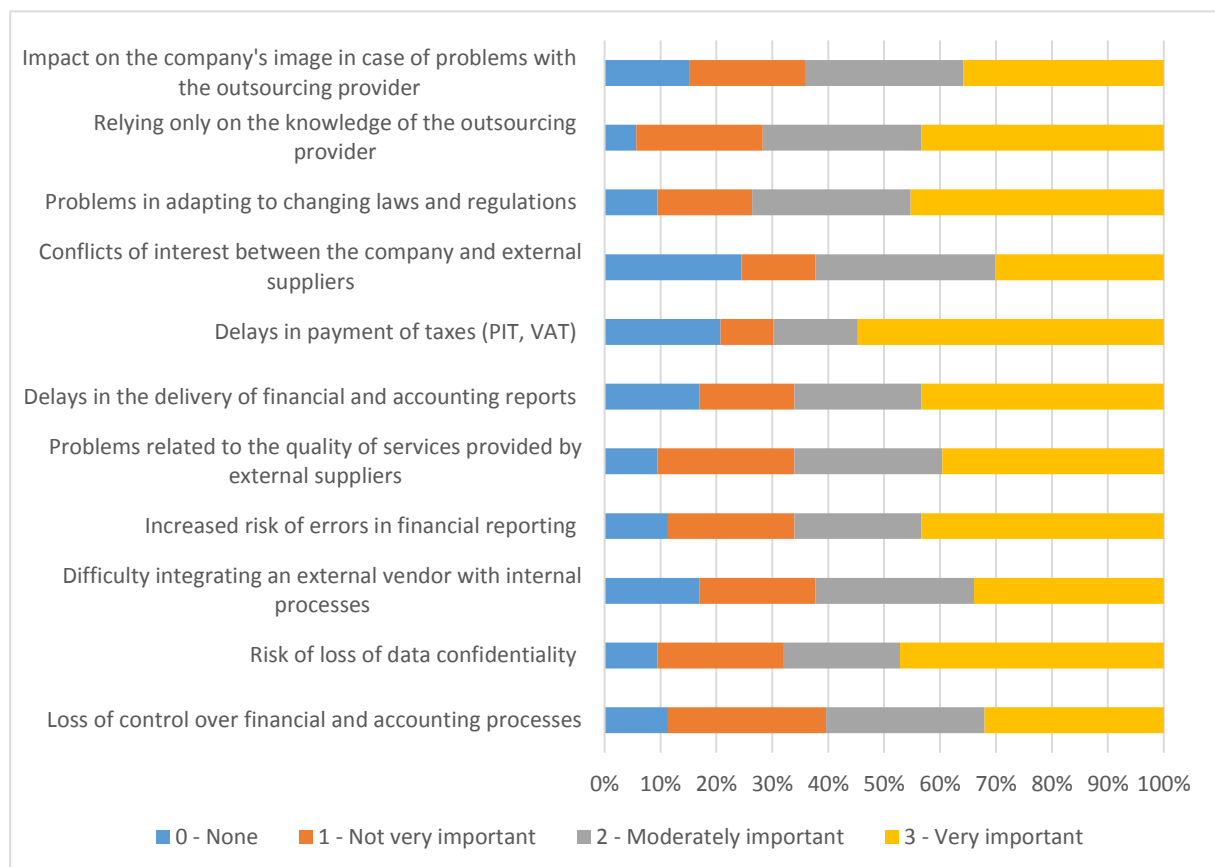


Figure 3. Threats identified by surveyed companies related to the use of outsourcing of financial and accounting services.

Source: own study.

Analyzing the data obtained from the enterprises participating in the survey, the most frequently indicated threat, of very significant importance, resulting from the application of outsourcing of financial and accounting services was the risk of delays in payment of taxes, i.e. PIT, or VAT. A given threat caused by the implementation of outsourcing of financial and accounting services was feared by 55% of the surveyed companies. The indicated threat may

be related to insufficient control of enterprises over the tasks entrusted to an external provider. Respondents who indicated a given threat declared that giving the supplier full responsibility for tax payments could lead to failure to pay them on time. The surveyed companies also indicated that delays in tax payments often lead to financial penalties in the form of late payment interest or other sanctions imposed on the outsourcer. In such a situation, the contracting companies are exposed to incurring additional, unforeseen costs, which in turn can negatively affect the timeliness in paying other obligations, such as with contractors. In addition, respondents who indicated concern about the risk of paying taxes declared that problems with tax payments could negatively affect their reputation, which in turn could result in a loss of trust not only with contractors, but also with customers. Another negative aspect closely related to the threat in question could be the difficulty of respondents in obtaining loans. Companies that have a problem with timely payment of tax liabilities will encounter difficulties in obtaining loans. Another threat from the use of outsourcing of financial and accounting services that the surveyed companies feared was the risk of loss of data confidentiality. The given threat was indicated by 47% of respondents. Enterprises that indicated a risk of data confidentiality noted that once confidential financial data was handed over to an outside provider, there was a risk that it would be inadequately secured or could be used inappropriately. In addition, respondents may have lost direct control over data processing and storage. This situation could, in turn, lead to a breach of the confidentiality of data not only of the principal, but also of its employees, customers, or contractors. Violation of the privacy of individuals related to the principal's business can negatively affect the company's reputation and loss of trust. In addition, when confidential personal data of customers, employees or business partners is disclosed, the company can be held financially liable. Costs associated with data breaches, including penalties for non-compliance with data protection regulations, compensation for victims, costs associated with security enhancements, and loss of customers can negatively affect a company's financial position by significantly reducing its liquidity. The other most frequently indicated threat from the use of outsourcing of financial and accounting services was problems in adapting to changing laws and regulations. The given threat was indicated by 45% of respondents. This negative aspect of outsourcing could be related to the adaptation of outsourcing companies to tax or legal amendments related to their industry. Respondents who indicated a fear of this risk in their business after partnering with an outsourced supplier may have encountered problems related to frequent changes in regulations. Tax regulations, as well as accounting regulations, are often subject to amendment or complete change. Despite the fact that an external supplier monitoring all changes and informing the client about them fulfills its role, companies indicated the difficulty of adapting quickly (on their own) to the resulting changes. Respondents indicated that the complexity of regulations often leads to problems in adapting quickly. When a company is unable to adapt to the resulting legal changes, it often has to face financial consequences. Failure to comply with tax laws and accounting regulations in many cases could lead to hefty financial penalties, interest on late payments and other legal

sanctions. Additionally, companies may have been exposed to lawsuits, both from customers and regulators, which can lead to lengthy and costly litigation. In addition, compliance problems could have led to disruptions in the company's day-to-day operations, i.e. delays in financial reporting or the need to make sudden changes in financial processes. This situation could have negatively affected the use of corporate time and resources. As a result, it could have lowered the companies' operational capacity and, in the long term, led to a loss of competitive position due to increased operating costs, reduced revenues or damaged market reputation.

In the research studies available in the literature, the risks of outsourcing financial and accounting services were indicated by respondents slightly differently from the results presented above. In a study by W. Molenda and D. Burzyńska found that the biggest threats were the lack of adequate safeguarding of financial data, fear of insufficient quality of outsourcing services, loss of control over the accounting and financial management of the enterprise, and concerns about inadequate communication between the enterprise and the provider of financial and accounting outsourcing services (Molenda, Burzyńska, 2023). On the other hand, in a study by M. Grzeszczak, among the risks, respondents indicated: lack of knowledge about the specifics of the company, lack of current access to financial and accounting data, and lack of support in making business decisions (Grzeszczak, 2024).

4. Conclusions

Operating in today's highly turbulent environment, driven by the dynamic development of technology, companies have the opportunity to take advantage of highly specialized providers, which offer comprehensive and professional support in the areas of finance and accounting. Companies using the services of a third-party provider gain a new perspective on the possibility of developing their core business. This is because by gaining a business partner characterized by a high level of knowledge and experience, they can focus on key areas of their business, leaving complex financial and accounting processes to specialists.

The surveyed companies most often chose to work with an external supplier out of a desire to minimize the risks associated with their business area. Enterprises that are focused on long-term growth and maintaining a competitive position want to minimize the risks associated with their business area by choosing a finance and accounting provider that will work in their favor and in accordance with their values. By delegating financial and accounting processes to an outsourced provider, companies receive adequate support, which enables them to manage their operations effectively.

The survey also identified the forms of outsourcing used by the surveyed enterprises and the tasks that enterprises most often outsourced. Full outsourcing was the most frequently indicated by the total number of enterprises surveyed. This was most likely due to the fact that

full outsourcing provided principals with comprehensive support for all financial and accounting functions, eliminating the need to establish cooperation with other suppliers. Full outsourcing also generally involves less expense than outsourcing individual tasks to different suppliers. Additionally, by outsourcing tasks to only one supplier, respondents were assured of consistency in reporting and a uniform standard of service quality. General accounting, on the other hand, was the most frequently outsourced task. General accounting encompasses a wide range of responsibilities, i.e. recording transactions, preparing financial statements, or guaranteeing tax compliance. Therefore, most respondents chose this option, delegating all tasks in the financial and accounting area to an external provider.

Due to the stated purpose of this article, the survey conducted identified the benefits and risks associated with outsourcing financial and accounting services. The most frequently identified benefit by the surveyed companies was the saving of time and resources. By reclaiming the tangible as well as intangible resources previously used to manage the internal finance and accounting department, companies were able to redirect them to more priority tasks related to the company's core business. With access to the expertise and skills of an external provider, companies also saved their time and resources by not having to invest in the training and development of internal staff. In addition, thanks to the supplier's use of the latest technologies and software, companies were able to achieve savings by not having to invest in them themselves.

In contrast, the biggest risk associated with outsourcing financial and accounting services, according to respondents, appeared to be delays in paying taxes. This may be due to the fact that their occurrence often results in the imposition of financial penalties and interest by tax authorities. The emergence of unforeseen costs in such a case can lead to a significant financial burden, which in turn can negatively affect the liquidity of the principal. In addition, if the threat occurred cyclically the risk of tax audits would be increased. The lack of regularity in the payment of taxes by companies can also negatively affect the perception of the principal's business in the eyes of customers, business partners, or investors.

The presented conclusions of the data analysis can contribute to further development of knowledge in the field of outsourcing of financial and accounting services. The completed study may inspire further research and deepen consideration of the importance of outsourcing of financial and accounting services in a broader scope.

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THE STABILISING ROLE OF VAT IN SHAPING REGIONAL BUSINESS CYCLES IN SELECTED CENTRAL EUROPEAN COUNTRIES

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Purpose: The aim of the paper is to present the role played by VAT in stabilising the economy. The study presents the formation of business cycles and the relationship between VAT revenue and GDP. A comparison is made of the course of economic fluctuations and changes in VAT revenues in selected Central European countries (part of the Visegrad Group - V4) over the period 2010-2020.

Methodology: The methodological basis of the research process and the empirical assessment of the regional business cycles of Poland, the Czech Republic, Slovakia and Hungary were preceded by theoretical analyses of business cycles. The study is based on 52 observations for each region studied. Data was obtained from the Eurostat database. Dynamic indicators reflecting changes in overall economic activity, i.e. quarterly GDP time series, were constructed. The obtained series were subjected to decomposition. Upper and lower turning points, resulting from the growth and decline phases of an economy, were identified. This made it possible to present complete business cycles and their subsequent evaluation in relation to the tax revenues, including VAT, achieved in these economies.

Findings: As a result of the research investigation, an assessment of the implemented fiscal stabilisation policies in selected European regions was carried out. Relationships between growth and decline phases in individual economies and the amount of budget revenues from VAT were determined. On this basis, an assessment was made as to whether the countercyclical stabilisation function is being realised. It was not possible to give an unambiguous answer because in some periods VAT had a stabilising function and in others it had a pro-cyclical effect. The most moderate stabilisation policy using VAT was pursued by Slovakia and Hungary. In Poland, VAT performed the stabilising function only episodically. In the Czech Republic, cyclical fluctuations were characterised by the highest amplitude of fluctuations and the VAT fulfilled the stabilising role in selected periods.

Originality/value: Evaluation of the implemented stabilisation policy on the impact of VAT on changes in economic activity in the V4 countries.

Keywords: cyclical fluctuations, VAT, counter-cyclical policy, V4 countries.

Category of the paper: Research paper.

1. Introduction

The impact of tax policy on economic stabilisation is widely discussed in the economic literature, particularly in the context of business cycles and fiscal policy. The impact of individual taxes on macroeconomic variables such as consumption, investment, aggregate demand or economic growth is constantly the subject of both theoretical and empirical analyses.

A relatively small number of studies address the issue of countercyclical policy in terms of the interplay between taxes and the mitigation of economic fluctuations. Also, few of the studies conducted to date undertake an analysis of the impact of a particular tax on changes in economic activity in a given area. In order to fill this gap, the author of the paper decided to make a presentation of the relationship and analysis between changes in economic activity and VAT revenues in selected European regions. The paper sets out to analyse whether VAT revenues, which dominate the budget revenues of individual countries, contribute to mitigating the cyclical fluctuations of these economies.

As one of the most important indirect taxes applied in many countries around the world (although its main purpose is to tax the value added at each stage of the production or distribution of goods and services), VAT, in the long term, can also act as an economic stabiliser (Claus, 2013). This tax, thanks to its flexibility in terms of rate changes and its automatic adaptation to economic conditions, can be useful in implementing stabilisation policies.

A comparative analysis method based on data extracted from the Eurostat database was used to assess the aforementioned phenomenon. A comparison was made between the development of economic fluctuations and the volume of VAT tax revenue. The study is based on 52 observations for each region studied. The countries of the Visegrad Group (V4) were taken as the regions: Poland, the Czech Republic, Slovakia, Hungary. These countries are united not only by their neighbourhood, but also by similar geopolitical and economic conditions.

The paper sets out to verify the hypothesis that VAT acts as an automatic stabiliser, mitigating excessive fluctuations in selected economies. The paper will first conduct a theoretical review in the field of fiscal stabilisation policy and how taxes affect economic prosperity. Then, the methodology of the study will be presented, together with a description of the different stages of the research procedure. In the following part of the paper, conclusions will be drawn regarding the formation of business cycles and a comparison of their course in relation to the formation of VAT revenues in selected Central European countries.

2. The essence of fiscal policy in stabilising modern economies

The state bodies responsible for collecting budget revenues and disbursing them are, in a market economy, next to the central bank, the second actor implementing stabilisation policy. State stabilisation policy is a set of measures taken to maintain economic equilibrium and minimise cyclical fluctuations. Its main objective is to ensure stable economic growth, prevent cyclical fluctuations and mitigate the effects of cyclical economic crises. Stabilisation policy is part of a broader macroeconomic policy and includes both fiscal policy and monetary policy. Fiscal policy, which includes taxation and fiscal spending policies, is inextricably linked to public finances and its impact on the economy can be multifaceted. In economic theory, the view is expressed that state fiscal policy, which consists of regulating the overall amount and proportion of state revenue and expenditure, can influence real processes in the economy, including its growth potential (Guerguil et al., 2017; Keita, Turcu, 2023). However, despite performing a variety of functions (including allocative or redistributive), fiscal policy is primarily a classic tool of stabilisation policy.

State authorities can consciously influence the business cycle by reducing the amplitude of medium-term cyclical fluctuations in the economy (Juja, 2011). Thus, one of the objectives of stabilisation policy is the implementation of countercyclical policy, which consists in the state authorities' efforts to reduce the amplitude and intensity of business cycle fluctuations (Barczyk, 2004; Calderón et al., 2016; Larch et al., 2021). Analysing the fiscal instruments lying on the revenue side of the state budget, it is indicated that tax revenues should increase in the growth phase of the economy (inhibiting the growth of consumer demand) and decrease in the decline phase. This course of action is expected to have a stimulating effect on changes in economic activity. In theory, consumption tax rates should be reduced during the low economic activity phase. This results in an inhibition of the decline in consumer demand during this period. In economies with chronic deficits, the theoretical postulates are usually not put into practice. This is due to the fact that consumption taxes are the main source of government revenue and are generally not reduced during either the downward or upward phases in the economy.

3. The impact of taxes on the economy in the light of economic theory

The mechanism of countercyclical effects of fiscal instruments on business cycle oscillations and their effects are interpreted differently in different theoretical streams.

From a Keynesian perspective, fiscal policy is crucial in shaping business cycles. Keynesians recognise that changes in tax rates have a direct impact on aggregate demand, which can affect the dynamics of economic growth in the short term (Keynes, 1936). According to

Keynes' theory, during an economic downturn, a reduction in taxes, especially for households and businesses, can increase disposable incomes of households and businesses and thus increase aggregate demand through consumption and investment and improve the economy (Auerbach, Feenberg, 2000; Blinder, 2006). Increased spending combined with tax cuts can provide a strong stimulus to the recovery of the economy.

According to neoclassical theory, the impact of tax policy on the economy is assumed to be limited and, in the long run, changes in taxes mainly affect the structural allocation of resources rather than short-term prosperity. According to this theory, tax changes affect business investment decisions, which in the long run can affect productivity growth and the potential growth rate of the economy (Friedman, 1962).

In contrast, real business cycle theory assumes that changes in tax policy have a marginal impact on business cycles, as external shocks such as technological change are the main source of economic fluctuations. However, fiscal policy can affect the rate at which the economy adapts to new conditions (Kydland, Prescott, 1982).

Until the mid-1970s, taxes were not used for anything other than purely fiscal purposes, as they did not perform functions such as income redistribution or resource reallocation. However, the above situation changed significantly in both Europe (welfare state programmes), Japan (industrial policy) and the United States, which, especially in the 1960s and 1970s, began to use fiscal policy for non-fiscal purposes to a significant and increasing extent (Wnorowski, 2008).

4. The role of VAT in counter-cyclical policy

Analysing the review of the literature on fiscal policy, it is also worth noting that the stabilisation function of fiscal policy developed on the basis of J.M. Keynes's theory - according to which, by influencing the structure and level of global demand, it is possible to affect the formation of real economic processes - allows countercyclical fiscal policy to be divided into active policy (related to discretionary actions of the state) and passive policy (related to the action of automatic economic stabilisers).

The basic types of active - targeted fiscal policy moves are (Winiarski, 2012):

- changes in tax rates,
- changes in spending on public works and investment,
- changes in the distribution of transfers from the state budget.

On the other hand, stabilisation policy measures operating automatically that are applied in economic practice can include:

- automatic stabilisers in the tax system (income and indirect taxes),
- automatic stabilisers in the social benefits system,
- subsidies in the agricultural sector.

Narrowing the considerations to the analysis of the impact of VAT on the economic cycle, it seems necessary to indicate its predictable (i.e. consistent with theoretical expectations) impact. When assessing the impact of VAT on the economic cycle, both micro- and macroeconomic aspects should be taken into account, as changes in the VAT rate or in the rules of its application can trigger reactions at different levels of the economy. This impact can manifest itself in several key areas, including consumption, investment, price levels and budget revenues.

In the area of consumption, VAT plays a key role. This tax, like excise duties, is levied on the source of taxation, i.e. on final consumers through marketing. The lower price and income elasticity of demand for consumer goods means that these taxes shape the real income of the lowest-income population to the highest degree. Bearing in mind that the mechanism of action of this group of taxes is automatic, indirect tax revenues should increase during good economic times (inhibiting the growth of consumer demand) and decrease during bad economic times (reducing the decline in consumer demand) (Barczyk, 2004). The mechanism of the impact of indirect taxes on economic prosperity is relatively simple. As a price-generating element (burdening the gross price), they stimulate (or relatively inhibit) demand from the public sector, businesses and households. The strength of the impact is greater for those unable to pass on the burden of taxation to final consumers. This is the case for VAT-exempt businesses and households in particular (Bostan, 2017; Walczak, Flejterski, 2008). By affecting the prices of goods and services, VAT causes prices to rise when the tax rate is higher. This has the effect of lowering consumer demand, so in times of economic weakness, when household incomes are lower, a VAT increase can further reduce purchasing power and lead to a further decline in consumption. In contrast, a reduction in the VAT rate can stimulate consumer demand, which has a positive impact on economic growth in the short term (Braz, 2009; Clemens, Roeger, 2022).

Changes in VAT rates may also affect businesses' investment decisions. A higher VAT rate may increase the cost of doing business, particularly for businesses that have a high reliance on importing goods or on services subject to VAT. In the event of a reduction in the VAT rate, businesses may benefit from cost reductions, which may encourage investment in further growth. On the other hand, uncertainty related to VAT policy (e.g. frequent changes in the rate) may negatively affect long-term investment decisions, as entrepreneurs will seek to avoid risks related to so-called fiscal unpredictability.

VAT also has an impact on changes in the price level in the economy. An increase in the VAT rate leads to an overall increase in prices, which can have a twofold effect on economic prosperity. On the one hand, an increase in VAT may reduce real consumer income, on the other hand, it may lead to an increase in government revenue, which can be used for public investment. However, there is a risk that an increase in VAT may lead to an inflationary spiral, especially when rising prices add up to higher production costs and increased wage pressures in the long run (OECD, 2016).

When analysing the aspect of VAT's impact on the economy, it is impossible to ignore its impact on fiscal sustainability. VAT is one of the main sources of government revenue in many countries. Increasing the VAT rate can help to improve public finances, especially in times of economic weakness when other sources of revenue, such as income taxes, may not be generating the expected revenue. Conversely, overburdening the public with VAT during an economic downturn can have the opposite effect - leading to a further downturn. It is therefore important that VAT policy changes are aligned with the business cycle to avoid exacerbating the negative effects of the recession.

In conclusion, it should be added that the long-term impact of VAT on the economy also depends on the reaction of financial markets. A reduction or increase in the VAT rate may affect perceived macroeconomic stability. This stability in turn influences investors' decisions and the stability of the domestic currency. An increase in the VAT rate may be taken as a signal of public finance problems, which may lead to an increase in the risk premium and a reduction in foreign investment. Conversely, reducing the VAT rate when inflation is high can be seen as a step to counter economic stagnation, which can improve financial market sentiment (IMF, 2017).

5. Stages of the research procedure

Preceding the empirical analyses, it should be noted that every business cycle consists of two essential elements: turning points and phases. Turning points are the starting points of phases. They make it possible to determine in time the starting and ending moments of the occurrence of phases, but they also make it possible to study other features of the oscillation. With regard to the functions they perform, turning points can be divided into two groups (Barczyk, Lubiński, 2009):

- lower turning points, marking the end of a period of low activity and the entry of the economy into an upturn,
- upper turning points, marking the end of the upswing and at the same time the beginning of the downturn.

Assuming that each business cycle is a certain time interval lying between two turning points that are identical in nature, it can be said by analogy that a phase of a cycle is a certain period occurring between successively different turning points (Stock, 1979). Accordingly, the business cycle is structured in two parts: an economic growth phase (located between the lower and upper turning points) and an economic decline phase (lying between the upper and lower turning points). The delineation of the different phases is determined by the definition adopted and the method used to separate the returns (Tichy, 1972).

Bearing in mind that economic processes run in cycles with a heterogeneous structure, the analysis of business cycle synchronisation involves comparing the individual components identified earlier. Due to the fact that economic reality is very complex, empirical trend determination is not an easy task. The main reason is the variability over time of long-term growth paths (Spychała, Spychała, 2024). It is necessary to decompose the series and extract the components of the cycle. For this purpose, appropriate statistical tests or filters are applied that allow the desired components to be separated according to: frequency, duration or amplitude of fluctuations. The application of filters, referred to as defiltering (filtering, decomposition of a series, trend extraction), also makes it possible to reduce non-stationary variables to stationary form and can therefore be considered as preparing the data for further analysis (Domańska, 2013).

In the group of indicators allowing for the isolation of turning points of business cycles and the analysis of their most important features, quarterly indices of GDP gross domestic product dynamics were adopted (where the corresponding quarter of the previous year = 100).

The first stage of data preparation for further procedures was the elimination of seasonal and random fluctuations, smoothing the chronological series with repeatedly selected moving averages using the TRAMO-SEATS procedure of deseasoning. A series containing the combined effect of trend and cycle was adopted for further analysis. In order to isolate cyclical fluctuations, the concept of a growth cycle was used, which is based on the analysis of the dynamics of changes in the growth rates of a selected variable and the study of fluctuations of aggregate activity around a trend - the so-called deviation cycle (Spychała, 2020).

Assuming that the studied series contain a unit root, and thus are non-stationary (Kruszka, 2009), it was assumed that the cyclical component of a variable is the difference between its current value and the value of the trend (weighted average of past, current and future observations). Therefore, a stochastic trend was extracted in the form of a development trend using the Hodrick-Prescott filter. Thus, the fluctuations were separated into two components: the trend and the cyclical component.

In the empirical study of business cycle fluctuations, it was assumed that the indicator reflecting changes in overall economic activity would be the quarterly GDP time series downloaded from the Eurostat database (available for all surveyed regions on a quarterly basis). The indicators created are indexes of the dynamics in relation to the corresponding period (quarter) in the previous year. The use of these data in the analysis is due to the fact that the

GDP series highly characterise the most important aspects of the business cycle process (informing on both demand and market supply changes). In addition, they are estimated using internationally harmonised rules, so the indicators created can be considered fully comparable. In addition, the turning points determined on the basis of the constructed indicators are highly real, as GDP belongs to the group of simultaneous indicators (Spychała, 2020).

The study carried out is based on 52 observations for each region studied. The individual regions were taken to be the countries of the Visegrad Group (V4): Poland, the Czech Republic, Slovakia and Hungary. In the conducted analysis of the course of business cycles in selected economies in the period Q1 2000 - Q4 2022, practical assumptions were made about the deviation cycles. In view of this, the minimum phase length can be 3 quarters and the minimum cycle length can be 6 quarters. The turning points must alternate. It was also assumed that the quarter in which the bottom turning point occurs will be included in the downward phase, while the quarter in which the top turning point is identified will similarly belong to the upward phase. The temporal scope of the study was determined by the availability of as long as possible, comparable statistical data series, necessary for the construction of reliable models, enabling correct, error-free inference.

The next part of the research involved an analysis of the evolution of income budget streams, including VAT revenues. These data are necessary for the analysis of the relationship between the studied quantities. Assuming the above, variables were used for the empirical assessment of cyclical oscillations in the conditions of Central European economies:

- GDP (which is an indicator of cyclical fluctuations that synthetically reflects the development of the level of economic activity),
- VAT revenue (remaining in relation to GDP).

6. Results of the analyses

Analysing the course of economic fluctuations for the GDP series over the period Q1 2010 - Q4 2022, one can observe significant similarities in the changes in economic activity in the individual Visegrad countries (figure 1), which confirms the economic interdependence of the regions under study.

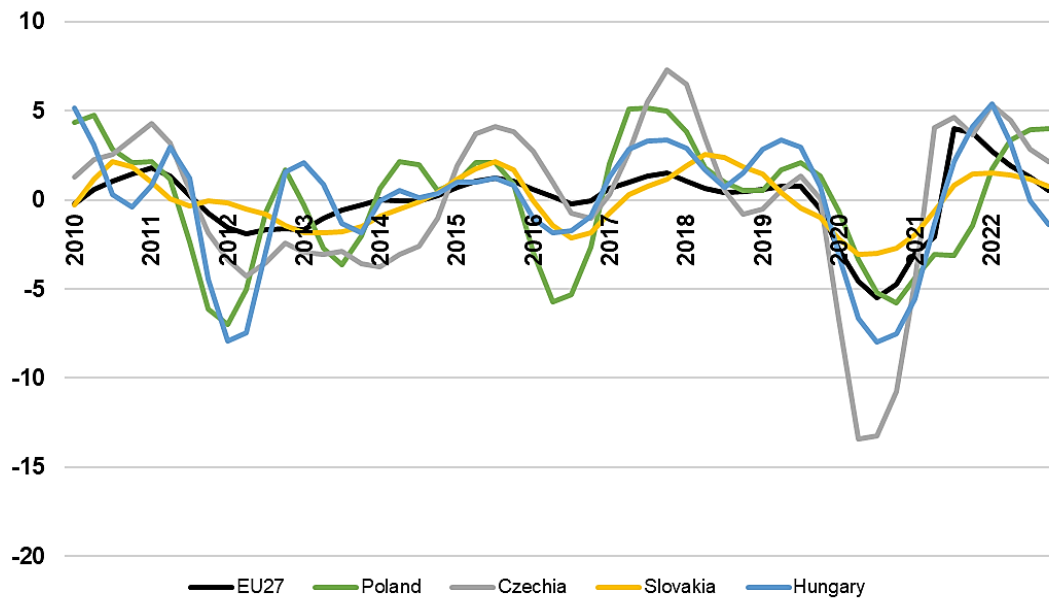


Figure 1. The progression of cyclical fluctuations for a time series of the GDP in the period of the first quarter of 2010 until the fourth quarter of 2022 for EU27 and the regions of V4.

Source: own compilation based on the research conducted.

The graphical diagram (figure 1) depicting the difference in the course of GDP changes allows a very generalised assessment of the degree of synchronisation of the cycles of the listed regions, nevertheless, some convergences can be noted. Certainly, the most noteworthy changes are those that fell in the approximate period from 2019 to 2021. All the regions surveyed recorded a significant decline in GDP growth. The outbreak of the Covid-19 pandemic and the initiation of restrictions on many areas of economic activity (Yasar, Elgin, 2024) were major contributors to the deepening crisis. The rebound and the start of an upward phase in the economies studied occurred at different times: The Czech Republic, Slovakia and Hungary accelerated growth as early as 2020, while Poland's economy did so in 2021. The most pronounced economic slump was in the Czech Republic in 2020. The periods in which convergent growth phases were recorded in all the surveyed economies were 2014 and 2015 (with a convergent period of decline at the turn of 2015 and 2016), followed by 2017 and the second half of 2022. The main differences in the shaped GDP trajectories for the surveyed regions concerned the intensity of fluctuations, with the Czech Republic being the most affected. On the other hand, the smoothest course of economic fluctuations (over the entire period under study) concerned Slovakia - the amplitude of its GDP fluctuations was characterised by the smallest differences.

Figure 2. presents the length of separated phases of economic fluctuations of the analysed regions and the period in which the individual phases fell in an alternating pattern (growth and decline phases). Eight phases were distinguished for the GDP time series for Poland (figure 2), and their sequence made it possible to distinguish three full business cycles (according to theoretical assumptions, a full business cycle begins with a growth phase and ends with

a downturn phase). The length of the identified business cycles ranged from 3 to 9 quarters. The first of the identified business cycles lasted from the second quarter of 2012 to the third quarter of 2013 and was a cycle in which the upward and downward phases were evenly distributed. The second identified cycle started in Q4 2013 and ended in Q2 2016 and was characterised by the dominance of the upward phase. On the other hand, the last - third - cycle, falling between Q3 2016 and Q3 2021, was characterised by the predominance of a downward period in the Polish economy. The prolonged downturn phase was certainly unaffected by the aforementioned Covid-19 pandemic. In Q4 2021, a turnaround took place, which with the growth phase started another - ongoing - business cycle. The economic acceleration initiated during this period may herald an exit from the post-pandemic and prolonged economic downturn for Poland.

For the period 2020-2022, 10 phases and 3 full business cycles were identified in the Czech Republic's economy, 8 phases and 2 full cycles in Slovakia and 11 phases and 4 full cycles in Hungary (figure 2).

The correct determination of the phases of economic growth or decline is of great cognitive importance. By identifying which phase a region is in at a given point in time, it is possible to indicate what is expected from a given potential stabiliser. Depending on the phase, according to the assumptions of countercyclical fiscal policy, it is possible to determine the expected direction of action of a given stabiliser (in the case of the expected direction of the impact of VAT).

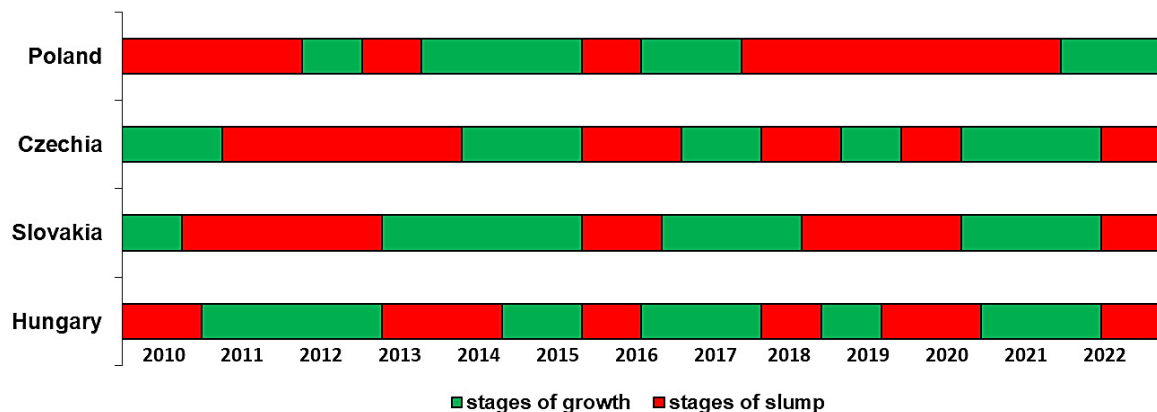


Figure 2. The indication of the stages of slump and the stages of growth in the period between the first quarter of 2010 and the fourth quarter of 2022 for the regions of V4.

Source: own compilation based on the research conducted.

The second part of the analyses carried out (on total tax and VAT revenue to state budgets) shows that total tax revenue increased between 2010 and 2022. Despite the upward trend, some countries experienced temporary decreases in tax revenue, but these were temporary situations. One example, but also a current cause of such a situation in Poland, is the measures taken under the Polski Ład introduced in 2022. Invariably, VAT revenues are expected to increase, as a result of the effective sealing of the tax system (e.g. through: application of the split

payment mechanism, implementation of Slim VAT packages, as well as joint accounting of related entities) (Krawczyk-Sawicka, 2023).

The combined graphs (figure 3) show the share of total taxes and the share of VAT expressed as % of GDP (for easier comparison of economies using different currencies) from Q1 2010 to Q4 2022 in all V4 regions. Using a diagram, the difference in the share of taxes in the economies under study in relation to GDP is illustrated and the percentage of the share of these revenues accounted for by the VAT receipts analysed. By far the highest ratios apply to Hungary, which is the only one of the surveyed countries to have already exceeded the threshold of a 10 per cent share of VAT in Hungarian GDP in 2022. By far the highest ratios concern Hungary, which is the only country among those surveyed to have already exceeded the threshold of a 10 per cent share of VAT in Hungarian GDP in 2022. In contrast, the lowest averaged share of VAT as a proportion of GDP concerned Slovakia (with a share between 5.87 and 7.69 % of GDP in the period under review).

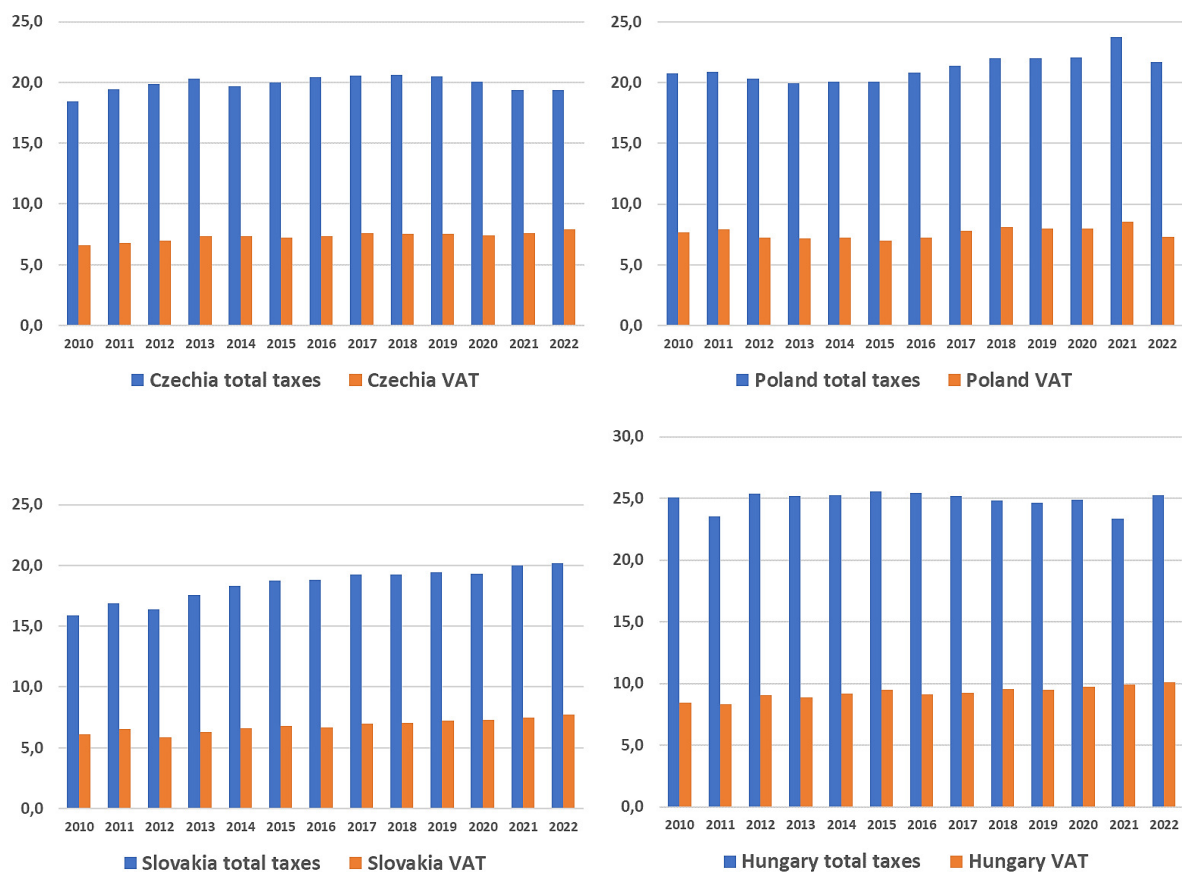


Figure 3. Share of total taxes and share of VAT as % of GDP in the period of the first quarter of 2010 until the fourth quarter of 2022 for the regions of V4.

Source: own compilation based on the research conducted.

Approximating the relationship between economic fluctuations and VAT revenues in the Polish economy (figure 4) in the period Q1 2010 - Q4 2022, it can be concluded that the direction of the interaction of these two variables in most of the analysed time interval was opposite. During periods of economic slowdown (in particular in 2011-2012 and 2018-2021

when the longest downward phases in Poland were distinguished), VAT revenues were characterised by an upward trend. It can be presumed that the stabilising function of mitigating fluctuations with indirect VAT has unfortunately not been properly utilised. Analysing the fiscal instruments lying on the revenue side of the state budget, it is indicated that tax revenues should decrease in the downward phase in order to stimulate consumer demand. It is expected that such a course of action would have a stimulating effect on changes in economic activity. The policy pursued in such a way may be justified by the struggle of the state authorities against rising inflation, which was especially intensified after the outbreak of the war in Ukraine. From 2022 onwards, anti-inflationary shields were systematically introduced to combat the crisis and the prices of products and services, which were rising too fast. Reduced VAT rates in specific categories were then applied (including zero VAT on food). Further discs also appeared in 2023. The current VAT rates have been in force in Poland since 2010, at which time the government temporarily raised VAT from 22 to 23% and from 7% to 8%, currently these rates have not returned to their previous level.

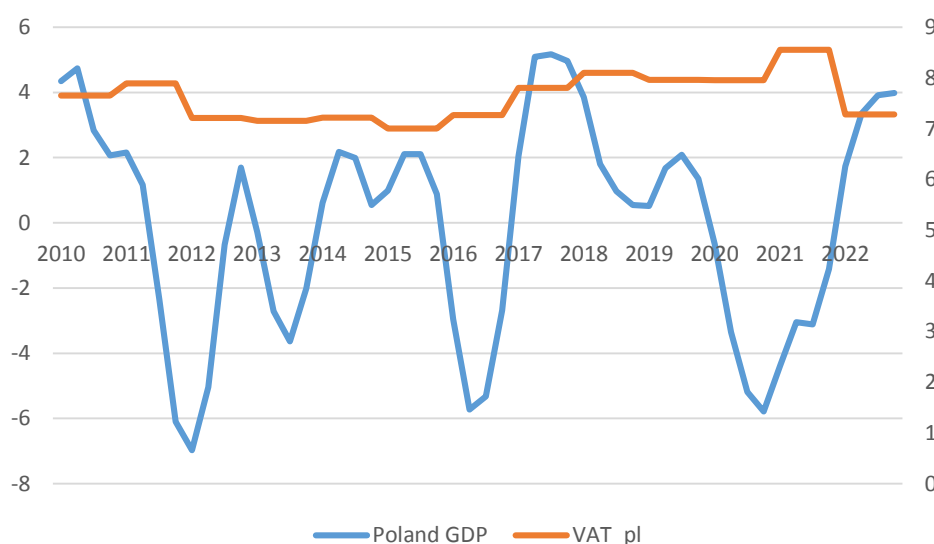


Figure 4. Cyclical fluctuations of GDP time series and changes in VAT revenues from the first quarter of 2010 until the fourth quarter of 2022 for Poland.

Source: own compilation based on the research conducted.

In line with the counter-cyclical policy, the direction of the relationship between the examined variables was noticeable in the second half of 2015 and in 2017 - at that time, the upward phase of the cycle was accompanied by increased VAT receipts. However, when analysing the entire period under study, these were episodic in nature. In view of the above considerations, VAT does not play a significant stabilising role in the Polish economy. The repeatedly changing over time VAT revenues were the result of other actions (including as a result of the implemented discretionary policy towards specific economic conditions that occurred in the studied period).

In the Czech economy, on the other hand, we can observe a clear VAT stabilisation effect coinciding with the pandemic crisis (figure 5). After the slowdown of 2020, when the economy started to enter a growth path, VAT revenues from 2021 onwards started to increase clearly. The Czech Republic is an economy whose tax revenues are at a relatively stable level in relation to GDP (figure 3); moreover, a reduction in this ratio was noticeable in the post-crisis period in the second half of 2020 and in 2021. Properly implemented countercyclical policies also applied to the years: 2010, 2015 and 2017, when the economic acceleration was accompanied by a stimulation of consumer demand.

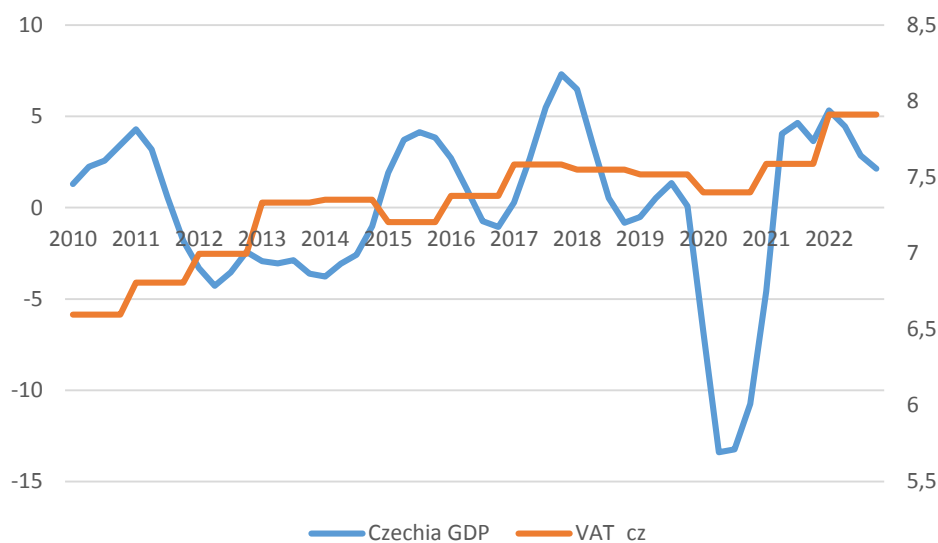


Figure 5. Cyclical fluctuations of GDP time series and changes in VAT revenues from the first quarter of 2010 until the fourth quarter of 2022 for Czech Republic.

Source: own compilation based on the research conducted.

It should be borne in mind that the standard VAT rate in the Czech Republic is at 21%. This is a moderate value compared to other EU countries and therefore the VAT revenue-to-GDP ratio is rather low compared to other European countries (Gawthorpe, 2020). The standard 21% VAT rate in the Czech Republic has remained unchanged to date, while the reduced rate has been reduced since the beginning of 2024 and currently stands at 12% (until 2023 there were two reduced VAT rates: 10 and 15%, one of which has been completely eliminated).

Looking at the evolution of changes in economic activity and changes in VAT revenue in Slovakia, one can see a dynamic course of fluctuations together with a smooth (without significant fluctuations) course of VAT revenue. Analysing the direction of changes in the examined variables (figure 6), it can be assessed that VAT revenues have been steadily increasing since 2013, regardless of changes in the economic situation. The slight increases in VAT revenue were mainly related to growth phases in the Slovak economy (which certainly played a stabilising role). This happened in the periods 2013-2015, second half of 2016 - second half of 2018 and second half of 2020 - first half of 2022. However, these were changes of a mild and moderate counter-cyclical nature, with the highest dynamics in the period 2011-

2013, beyond which VAT revenue increases were subject to slight fluctuations, but nevertheless consistently and gradually increasing.

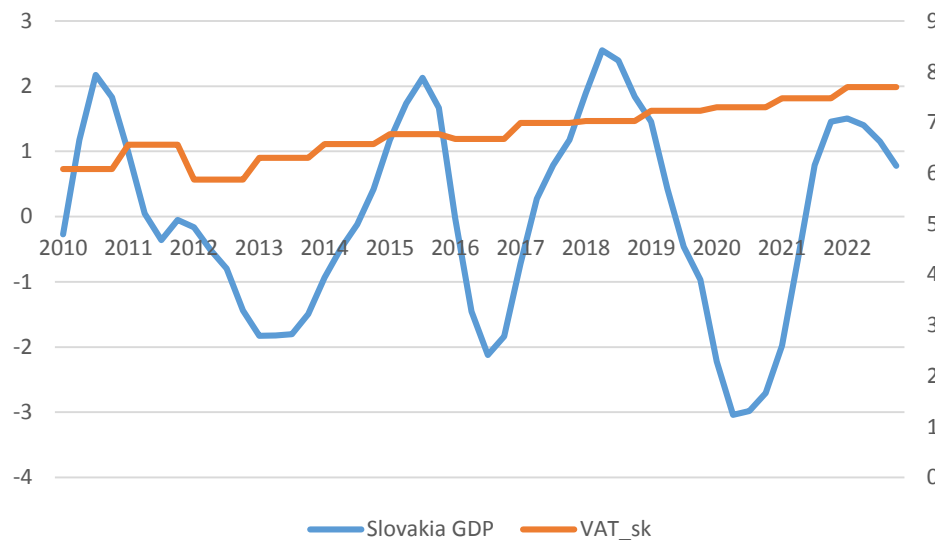


Figure 6. Cyclical fluctuations of GDP time series and changes in VAT revenues from the first quarter of 2010 until the fourth quarter of 2022 for Slovakia.

Source: own compilation based on the research conducted.

Although Slovakia has seen a steady increase in the share of VAT revenue, of the economies analysed it is Slovakia that has the lowest averaged share of VAT in relation to GDP. To date, the main VAT rate in Slovakia is 20%, with some products and services subject to reduced rates of 10% and 0% for selected services (Čakoci, Červená, 2021; Dobrovič et al., 2021). However, by the authorities' decision of 18.10.2024, the standard VAT rate in Slovakia will increase from 20 to 23% from 1.01.2025. In addition, the reduced VAT rate will increase from 10 to 19%. A second reduced VAT rate of 5% will also apply.

Hungary, with a characteristically high standard VAT rate of 27% at the European level (it is the highest VAT rate in the EU countries), has, like Slovakia, pursued a policy of gradual and moderate increases in VAT revenue (Pavlin, Györke, 2024). The course of change in the evolution of the VAT share in relation to GDP did not fluctuate significantly over the period under review. The largest increase in VAT revenue in relation to GDP was in 2012. At that time, when Hungary entered a phase of economic growth, there was an increased dynamics of VAT revenue collection. These measures were definitely counter-cyclical in nature. However, from the beginning of 2013, the fluctuations in Hungary's economic activity were relatively mild until the outbreak of the Covid-19 pandemic and the global economic collapse. This period saw a further increase in the share of VAT as a proportion of GDP, which may also have stabilised Hungary's economy. However, during the period of relative economic stability and low amplitudes of cyclical fluctuations (i.e. the 2013-2020 period), Hungary's fiscal policy was also pursued in a moderate manner.

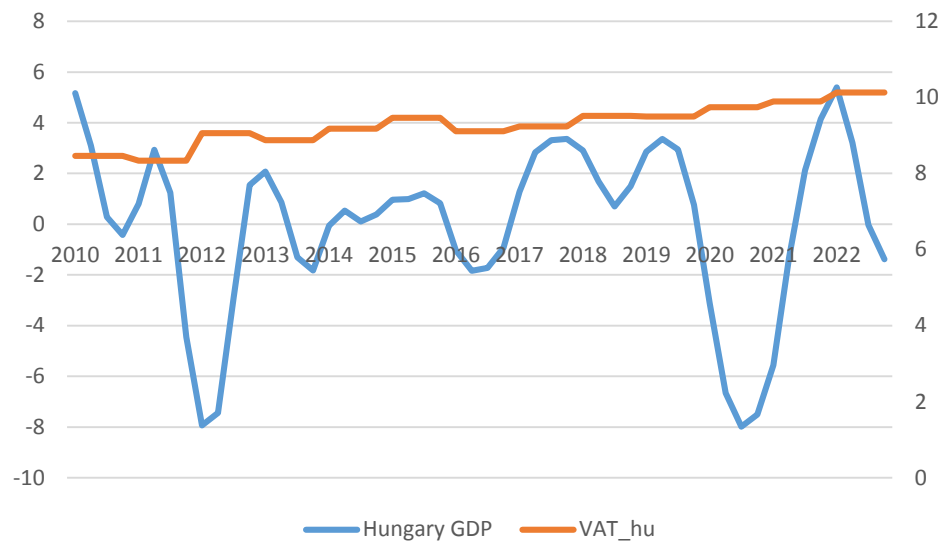


Figure 7. Cyclical fluctuations of GDP time series and changes in VAT revenues from the first quarter of 2010 until the fourth quarter of 2022 for Hungary.

Source: own compilation based on the research conducted.

As shown in Figure 7, from 2012 onwards, the direction of the impact of the variables studied, although moderate, was in line with theoretical assumptions and VAT revenues increased during periods of better prosperity and decreased during periods of slowdown. However, there were negligible fluctuations in budget revenue. It can be assumed that in the Hungarian economy the overriding role of VAT is primarily to feed the state budget.

7. Discussion and final conclusions

Concluding the theoretical considerations and comparative studies carried out in this article on the relationship between changes in economic activity (measured in GDP) and changes in the share of VAT revenue to state budgets in Poland and other Visegrad Group countries, it can be noted that the impact of VAT on economic prosperity is complex. This impact depends on many factors, such as the size of the rate change, the structure of the economy, the level of confidence in public institutions or the general state of the economy. Theoretically, consumption tax rates should be reduced during a phase of low economic activity (thus inhibiting the decline in consumer demand during this period). A rational VAT policy can be an effective tool to stabilise the economy, especially during periods of economic downturn, whereas an inappropriate application of the policy can exacerbate the downturn phase of an economy. It is important that VAT decisions are made taking into account the business cycle and other aspects of fiscal policy.

Studies conducted indicate that VAT policy has a significant impact on economic growth rates. For example, in the short term, a reduction in VAT can increase consumption, which contributes to a higher rate of economic growth. However, in the longer term, the effects are much more complex. Reducing VAT can contribute to increasing budget deficits, which in the long term can reduce confidence in the sustainability of public finances and reduce investment by the countries concerned. On the other hand, increasing VAT receipts may increase government revenues, but may also have the effect of reducing the level of economic activity, which in the long run may lead to lower economic growth rates (Gali, Perotti, 2003). If the budget deficit is a notorious phenomenon in an economy, governments usually cannot afford to reduce tax rates despite the economic downturn. In view of this, a budget deficit usually means higher taxes in the future. Raising taxes, on the other hand, means that the costs of reducing imbalances in public finances are shared by millions of taxpayers.

VAT is a significant and growing source of revenue among the surveyed economies. Over the period under study, this importance has increased slowly but steadily. At the same time, the relative importance of VAT in the tax structure has become more variable across countries. This means that some countries rely more on VAT and others less. Of the economies surveyed, Hungary is the country that relies the most precisely on VAT as the main stream for the state budget.

VAT is the most important consumption tax in all European Union countries. In 2022, the European Union's revenue from consumption taxes accounted for around 11% of GDP and over 27% of total revenue, slightly declining compared to 2021. In terms of VAT, the EU system is based on the EU VAT Directive, which is a harmonised legal framework to which national VAT rules must conform across the EU. The approach to reduced rates is also coordinated at EU level. The reform of VAT rates came into force in 2022 (Council Directive (EU) 2022/542). This directive amended the VAT Directive 2006/112/EC and provides EU Member States with more flexibility in setting reduced VAT rates. Reduced rates and exemptions are important levers of VAT policy. Reductions and exemptions aim to achieve distributional objectives and encourage the consumption of certain goods and services (Annual Report on Taxation, 2024).

The paper sets out to verify the hypothesis that VAT performs an automatic stabilising function, mitigating excessive fluctuations in selected economies. As a result of the research procedure carried out, it is impossible to give a clear answer to the question whether the policies implemented by the countries studied using VAT are countercyclical policies (and VAT has a stabilising function). This is not possible because in the selected economies, VAT had a stabilising function in some periods and a pro-cyclical effect in other periods. The most moderate stabilisation policies using VAT were pursued by Slovakia and Hungary, and the direction of the impact of GDP and VAT revenues were countercyclical in the vast majority of the research period. In the Czech Republic, cyclical fluctuations were characterised

by the highest amplitude of fluctuations and VAT fulfilled the role of a stabiliser in selected periods. In Poland, on the other hand, VAT fulfilled the stabilising function only episodically.

Despite the different conclusions obtained for individual economies or for individual periods, it can certainly be recognised that the impact of VAT does not operate in a vacuum and that other factors also contribute to the economic stabilisation process. Nevertheless, taxes do have a significant impact on the shaping of the economic situation. Their proper regulation at appropriate points in the business cycle can support economic recovery or help stabilise the economy during downturns. It is important that tax policy is tailored to current economic conditions and the budgetary needs of the state.

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THE IMPORTANCE OF GREEN INVESTMENTS IN IMPROVING THE COMPETITIVENESS OF MUNICIPALITIES IN POLAND

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Purpose: The aim of the article is to present the relationship between environmental (so-called "green") investments and the change in the level of competitiveness of municipalities in Poland. The significance of green investments in improving the competitiveness of local governments at the municipal level was determined based on the division of the studied units into four groups: urban municipalities, urban-rural municipalities, rural municipalities and cities with county rights. The study was designed to verify the hypothesis that there is a relationship between the change in the level of competitiveness and the scope of environmental investments in municipalities in Poland, with the highest relationship being noted in cities with county rights.

Methodology: The study presents changes in the level of competitiveness of municipalities based on 21 indicators and the scope of green investments in municipalities based on 10 indicators constructed based on public statistical data from the Local Data Bank of the Central Statistical Office. The selection of indicators was made using the Z. Hellwig reduction method – i.e. by isolating diagnostic features that showed little correlation between each other. The level of competitiveness and environmental investments were presented based on a synthetic measure showing the taxonomic distance of a given municipality from the established development pattern. In turn, the relationships between the studied variables were established based on regression analysis.

Findings: As a result of the conducted research procedure, environmental investments and changes in the level of competitiveness of 2477 communes in Poland were presented, and the relationships between these variables were determined in the individual research groups. The most significant relationships were observed among cities with county rights and rural communes. In turn, the highest values of the synthetic index in the field of competitiveness were recorded in the case of urban-rural communes, and in the field of environmental investments - in the case of urban communes.

Originality/value: The article presents the results of extensive research conducted on a group of 2477 entities based on 31 indicators that uniquely present the competitiveness and environmental orientation of investments in municipalities in Poland. The obtained results of the study may be a source of inspiration for EU institutions in the field of formulating environmental strategies covering the entire area of the European Union.

Keywords: green investments, competitiveness, local governments, distance from the model.

Category of the paper: Research paper.

1. Introduction

Determining the level of competitiveness of local government units is an extremely important research problem both in the theory of economic sciences and in economic practice. The level of competitiveness of a commune affects, for example, its investment attractiveness, the well-being and wealth of its residents, or the absorption capacity of EU funds (Soares, 2024; Zerbib, 2019; Caldecott, Rook, 2015). In addition, in the face of global climate change, various solutions are being developed to reverse the adverse effects of human interference in the natural environment. For example, within the framework of the European Union's climate policy, activities for sustainable development, decarbonization of the economy, or the principles of the so-called Green Deal are being promoted (Eckert, Kovalevska, 2021). Programmes and projects in the field of reducing emissions, disseminating renewable energy sources, greening public spaces and using environmentally friendly technologies are often implemented at the lowest levels of public management (Sikora, 2021). In connection with the above, the aim of this study is to present the relationship between environmental (so-called "green") investments and the change in the level of competitiveness of municipalities in Poland.

Research aimed at determining the factors influencing competitiveness is the subject of many scientific studies (Arfaoui et al., 2024; Vela Almeida et al., 2023; Kauffman et al., 1997; Porfir'ev, 2016; Siedschlag, Yan, 2021; Zhang et al., 2024). However, a research gap has been identified in the literature on the importance of environmental investments in local development. In order to fill this gap, the author of the study decided to analyze the relationship between green investments and the change in the level of competitiveness of municipalities in Poland. In other words, the article aims to analyse whether green investments are implemented primarily in communes that have recorded a significant improvement in their competitiveness level, or whether environmental investments contribute to improving the competitiveness of communes in Poland.

The aim of the article is to identify the relationship between environmental (so-called "green") investments and the change in the level of competitiveness of municipalities in Poland. The study will present changes in the level of competitiveness of all 1477 municipalities in Poland based on 31 indicators and the scope of environmental investments (so-called "green") based on 10 variables. Additionally, the research group will be divided into four types of municipalities: urban municipalities (236 units), urban-rural municipalities (662 local governments), rural municipalities (1513 local governments) and cities with county rights (66 cities). The basis used to calculate the indicators will be statistical data from the Local Data Bank of the Central Statistical Office (BDL GUS). The change in the level of competitiveness and the scope of environmental investments in individual communes will be presented based on a synthetic measure presenting the taxonomic distance of a given commune from the

established development pattern. In turn, the relationships between the variables studied will be established based on regression analysis.

The article will first review the literature on environmental investments and competitiveness. Then, the research methodology will be presented along with a description of the individual stages of the research procedure. The results of the study will be discussed in detail next. The final part of the study will provide conclusions and recommendations regarding the importance of green investments in the development of municipalities in Poland.

2. Environmental investments in subject literature

The issue of environmental investments appears more and more often in the literature on the subject. They play a key role in achieving sustainable development goals, constituting a response to contemporary challenges related to the degradation of ecosystems, climate change and limited natural resources (Gao, Zheng, 2017; Cheng, 2023). Environmental investments can be defined as financial, technological and organizational outlays undertaken to protect the natural environment, minimize the negative impact of human activity and effectively manage resources (Lee, 2020; Mu, 2024). In the literature, environmental investments are analyzed from various perspectives, from economic, through ecological, to social, which reflects their interdisciplinary nature (Tran et al., 2020; Murwaningsari, Rachmawati, 2023).

Environmental investments are activities that aim to reduce the negative impact of human activity on the environment through the use of technologies, processes and management strategies that contribute to the protection of natural resources, reduction of pollutant emissions and improvement of the quality of the environment (Shkuropat, Stepanov, 2019). In the literature, they are defined as both preventive and corrective actions, which may include direct investments in environmental protection technologies and infrastructure, as well as indirect actions, such as environmental education or changes in production processes leading to a reduction in the negative impact on the environment (D'Angelo, Cappa, Peruffo, 2024).

Environmental investments are becoming increasingly important in building the competitive advantage of enterprises, regions and countries (Seidl, Nunes, 2021; Bouchmel et al., 2024). According to the literature on the subject, investing in ecological technologies and strategies not only promotes environmental protection, but also brings economic benefits, improves operational efficiency and strengthens the reputation of the entity implementing such investments. (Nenavath, Mishra, 2023; Ganda, Ngwakwe, Ambe, 2015).

The literature on the subject highlights several mechanisms through which environmental investments can contribute to increased competitiveness (Li et al., 2022). Such investments can at least lead to reduced operating costs. In addition, environmental investments stimulate the development of technological innovations (Hu et al., 2024). Entities that have to adapt to increasingly stringent environmental standards are forced to develop new technologies and solutions, which helps increase their innovation (Siedschlag, Yan, 2021). The literature points to the so-called Porter hypothesis, according to which restrictive environmental regulations can encourage companies to develop innovative solutions that improve both ecological and economic performance (Kronenberg et al., 2021).

Not only individual entities, but also entire economies can benefit from environmental investments. Governments that promote green technologies and investments create favorable conditions for the development of innovations and increase the attractiveness of their market for foreign investors. Based on the literature on the subject, it is possible to indicate key mechanisms through which environmental investments contribute to the growth of countries' competitiveness (Martin, Moser, 2016; Li, Chang, Zunong, 2023; Chițimiea et al., 2021; Ceccarelli, Ramelli, 2024). Investments in renewable energy, low-emission technologies and sustainable agriculture are creating new industries and economic sectors. In turn, economies that invest in resource-efficient technologies can reduce their dependence on raw material imports and improve their trade balance. In particular, investments in recycling and the circular economy contribute to reducing the use of primary raw materials, which in the long term lowers production costs and improves competitiveness (Kantorowicz et al., 2024).

Environmental investments in municipalities are a key element of local sustainable development policies. They aim to improve the quality of life of residents, protect natural resources and adapt to the challenges resulting from climate change and environmental degradation (Heijlen, Duhayon, 2024). Municipalities, as basic public administration units, play an important role in implementing environmental strategies, taking action in the field of water and air protection, waste management and sustainable urbanization (Du et al., 2024). Environmental investments in municipalities have a direct impact on the quality of life of local communities. They improve the health of residents, increase the attractiveness of municipalities for investors and tourists, and support the development of a local economy based on the sustainable use of natural resources (Khan et al., 2024). The key importance of such investments results from the need to counteract phenomena such as air pollution, degradation of water resources, inefficient waste management and excessive energy consumption (Mo, Ullah, Ozturk, 2023; Chi et al., 2024). In the long term, effective environmental investments contribute to reducing the costs associated with the negative effects of pollution and climate change (Saeed Meo, Karim, 2022).

Local government units, faced with global environmental challenges, growing competition for investors and residents, as well as regulatory requirements, increasingly perceive environmental investments as a key element in improving their competitiveness (Indriastuti, Chariri, 2021). These investments contribute to sustainable development, strengthen the attractiveness of the commune, improve the quality of life of residents and support the local economy (Kapeller, Leitch, Wildauer, 2023).

In summary, environmental investments are a key element of environmental protection policy and sustainable development strategies, especially local development. Their interdisciplinary nature and wide range of benefits – from protecting ecosystems, through reducing emissions, to increasing innovation – make them essential in striving to achieve a balance between social, economic and ecological needs. Scientific literature emphasizes the need for further development of these investments and integration of public policies with environmental protection activities at the local level, in order to ensure sustainable development for both current and future generations.

3. Stages of the research procedure – research methodology

The study was designed to verify the hypothesis that there is a relationship between the change in the level of competitiveness and the scope of environmental investments in municipalities in Poland, with the highest relationship being noted in cities with county rights. The study covered all municipalities in Poland – a total of 2477 units, divided into four groups: urban municipalities (236 units), urban-rural municipalities (662), rural municipalities (1513) and cities with county rights (66).

In order to examine the level of competitiveness and the scope of environmental investments of municipalities in Poland, a synthetic measure of distance from the model was used. The research procedure was carried out in two ways - the scope of green investments was determined based on the cumulative value of indicators in 2023 (in a static approach), while the competitiveness of individual municipalities was examined in a dynamic approach (based on the change in the value of indicators in a ten-year period, i.e. in the years 2014-2023). The research procedure consisted of five successive stages:

1. isolation of the so-called components – i.e. indicators defining the level of competitiveness and the scope of green investments,
2. selection of variables – construction of the geographic information matrix,
3. reduction of the multi-feature space,
4. determination of the results of green investments and the level of competitiveness of the units subject to the study,

5. ranking of the studied communes on the scale of the level of competitiveness and the scope of green investments based on a ranking created according to the decreasing value of the synthetic measure,
6. classification of local governments in four categories: urban communes, urban-rural communes, rural communes and cities with county rights,
7. determination of the relationship between the scope and scale of environmental investments and the change in the level of competitiveness of local government units at the commune level.

In the first stage, based on a review of the literature covering the theory of regional competitiveness, the most important components were identified, i.e. indicators determining the level of competitiveness and environmental investments (Chițimiea et al., 2021; Wang, Wang, 2023; Zailani et al., 2019). The study used data from the Local Data Bank of the Central Statistical Office. The author of the study is aware of the imperfections and incompleteness of the construction of individual indicators characterizing the variables studied. Individual characteristics could be constructed more precisely, but all available public data that may determine the level of competitiveness and the scope of environmental investments were taken into account. However, it is worth considering in the future to complete a broader catalog of indicators, e.g. from other sources.

Table 1.

Indicators included in the analysis of competitiveness and green investments

Scope of the study	Indicators
Competitiveness (21 variables)	share of municipal investment expenditure in total expenditure; total budget revenue per capita; total capital expenditure per capita; amount of EU funds obtained by the municipality per capita; renovation of municipal apartments per 10,000 inhabitants; unemployment rate (destimulant); percentage of residential buildings connected to the water supply network; percentage of residential buildings connected to the sewage system; percentage of population using the water supply system; percentage of population using the sewage system; percentage of population using the gas system; water consumption per capita; average usable area of an apartment per 1 person; number of apartments per 1000 inhabitants; children in nurseries, wards and children's clubs per 1000 children up to 3 years of age; entities entered in the REGON register per 10,000 inhabitants; entities newly registered in the REGON register per 10,000 inhabitants; individuals conducting business activity per 10,000 inhabitants; foundations, associations and social organisations per 10,000 inhabitants; share of newly registered creative sector entities in the total number of newly registered entities; apartments put into use per 1000 inhabitants
Green investments (10 variables)	planting trees and shrubs per 1 km ² of area; funds planned for revitalisation activities in the field of the environment per capita; percentage of the population using sewage treatment plants; treatment plants with increased removal of nutrients in % of the population; water consumption for industrial purposes per capita (destimulant); products containing asbestos remaining for disposal in relation to the inventoried total volume of products containing asbestos (destimulant); waste collected selectively in relation to total waste; share of parks, green areas and housing estate green areas in the total area; total area of green areas per capita; bicycle paths per 100 km ²

Source: own research.

In the second stage of the conducted research procedure, a geographic information matrix was built based on 31 indicators (Table 1), which determined the scope of environmental investments as of 2023 and changes in the level of competitiveness in the years 2014-2023. Then, Pearson linear correlation coefficients were calculated between all the examined output indicators. It is extremely important that the indicators selected for the synthetic measure of distance from the standard are weakly correlated with each other. Thanks to this, the information capacity of these indicators is different.

The created matrices of Pearson linear correlation coefficients were the basis for reducing the output variables using the Z. Hellwig reduction method – i.e. extracting diagnostic features, i.e. those indicators that should be taken into account in the further research procedure (Mielke, Steudle, 2018). The Z. Hellwig reduction method uses correlation coefficients between variables for calculations. In the Z. Hellwig reduction method, the diagnostic feature is the indicator whose sum of absolute correlation coefficients with other features is the largest (it is then called the central feature). Then, the variables for which the value of the correlation coefficient with the diagnostic feature is higher than the critical value determined based on the following formula are eliminated (Inderst, Kaminker, Stewart, 2016):

$$r^* = \sqrt{\frac{(t^*)^2}{n-2+(t^*)^2}} \quad (1)$$

where:

r^* – critical value of Pearson's linear correlation coefficient,

t^* – value of Student's t-statistic (at significance level $p = 0.05$),

n – number of output indicators (variables).

As a result of the method, the variables that were statistically significantly correlated with the diagnostic feature (called satellite features) were eliminated. In each subsequent step, the correlation matrix was reduced by the central feature and satellite features. The Z. Hellwig method is repeated to obtain new reduced correlation matrices until the set of features is exhausted or isolated features are extracted.

In the next stage of the research procedure, the pattern and anti-pattern of the change in the level of competitiveness and the scope of environmental investments were determined. The pattern was considered to be the maximum standardized values of individual diagnostic features, while the anti-pattern was their minimum values (Spychała, 2023). In the next step, the taxonomic distance of each studied commune from the pattern of the scope of green investments and the change in the level of competitiveness was determined based on the following formula (Arvanitidis et al., 2009):

$$d_{i0} = \sqrt{\sum_{j=1}^m (z_{ij} - z_{0j})^2} \quad (2)$$

where:

d_{i0} – taxonomic distance of commune i from the adopted development pattern,

z_{ij} – standardized value of indicator (feature) j for commune i ,

z_{0j} – standardized value of indicator (feature) j for the development pattern.

In the fifth stage of the research procedure, two synthetic measures were determined for each commune, which were an indicator of the change in the level of competitiveness of the commune and the scope of green investments. The synthetic measure was calculated based on the following formula:

$$v_i = 1 - \frac{d_{i0}}{d_0} \quad (3)$$

where:

v_i – synthetic measure of the level of development of commune i .

d_{i0} – taxonomic distance of commune i from the adopted development pattern,

d_0 – taxonomic distance of the pattern from the anti-pattern of development.

Table 2.

Municipalities with the highest value of change in the competitiveness index in 2014-2023

The highest values of the competitiveness index					
Place	Name of the commune	Value	Place	Name of the commune	Value
Urban communes					
1	HEL	0,319	6	ZAKOPANE	0,306
2	WĘGRÓW	0,314	7	KARPACZ	0,305
3	ŁĘBA	0,312	8	LUBAWA	0,303
4	SZKLARSKA PORĘBA	0,309	9	KOŁOBRZEG	0,295
5	PŁONSK	0,308	10	ZŁOTORYJA	0,295
Urban-rural municipalities					
1	MIELNO	0,560	6	BUDZYŃ	0,398
2	WŁADYSŁAWOWO	0,469	7	LUTOMIERSK	0,397
3	JASTARNIA	0,467	8	PIESZYCE	0,395
4	OTYŃ	0,406	9	TUŁOWICE	0,391
5	MORAWICA	0,404	10	OPATÓWEK	0,390
Rural communes					
1	USTRONIE MORSKIE	0,348	6	RASZYN	0,319
2	SZTUTOWO	0,329	7	CISNA	0,318
3	DOBROMIERZ	0,328	8	WIĄZOWNA	0,312
4	KROTOSZYCE	0,324	9	STARE BOGACZOWICE	0,311
5	ELBLĄG	0,322	10	CEDRY WIELKIE	0,310
Cities with county rights					
1	CHORZÓW	0,304	6	M. ST. WARSZAWA	0,289
2	ZABRZE	0,301	7	BIELSKO-BIAŁA	0,287
3	ŚWINOUJŚCIE	0,297	8	LUBLIN	0,285
4	SOPOT	0,293	9	WROCŁAW	0,284
5	KATOWICE	0,291	10	GLIWICE	0,284

Source: own research.

The synthetic indicator of the level of development takes values from 0 to 1, where the higher its value, the higher the level of development of the phenomenon studied. Based on the calculated synthetic indicators, a ranking of 2477 communes in Poland was established, and then detailed rankings were established, divided into four groups: urban communes, urban-rural communes, rural communes and cities with county rights.

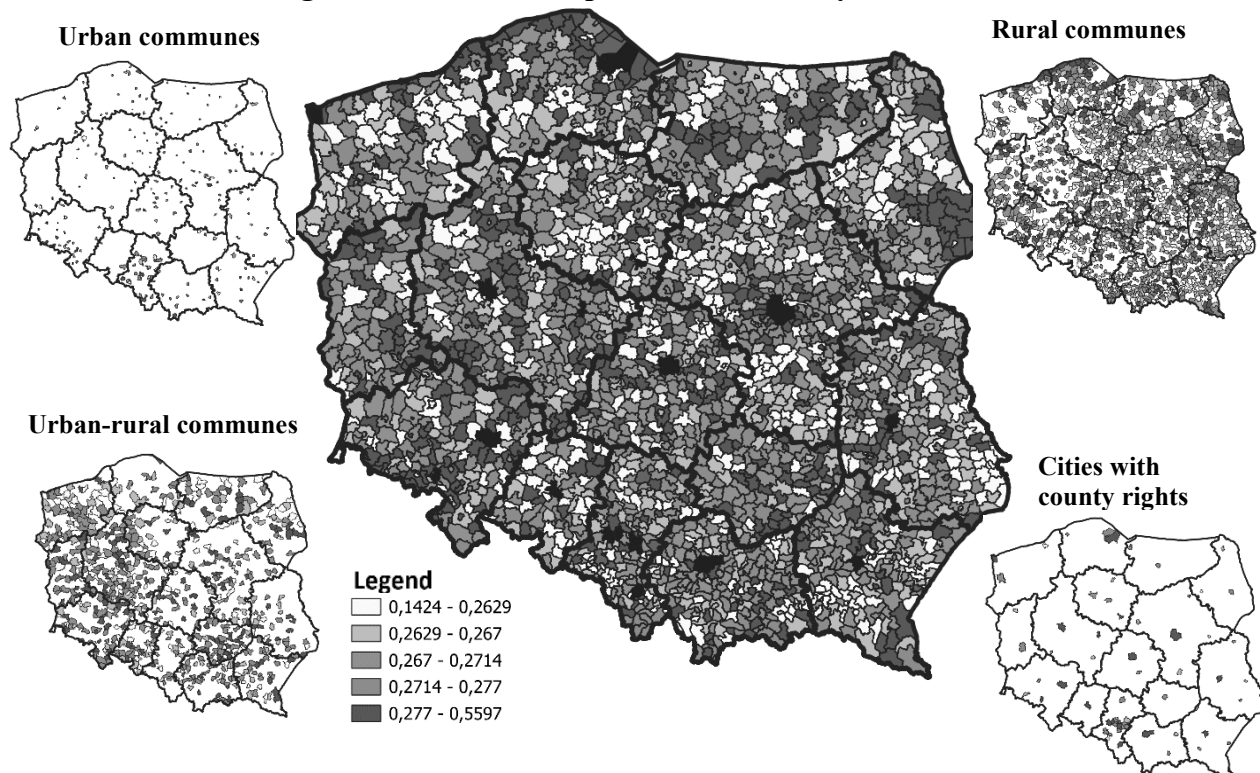
Table 3.

Municipalities with the highest environmental investment indicator in 2023

The highest values of the environmental investment indicator					
Place	Name of the commune	Value	Place	Name of the commune	Value
Urban communes					
1	ŁĘKNICA	0,472	6	PRUSZKÓW	0,408
2	SZCZAWNIO-ZDRÓJ	0,438	7	GÓROWO IŁAWECKIE	0,406
3	ZŁOTÓW	0,428	8	KOŁOBRZEG	0,397
4	ZĄBK	0,416	9	ŻYRARDÓW	0,395
5	CZŁUCHÓW	0,411	10	LIDZBARK WARMIŃSKI	0,392
Urban-rural municipalities					
1	PIWNICZNA-ZDRÓJ	0,400	6	GLUSZYCA	0,359
2	SZCZAWNICA	0,390	7	NARÓL	0,356
3	CIESZANÓW	0,381	8	PACANÓW	0,351
4	ŁĄDEK-ZDRÓJ	0,363	9	CIEŻKOWICE	0,340
5	UNIEJÓW	0,362	10	WOŁOMIN	0,340
Rural communes					
1	BRODY	0,398	6	WIELKIE OCZY	0,380
2	STARY DZIKÓW	0,397	7	HORYNIEC-ZDRÓJ	0,365
3	KURYŁÓWKA	0,387	8	ADAMÓWKA	0,362
4	KREMPNA	0,385	9	OLSZANICA	0,361
5	JASŁISKA	0,383	10	LEWIN KŁODZKI	0,359
Cities with county rights					
1	CHORZÓW	0,425	6	M. ST. WARSZAWA	0,396
2	ŁÓDŹ	0,409	7	RZESZÓW	0,395
3	SOPÓT	0,404	8	OLSZTYN	0,395
4	BIAŁYSTOK	0,398	9	SIEMIANOWICE ŚLĄSKIE	0,393
5	PŁOCK	0,396	10	TORUŃ	0,391

Source: own research.

Change in the level of competitiveness in the years 2014-2023



The scope of environmental investments in municipalities in Poland

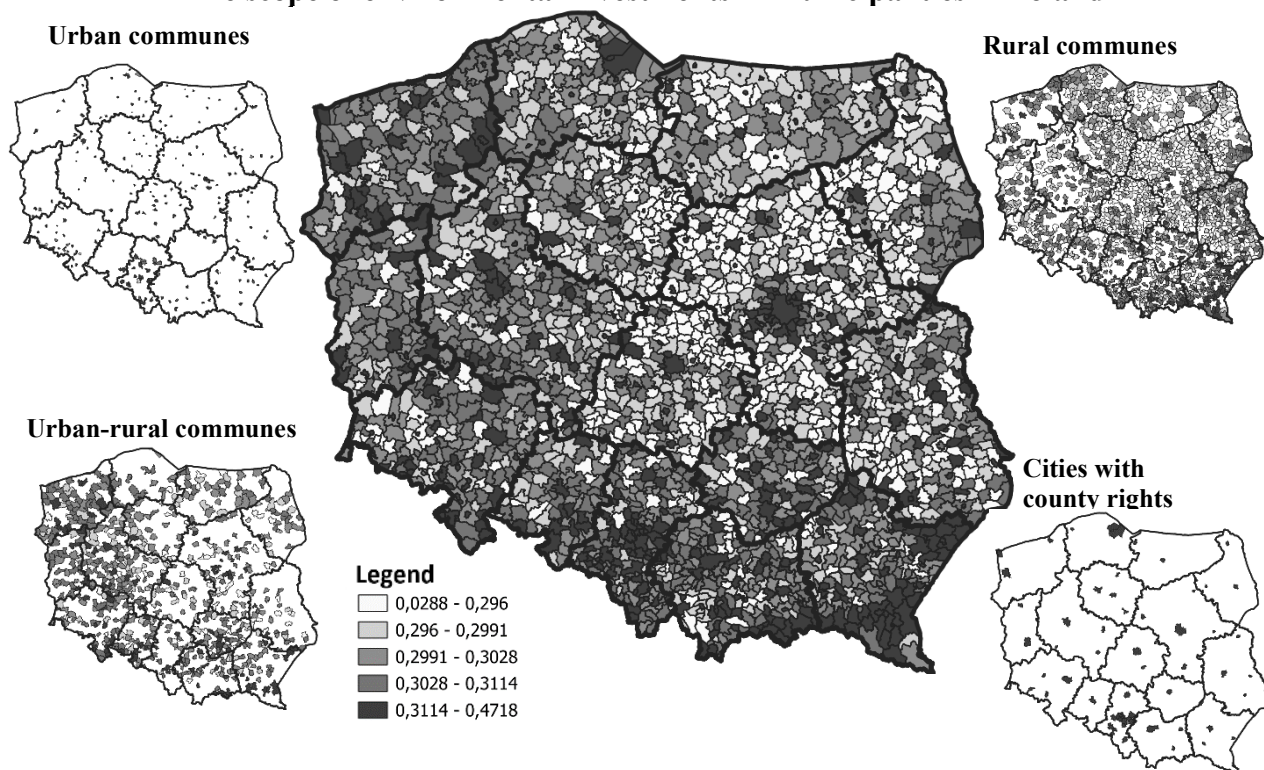


Figure 1. Diversification of competitiveness and environmental investments in municipalities.

Source: own research.

Figure 1 and Tables 2 and 3 present the results of the conducted research procedure. Table 2 presents the communes with the highest values of the synthetic indicator regarding changes in the level of competitiveness in the years 2014-2023 within individual groups of units. In turn, Table 3 lists the communes with the highest values of the synthetic measure in the field of green investments as of 2023 calculated for each group of local government units. Figure 1 contains cartograms presenting the spatial differentiation of the values of the above synthetic indicators in Poland.

4. Results – conclusions based on the research conducted concerning the competitiveness and green investments

As a result of the conducted research procedure, the spatial differentiation of 1477 communes in Poland was presented due to the scope of environmental investments and changes in the level of competitiveness (figure 1). In the studied group of units, the value of the synthetic measure presenting changes in the level of competitiveness in the years 2014-2023 ranged from 0.1424 to 0.5597, with the lowest value recorded in the case of a unit classified as a rural commune, and the highest in the case of an urban-rural commune (Table 4). In turn, the value of this measure presenting the scope of environmental investments of the studied communes ranged from 0.0288 to 0.4718, with the lowest value of the indicator identified in the urban-rural commune, and the highest in the urban commune.

Table 4.
Average, lowest and highest values of synthetic indicators

Type of communes	synthetic indicator - competitiveness			synthetic indicator - investments		
	average value	minimum value	maximum value	average value	minimum value	maximum value
Urban	0.2719	0.2437	0.3191	0.3353	0.2911	0.4718
Urban-rural	0.2785	0.2412	0.5597	0.3046	0.0288	0.3996
Rural	0.2687	0.1424	0.2700	0.3008	0.2824	0.3982
Cities	0.2738	0.2370	0.3036	0.3517	0.3096	0.4252
Total	0.2718	0.1424	0.5597	0.3065	0.0288	0.4718

Source: own research.

Similar differentiation of the studied indicators was observed in the case of individual groups of local government units. It is also worth noting that the greatest differentiation of the change in competitiveness was noted in urban-rural communes, while the greatest similarity was observed in the case of cities with county rights. Similarly, the smallest differentiation of the scope of green investments was noted in cities with county rights, and the largest – again in urban-rural communes.

Taking into account the spatial differentiation of the indicators studied, it is worth noting that in the case of the scope of green investments, the highest values of the synthetic measure were observed in municipalities located in the southern and western part of Poland. In turn, the lowest values of the measure in the scope of environmental investments were recorded in municipalities in central and north-eastern Poland. However, in the case of the change in the level of competitiveness, the values of the synthetic indicator were evenly distributed in individual parts of Poland and - therefore - it is not possible to clearly indicate the regions in which the change in the level of competitiveness would be the largest or the smallest.

The leaders of changes in the level of competitiveness in individual types of communes were: Hel, Mielno, Ustronie Morskie and Chorzów. The high positions of the coastal communes in the ranking result, among others, from the largest number of business entities entered in the REGON system per 10,000 inhabitants and the percentage of inhabitants using the network infrastructure. In turn, the high position of Chorzów is the result of the high number of renovations of municipal apartments per 10,000 inhabitants, the availability of nurseries and kindergartens and the value of EU funds obtained per inhabitant. In turn, the leaders in the scope of environmental investments in the individual groups were: Łęknica, Piwniczna-Zdrój, Brody and – once again – Chorzów. The high position of the indicated communes is the result of, among others, the largest areas of green areas per 1 inhabitant, the smallest water consumption for industry per 1 inhabitant, or the share of sewage treatment plants with increased removal of biogenic substances. Moreover, in all the indicated communes, a number of environmental investments were implemented, such as: expansion of water and sewage networks, construction of ecological waste incinerators, use of renewable energy sources, or investments in environmentally friendly transport.

5. Discussion – the importance of green investments in the competitiveness of regions

In the last stage of the research, the relationship between the change in the level of competitiveness and the scope of environmental investments in Polish municipalities was determined. The above relationships were examined separately for each type of municipality and for all municipal governments together. As part of the research procedure, simple linear regression models were built between the variables studied within the individual types of municipalities (Table 5). A positive relationship was observed in all types of municipalities, except for urban municipalities (Table 6).

Table 5.*Linear regression models between the studied variables*

Research group	Regression model formula
All communes (2477)	$y = 0.289 + 0.0652 * x$
Urban communes (236)	$y = 0.348 - 0.0465 * x$
Urban-rural communes (662)	$y = 0.302 + 0.0079 * x$
Rural communes (1513)	$y = 0.268 + 0.1224 * x$
Cities with county rights (66)	$y = 0.152 + 0.7307 * x$

Source: own research.

Based on selected statistics of the obtained models, the explanatory power of the obtained regression functions was assessed as relatively low. The highest value of the determination coefficient R^2 was obtained in the case of the model defined for cities with county rights (8.16%). In the case of this type of communes, the variability of the dependent variable was therefore explained by the independent variable in 8.16%. It can therefore be assumed that in cities with county rights there is the strongest correlation between green investments and changes in the level of competitiveness. Therefore, the hypothesis formulated in the study was partially positively verified.

The highest quality of the regression model estimated for cities with county rights is also confirmed by the fact that in its case the standard error of the residuals was the lowest (1.04%). It can therefore be stated that in the case of cities with county rights the regression model determined a correct – positive relationship between the change in the level of competitiveness and the scope of environmental investments.

Table 6.*Parameters determining the quality of regression models in the system of individual research groups*

Characteristics	All communes (2477)	Urban communes (236)	Urban-rural communes (662)	Rural communes (1513)	Cities with county rights (66)
Relationship: environmental investments and competitiveness	positive	negative	positive	positive	positive
Dependence coefficient R^2	0.46%	0.04%	0.03%	2.33%	8.16%
P-value for F-test	0.08%	76.14%	68.08%	0.00%	2.01%
Standard error of residuals	2.01%	1.17%	3.16%	1.30%	1.04%
Sum of squared residuals	27.13%	849.14%	42.10%	104.83%	3943.70%
Coefficient of residual variation	13.51%	23.24%	8.79%	20.63%	26.29%

Source: own research.

The synthetic measure of the dispersion of empirical values around theoretical values is the standard deviation of the residual component. It provides information about the average deviation of the empirical values of the explained variable from the theoretical values obtained from the regression function. As the value of the standard deviation of the residual component increases, the statistical "goodness" of the fit of a given regression function to the empirical data decreases (Arvanitidis et al., 2009). In the conducted study, positive and negative residuals were identified. Positive residuals show that the observed value of the explained variable is

higher than the expected one, resulting from the model, while negative residuals indicate the opposite situation. The lowest value of the standard error of the residuals was noted in the case of the model estimated for cities with county rights. In turn, taking into account the residual variation coefficient, the model defined for urban-rural communes can be considered relatively well-fitted, because the value of this coefficient was 8.79% (this part of the average value of the explained variable constitutes its standard deviation of the residuals). The actual change in the level of competitiveness and the scope of green investments in urban-rural communes and in cities with county rights - apart from a few cases - differs relatively little from the value obtained from the regression model.

6. Conclusions

In conclusion of the research conducted in this article on the relationship between the improvement of competitiveness and the scope of green investments in municipalities in Poland, it can be noted that a positive relationship was identified in the case of urban-rural municipalities, rural municipalities, cities with county rights and municipalities in general. In the case of urban municipalities, a negative relationship was noted. Thus, the study identified both positive and negative relationships between environmental (so-called “green”) investments and changes in the level of competitiveness of individual types of communes in Poland. It can therefore be noted that in most municipalities in Poland, the improvement of the competitiveness of a local government unit contributes to the implementation of environmental investments, and such green investments increase the level of competitiveness of the municipality. Municipalities in Poland should therefore increase their interest in environmental investments, because they have a positive impact on the improvement of competitiveness. On the other hand, green investments are primarily decided by those municipalities that have achieved a satisfactory level of competitiveness.

Of all the estimated regression functions, the model built as part of the analysis of the group of cities with county rights should be considered the highest quality, explaining over 8% of the variability of the dependent variable, while the explanatory variable turned out to be significant at a significance level of 2%. Also, based on the analysis of residuals, the model built as part of the analysis of cities with county rights was considered to be the best match for reality. Therefore, to sum up the conducted research, it should be stated that the improvement of competitiveness had the greatest impact on the scope of environmental investments in the largest cities. This therefore confirms the hypothesis formulated in the study.

In relation to the above, it should be noted that in the context of the conducted research, it is not possible to clearly determine the relationship between the improvement of competitiveness and the scope of green investments, and the results of the conducted research

procedure are based only on statistical dependence and their interpretation must be cautious. There is certainly no doubt that environmental investments have a positive impact on the improvement of the competitiveness of municipalities in Poland. However, it is very difficult to clearly determine the scale of this impact, because the level of competitiveness recorded in the studies resulted from the operation of a number of different types of stimuli. Moreover, it is worth noting that the results of green investments will be visible only in the longer term, so they were not included in the conducted study. Additionally, it is very difficult to measure the level of competitiveness or the scope of environmental investments, due to the lack of generally available objective indicators that would directly refer to the above-mentioned factors. Due to the specificity and extended time horizon of environmental investments, it would be worth considering extending the period studied in similar analyses in order to also take into account the long-term interactions between the variables studied.

The conducted research procedure is unique, because in the literature on the subject it is impossible to find another study in which the relationships between improving competitiveness and environmental investments were, firstly, conducted comprehensively for all territorial units of the lowest given country (the research group consisted of 1477 communes), and secondly – a synthetic measure created based on the Z. Hellwig feature reduction method would be used for this purpose. The above considerations, conducted research and obtained results may therefore constitute both an impulse to undertake more in-depth analyses in this direction, as well as inspiration for governments and European Union bodies in the scope of defining additional incentives to incur funds for the implementation of environmental investments. Green investments are not only a desirable action due to the implementation of the assumptions of the European Green Deal, but also – as the conducted research has shown – they increase the competitiveness of the region.

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KEY FEATURES OF FULFILLMENT SERVICES FOR E-COMMERCE

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Purpose: The study aims to identify the most important features of fulfillment services for e-commerce by analyzing the content of logistics companies' websites. It seeks to determine which aspects are most frequently highlighted and how fulfillment providers can enhance their competitiveness.

Design/methodology/approach: The research employs a content analysis approach, examining the frequency of specific logistics service features on fulfillment companies' websites. The data is quantified to identify key trends and priorities within the industry.

Findings: The results indicate that fast shipping, seamless IT integration, and flexible cooperation are the most frequently emphasized features. Additionally, personalized packaging, error-free order processing, and multi-carrier delivery options are key competitive factors for fulfillment providers.

Research limitations/implications: The study is based on publicly available content from logistics companies' websites, which may not fully reflect the actual services offered. Furthermore, it does not account for customer perceptions or direct business performance indicators.

Practical implications: The findings provide fulfillment companies with insights into industry trends and highlight areas for improvement. Businesses can refine their service offerings to align with e-commerce retailers' priorities, such as speed, reliability, and seamless technology integration.

Social implications: By improving fulfillment services, e-commerce logistics providers can contribute to greater consumer satisfaction, reduced environmental impact through optimized packaging and delivery solutions, and enhanced efficiency in e-commerce.

Originality/value: This research offers a data-driven perspective on fulfillment service priorities, filling a gap in the literature by focusing on how logistics providers present their offerings online. It provides a valuable reference for both researchers and industry professionals seeking to understand and enhance fulfillment strategies.

Keywords: e-commerce, order fulfillment, logistics services, supply chain optimization.

Category of the paper: Research paper.

1. Introduction

In fast-changing e-commerce, order fulfilment services have become an essential factor in the success of online shops. Consumers' growing expectations for fast, reliable and convenient delivery of online purchases continue to rise, so the ability of businesses to manage inventory, process orders and deliver timely shipments is becoming a key determinant of competitiveness. At the same time, competition makes it increasingly necessary for online shops to focus on the processes involved in promoting their online offerings, making it more difficult for them to effectively implement logistics processes related to order fulfilment.

Online shops wishing to specialize in marketing activities have the option of outsourcing fulfilment to logistics providers. Logistics companies, offer end-to-end fulfillment solutions, handling tasks such as warehousing, picking, packing, shipping and returns management. These services not only streamline supply chain operations, but also enable online shops to focus on their core functions, such as product development and marketing, while maintaining customer satisfaction. The integration of advanced technologies, such as real-time tracking and automated inventory management, further increases the efficiency and accuracy of fulfilment processes, making them essential in the digital age. When deciding on fulfillment service providers, online shops are forced to make a strategic choice.

The aim of this article is to identify the important characteristics of fulfillment services that logistics companies offer for e-commerce. In the presented research, the author assumed that fulfillment companies, as experts in the industry, emphasize the most important elements and features of fulfillment services in their promotional messages on their own company websites, so as to encourage their potential customers, such as online shops, to choose their offer. By analyzing the messages it is possible to identify the key features of fulfillment services provided to e-stores. The article also discusses the advantages, challenges and criteria that companies need to consider when choosing a fulfillment partner for order fulfilment.

This research will be valuable for order fulfillment service providers seeking to enhance their offerings and better align with the needs of e-commerce businesses. E-commerce retailers can use the findings to evaluate fulfillment partners based on critical service features. Additionally, logistics and supply chain professionals will gain insights into industry trends and strategies for improving operational efficiency. The study may also benefit researchers and policymakers interested in the evolving landscape of e-commerce logistics and its impact on market dynamics.

2. Literature review

Intense competition among online shops, combined with the increasing demands of online shoppers, has made efficient order fulfilment processes a key success factor in e-commerce (Rahman, Kirby, 2024, p. 16). In the e-commerce market, buyers expect fast and affordable delivery. Online shoppers are looking not only for convenience, but also for a seamless shopping experience, from order placement to delivery (Bilgihan, Kandampully, Zhang, 2015, p. 114). In e-commerce, fulfilment refers to the processes of receiving, processing and delivering an order to the customer (Isac, 2014, pp. 122-123). Order fulfilment is one of the key factors that influence consumer behavior and, in particular, has a positive impact on buyer loyalty and repeat purchases in e-shops (Nguyen, Leeuw, Dullaert, 2018, pp. 262-263). Research indicates that the quality of e-commerce order processing is strongly positively correlated with e-satisfaction and e-loyalty of customers to the e-store (Camilleri, 2021, p. 387). In an online environment where one negative delivery experience can lead to lost customers and a damaged reputation, prioritizing delivery performance is essential to survive and succeed in e-commerce (Acimovic, Farias, 2019). In addition to the benefits in terms of customer satisfaction and loyalty, improved order processing minimizes errors and reduces e-shop operating costs (Sharma, 2024, p. 60).

Online shops can handle order fulfilment by managing all fulfilment processes internally or outsource all or some of it to external logistics companies. In this case, logistics companies providing fulfilment services take over fulfilment processes from online shops such as storage and inventory management, order processing, picking and packing, shipping and delivery, returns handling, customer service (Kawa, 2017, p. 431).

The advantage of outsourcing fulfilment services to third-party logistics operators is that no e-shop resources are involved in order processing, but the disadvantage is that the e-shop has less control over the sale of products (Niedźwiedzińska, 2018, p. 933). By outsourcing fulfilment processes to logistics providers, online shops can save on warehousing, staff, equipment and other logistical expenses. They also have the opportunity to use different types of services that can be scaled up when sales increase. These service providers specialize in logistics, which means they often have optimized processes, advanced technology and skilled staff to ensure efficient and accurate order processing. They also have multiple warehouse locations closer to key customer bases. This enables them to reduce delivery times, increasing customer satisfaction.

On the other hand, however, outsourcing order fulfilment means handing over much of the customer service to a third party. If the service provider fails to meet customer expectations, the online shop's reputation may suffer. It should also be noted that not all order fulfilment providers offer the same standard of service. Differences in service quality can result in inconsistencies in order accuracy, packaging standards and delivery times, which can lead to

customer dissatisfaction. When online shops work with a third party, maintaining good communication regarding stock levels, order status and returns can be challenging. Miscommunication errors and misunderstandings can result in stock shortages and delayed orders. Disadvantages of outsourcing order fulfillment can also include: limited customization options for online buyers, relatively high unit storage costs, dependence of logistics operations on an external entity (Prokopowicz, 2023, p. 50).

Order fulfillment, like any other type of service, must meet the high quality standards that define exceptional service delivery in any industry. High quality service is characterized by reliability, responsiveness, assurance, empathy and tangibility - principles derived from the SERVQUAL service quality concept (Parasuraman, Zeithaml, Berry, 1988). In the context of order fulfillment, reliability translates into the accurate and timely processing and delivery of orders, ensuring that promises made to customers are fulfilled flawlessly. Responsiveness reflects the ability of service providers to quickly resolve issues, adapt to change and meet customer requirements. Assurance involves building trust by demonstrating competence, professionalism and responsibility in all interactions, instilling confidence in both the online shop and its customers. Empathy emphasizes personalized service, such as handling special requests or providing solutions tailored to the customer's unique needs. Tangibility refers to the physical aspects of the service, including the quality of the packaging, the condition of the goods after delivery and the presentation of facilities such as warehouses. By excelling in these dimensions, fulfillment service providers not only ensure the smooth operation of online shops, but also increase end-customer satisfaction, making service quality a key competitive advantage.

According to research, there has been a noticeable trend in Poland in recent years of online shops increasingly resign from their own warehouses (Surpel, 2022, p. 779). This makes the simultaneous growing demand for fulfillment services provided by specialized logistics operators

There are many different companies offering fulfillment services in Poland, ranging from multinationals to logistics companies and small specialized local operators (Kawa, 2021, p. 9). Important players in this market are 3PL companies. They handle a variety of e-commerce supply chain services, including warehousing, order processing and shipping. They work with a number of e-commerce shops and often offer scalable solutions that can grow with a growing online shop. There are also e-commerce specialist warehousing networks on the market through which online shops can store products closer to customers for faster delivery.

Outsourcing order fulfillment services is a type of B2B contract in the supply chain, in which online shops work with third-party logistics providers to handle fulfillment tasks. Unlike simple purchasing, this arrangement often involves a complex contract that sets out the terms of the relationship, defining responsibilities, service levels and mutual expectations of the parties to the transaction. Choosing the right order fulfillment provider requires careful evaluation of many factors. Practitioners and experts in the e-commerce industry point, among

others, to the following factors when selecting fulfillment providers (Pettersson, 2024; Chen, 2023; Kaur, 2023; Maciuba, 2022):

- Experience and reputation in the industry. Ideally, a company should have many years of experience in providing fulfillment services. Particularly with regard to the products offered by the online shop.
- Effective inventory management with ongoing stock reporting.
- Location of warehouses and dispatch centers closer to buyers. This can result in shorter delivery times and lower delivery costs.
- Storage conditions adapted to the specific products stored.
- Price transparency, which means that e-shop owners know what they are paying for.
- High-quality information technology at the fulfillment company's disposal and the ability to easily integrate with e-shops systems. The ability to integrate with e-marketplace platforms is also important.
- Offering customized and additional services.
- Effective customer service and appointment of a dedicated customer service employee for the e-shop.

Given the direct impact of order fulfillment on customer satisfaction and brand reputation, choosing the right logistics partner is an important strategic decision for online shops, requiring due diligence and a clear understanding of the complexities involved in outsourcing this service.

The rapid growth of e-commerce has significantly increased demand for efficient and scalable fulfillment services. As online retail continues to evolve, fulfillment providers must adapt to changing consumer expectations, including faster delivery, seamless IT integration, and omnichannel logistics (Pamdey and Pawar, 2023; Li, Wang, Liu, 2023). However, there is limited research on how fulfillment companies position their services and which features are most emphasized in the industry. Understanding these priorities is crucial for both fulfillment providers seeking to differentiate themselves and e-commerce businesses selecting the right logistics partners.

3. Methodology

The subject of the research was the content of information messages posted on their websites by logistics companies providing fulfillment services. The method used in the research was content analysis. This method is defined as the analysis of the explicit and implicit content of specific material by classifying, collating and evaluating key symbols and themes to determine its meaning and likely effect (Merriam-Webster, 2024). The research followed the following steps.

1. Initial observation of fulfillment providers' websites.
2. Selection of variables for content analysis that represented features of fulfillment services.
3. Selection of the objects to be studied (research sampling), i.e. the websites of fulfillment companies.
4. Conducting a proper content analysis of the websites selected for the study.
5. Quantitative and qualitative analysis of the collected data.

The selection of the sample was purposeful and was guided by the criterion of specialization of logistics companies in the implementation of fulfillment services for e-commerce. These were companies operating in Poland. In order to study various types of companies, both large and small, the research sample included well-known 3PL companies with a large market share, as well as smaller logistics companies. The selection of enterprises for the research sample was made in such a way that the first 30 enterprises were selected, which, after typing the phrase “fulfillment for e-commerce” into Google search engine, were found highest in the search results and at the same time met the condition of specialization of fulfillment services and location in Poland. The addresses of the websites selected for the study are presented in Table 1.

Table 1.

Addresses of the analyzed websites of companies providing order fulfillment services to e-shops

Web addresses of fulfillment companies for e-commerce	
(1) https://tpmlogistics.pl ; (2) https://omnipack.com/pl/ ; (3) https://www.dhl.com/pl-pl ; (4) https://magpack.pl ; (5) https://www.mbe.pl ; (6) https://eurocommerce.pl ; (7) https://labranlogistics.pl ; (8) https://logisticsagencies.pl ; (9) https://customeritum.pl ; (10) https://www.pakujemy.pl ; (11) https://ehopi.pl ; (12) https://mindpack.pl ; (13) https://www.ornlenpaczka.pl ; (14) https://www.qlink.com.pl ; (15) https://sheepme.pl ; (16) https://insidelog.pl ; (17) https://www.salesupply.pl ; (18) https://doing.pl ; (19) https://www.boxe.pl ; (20) https://hartlogistics.pl ; (21) https://eurohermes.eu ; (22) https://imker.pl ; (23) https://www.logmaster.pl ; (24) https://magazyngdynia.pl ; (25) https://trans-tok.pl ; (26) https://logistiko.pl ; (27) https://pro-logis.waw.pl ; (28) https://xbsgroup.pl ; (29) https://yellow-monster.pl ; (30) https://inpost.pl	

Source: own research.

The content analysis was conducted during the months of January and February 2025. The initial observation of the websites made it possible to identify variables representing important characteristics of fulfillment services that were communicated to online shops by logistics providers. The occurrences of these variables were coded which made it possible to determine the frequency of their occurrence in the sample of websites studied. A total of 48 variables were used in the research, which fell into 7 categories. The variables with their symbols and their category affiliation are presented in Table 2.

Table 2.*Names of variables representing characteristics of fulfillment services*

Category names	Variable names
Handling orders and returns	High number of shops serviced (SK); Wholesale handling (ZH); Non-disruptive sales (BS); High number of parcels shipped (SL); Low error rate (ZB); Returns preparation for sales (NP); Cross-border e-commerce handling (ZE); Returns verification (NW); Fast shipping (WS)
Storage	Optimal storage conditions (MO); Ongoing inventory control (MK); Product insurance (UP); Differentiated products (MZ); Use of barcodes (MA); Ample storage space (MP); Large number of warehouses (ML); Owning a cold room (MH); Picking robots (MR)
Transport	Multiple courier companies (TL); Tracking of shipments (SP); Delivery of goods to the warehouse (TS); Attractive location (TW); Possibility of own contracts with couriers (TU)
Cooperation with e-stores	Flexible cooperation with shops (EL); Knowledge and experience (DW); Support in market expansion and marketing (OR); Dedicated shop customer service (OD); Cooperation with large as well as small shops (DM); Professional customer service (PO); Assistance in preparing promotional materials (PP); Long-term contract (UK); Special support in the initial phase of cooperation (WW)
Product packaging	Packaging according to individual guidelines (PI); Additional packaging services (PD); Insertion of promotional materials (PU); Use of ecological packaging (EK); Wide range of packaging and packaging materials (PM); Use of different types of labels (ER); Appropriate matching of packaging to products (PP)
Information technology	Easy IT integration (IM) IT integration with trading platforms (IP) Secure and reliable IT systems (IT)
Prices	Advantageous billing (CK); Low service prices (CN); Stable and predictable prices (CG); Cheap packaging (CO); Lower rates with higher sales (CS); Free integration of systems (CI)

Note. In brackets next to the names of the variables are their symbols used for to facilitate quantitative analysis.

Source: own research.

4. Findings

Figure 1 presents the frequency of variables related to order processing and returns management. The most frequently occurring characteristic in this group is fast shipping, indicating that fulfillment companies recognize that fast order processing and fast delivery is an important competitive advantage in the industry, as well as a key factor in customer satisfaction. Serving foreign buyers (cross-border e-commerce) was also a frequently occurring variable. The significant percentage of cross border e-commerce service shows that fulfillment companies recognize the increasing importance of this rapidly growing branch of e-commerce. A low percentage of order processing errors was also indicated relatively frequently. This may be indicative of the high importance placed on accuracy in logistics processes and high quality. A low percentage of companies indicate that they also handle bulk orders. These services should therefore rather be regarded as niche, with companies focusing primarily on handling e-commerce retail sales.

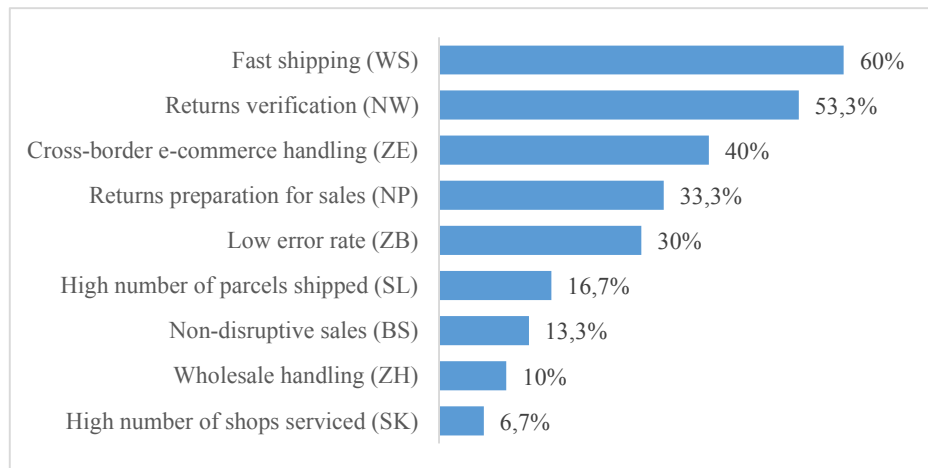


Figure 1. Frequency of order handling variables.

Source: own research.

Figure 1 also includes the variables for handling returns. Of the companies surveyed, all dealt with returns, however, around half indicated that they dealt with thorough verification of returns in terms of quality and quantity, and in some cases companies highlighted that they also dealt with restoring returned products to their commercial value and preparing them for re-sale. The relatively high percentage of features related to returns shows that returns are a major challenge in e-commerce, and fulfillment companies are striving to demonstrate their ability to manage returns effectively.

Figure two shows the characteristics of fulfillment services relating to the storage of products for e-commerce. The most frequently indicated feature in this group was optimal storage conditions for products in the warehouse. Companies often emphasized that the storage conditions are adapted to the specific characteristics of the products, for example in terms of temperature. This shows that fulfillment companies prioritize the protection of the quality of the stored products. Figure 2 also shows that an important feature is the ongoing updating of stock levels and the associated stock control by e-stores. This is a feature that contributes to the availability of products by minimizing stock shortages and helps to improve the functioning of e-commerce supply chains.

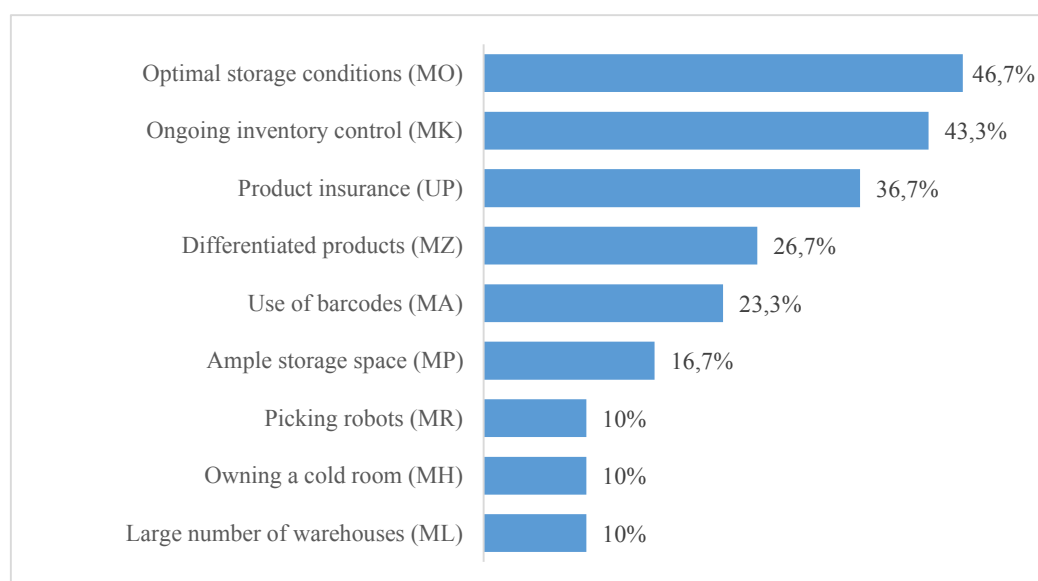


Figure 2. Frequency of storage variables.

Source: own research.

A significant proportion of fulfillment companies also emphasise that the stored products are insured, which can be an important incentive especially for online shops with high-value products.

Declaring the possibility of storing diverse goods (especially in terms of size) shows that this can be a feature that distinguishes fulfillment companies from their competitors in the eyes of shop owners, especially those selling diverse products.

Figure 3 presents the variables for the transport function supported by fulfillment companies.

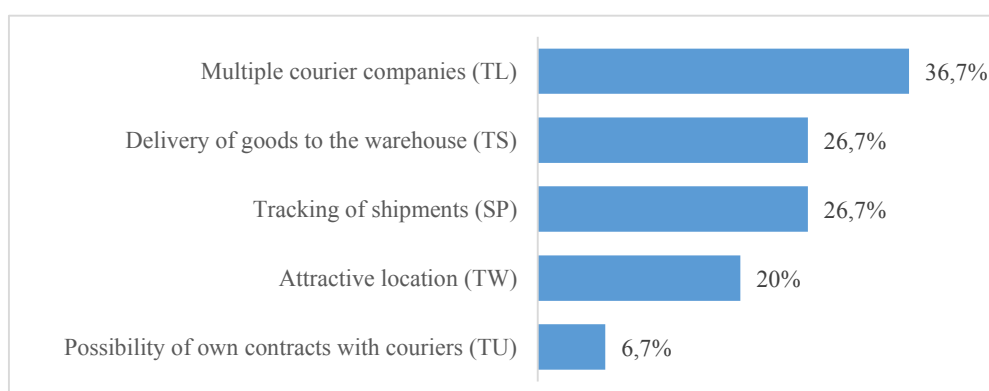


Figure 3. Frequency of transport variables.

Source: own research.

The most frequently highlighted feature in this group was the cooperation of fulfillment companies with multiple couriers. This feature is well perceived by online shop owners, as it is usually associated with greater flexibility in the delivery of products to online buyers, with a greater territorial coverage of deliveries and lower delivery prices.

Some fulfillment companies support the delivery of products to their warehouses, which can be a significant convenience for online shops and encourage them to cooperate. The same percentage of companies provide online shops with shipment tracking, indicating a focus by these companies on transparency and efficiency, which is also a desirable feature from the perspective of streamlining e-commerce supply chain operations.

Although the attractive location of warehouses and dispatch centres is important for fast delivery and logistical efficiency, it is not as often emphasized by logistics providers as working with multiple couriers.

Few companies highlight the possibility of individual contracts with couriers, which may mean that this is not an important feature for online shops and they rather prefer the intermediation of fulfillment providers in this regard.

Figure 4 shows the features associated with the broader cooperation of fulfillment companies with online shops.

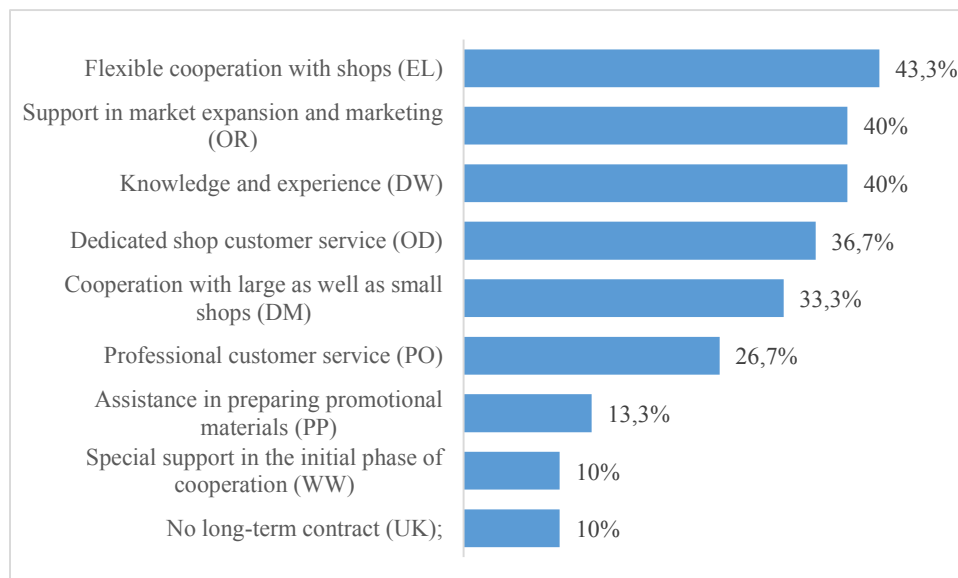


Figure 4. Frequency of cooperation variables with online shops.

Source: own research.

The most frequently indicated feature in this group was flexible cooperation with online shops. This shows that fulfillment providers emphasize their ability to adapt to the preferences of online shops. They offer shops more customized solutions rather than rigid service delivery methods.

Figure four also shows that fulfillment companies often emphasize experience and the ability to help e-stores, e.g. with market development. This positions them not only as fulfillment service providers, but as strategic partners. Offering a dedicated customer (e-shop) service suggests a personalized approach to e-shops by many of the fulfillment providers surveyed.

Figure 5 presents the features of fulfillment services related to the product packaging process.

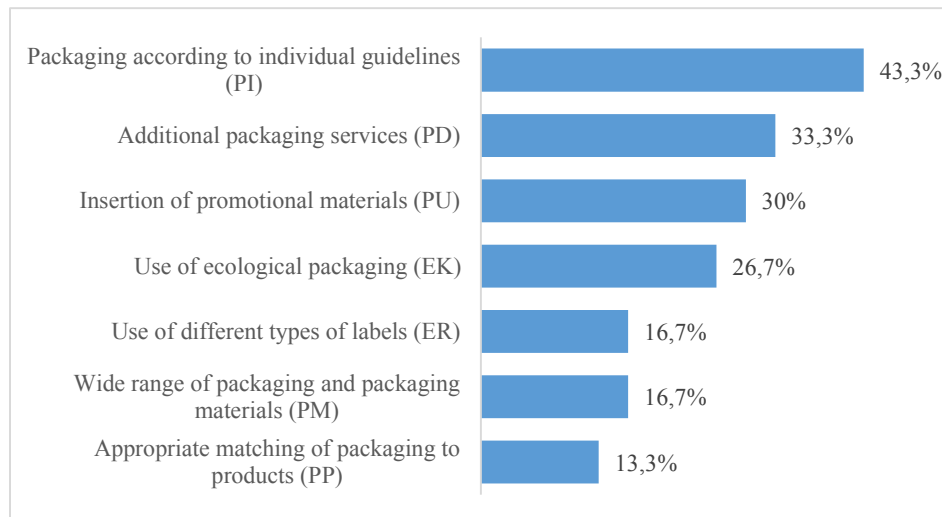


Figure 5. Frequency of product packaging variables.

Source: own research.

The two most frequent variables, packaging according to individual shop guidelines and additional packaging services, show that logistics fulfillment service providers demonstrate their ability to adapt product packaging solutions for the specific needs of e-stores. Some of the logistics providers emphasized the use of eco-friendly packaging, which shows that sustainability is becoming increasingly important in fulfillment services.

Figure 6 shows the important features of fulfillment services in the area of information technology.

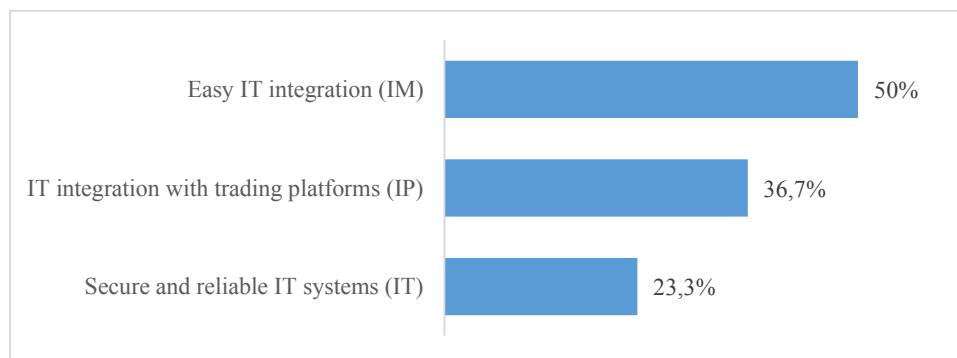


Figure 6. Frequency of information technology variables.

Source: own research.

Figure 6 shows that half of the logistics providers for e-commerce emphasize the seamless integration of their IT systems with those of e-stores. It can be assumed that for e-stores, easy integration of operations with fulfillment providers is a very important feature. Also frequently mentioned was the offered integration with trading platforms. This means that logistics fulfillment providers increasingly emphasize integration with marketplace trading platforms such as Allegro, Amazon and eBay. This trend reflects the growing need for multichannel support, as e-commerce businesses no longer rely solely on their own websites but operate across multiple sales platforms. Seamless integration with these marketplaces allows for

automated order processing, real-time inventory synchronization, and efficient returns management, ensuring a consistent shopping experience for customers across different channels.

The relatively low frequency of the variable - Secure and reliable IT systems, is not a significant differentiating factor from competitors' offerings. This is probably due to the fact that the high reliability of IT systems is taken for granted in the industry and this feature is indicated less frequently in messages.

Figure 7 shows the features associated with the pricing area and with the billing for fulfillment services.

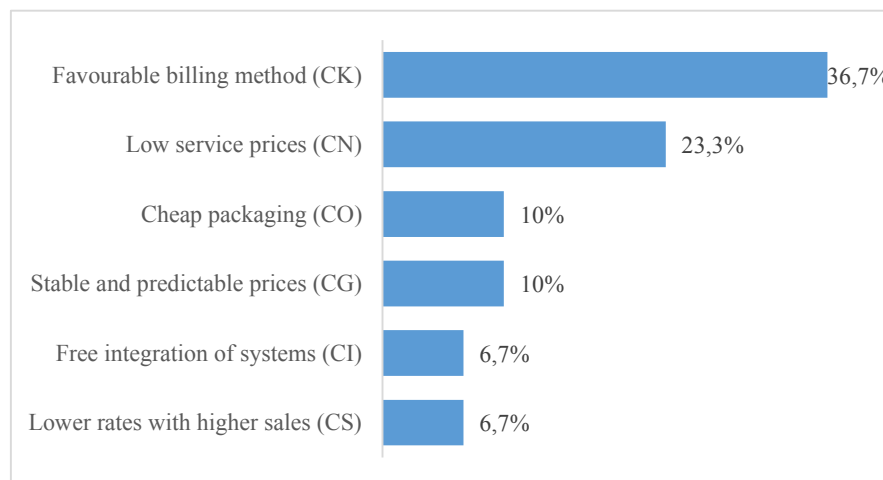


Figure 7. Frequency of fulfillment price variables.

Source: own research.

The most frequently indicated variable was favourable for e-shops billing methods for fulfillment services. Thus, logistics providers emphasize flexible and transparent ways of billing for their services. It can also be seen from Figure 7 that suppliers are less likely to encourage low service prices or price discounts. This suggests that they prioritize value delivery and high service quality over the cheapest options.

5. Conclusions

The research carried out shows that speed of order fulfillment and shipping are the dominant features in the messages on the websites of fulfillment service companies. The high importance of these features is related to the fact that they are an important factor in the satisfaction of online buyers. The growing role of cross-border service by fulfilment companies is also noticeable. This is due to the expansion of global e-commerce. These companies also prioritize high quality storage and ongoing stock control. This reflects the large role of these features in

ensuring product availability and protecting products from damage or deterioration of their commercial value.

The research also showed that online shops prefer to work with fulfillment providers that provide a variety of delivery options via different courier companies. The study also showed that fulfillment providers are positioning themselves in the market as flexible and experienced partners for online shops, rather than pure fulfillment providers. These companies are evolving towards full e-commerce support along with support for e-commerce market expansion.

In the area of packaging processes, the main priority of logistics service providers for e-commerce is customization. This manifests itself in the packaging of products according to the individual requirements of e-shops, as well as in the offering of numerous additional packaging services. Sustainability is also gaining in importance, manifesting itself in the use of ecological, i.e. environmentally friendly packaging.

Considering the cost and pricing factors for e-shops, it can be concluded that the most important factor is a flexible and transparent way of billing for services. Setting low prices is not an often cited feature, which suggests that quality of service, reliability and flexibility are more important than low prices.

Also of great importance is the seamless integration of the IT systems of fulfillment providers with those of the e-shop. The IT support of multichanneling is also noticeable, as shown by the frequent declaration of integration with e-commerce platforms. This shift underscores the critical role of fulfillment providers in facilitating omnichannel retail strategies, where businesses require flexible and interconnected logistics solutions to remain competitive. The findings emphasize the importance of IT integration and platform compatibility as key factors in e-commerce fulfillment.

Based on the research findings, fulfillment companies can enhance their competitiveness by investing in seamless IT integration with e-commerce platforms and develop real-time inventory tracking systems across multiple sales channels to support omnichannel fulfillment. They should prioritize fast shipping and error-free order processing by adopting automated picking, packing, and barcode scanning technologies. They should also partner with multiple courier services to provide flexible delivery options and enhance last-mile efficiency. Logistics enterprises should offer custom packaging options, including eco-friendly materials and promotional inserts, to help e-tailers strengthen their brand identity. Important feature is providing personalized fulfillment solutions tailored to businesses of different sizes. To improve customer engagement and flexibility they should provide dedicated support teams for e-commerce businesses to guide them in fulfillment operations and logistics strategies. Implementing dynamic pricing models that offer lower rates based on order volume, could encourage long-term partnerships.

The research conducted has some limitations. This relies on publicly available website content, which may not fully reflect the actual service capabilities of order fulfillment providers. Companies may emphasize certain features for marketing purposes while omitting aspects that

are less marketable but still operationally significant. As a result, the findings might overrepresent commonly advertised services while underestimating those that are essential but less frequently promoted. To gain a more comprehensive understanding, future research could incorporate complementary method such as interviews with industry experts and fulfillment providers to verify the actual importance of characteristics of the order fulfillment services.

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THE ROLE OF CULTURAL HERITAGE IN THE DEVELOPMENT OF THE TOURIST BRAND IN THE BALTIC SEA REGION

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Purpose: This article addresses the problem of transnational destinations branding. An example of such a destination is the Baltic Sea Region (BSR), which is the first macro-region of the EU. The main objective of the article is to answer the question of how the cultural heritage of the BSR can be used in the branding development process of the Baltic Sea Region. A secondary objective is to identify the key cultural resources and stakeholders of the BSR.

Design/methodology/approach: The achievement of the research objectives called for conducting a literature study related to the branding process of tourism destinations. Based on secondary sources, including materials of international organisations, key cultural resources of the BSR were identified, key stakeholders involved in the branding process were identified. In addition, a participatory observation method over the last 30 years was used involving observation of the tourism and cultural cooperation process within the BSR.

Findings: Research has shown that the Baltic Sea Region has an attractive and diverse cultural potential, which could be used in the creation of a tourism brand. This brand could be based on common themes such as Hanseatic heritage, Viking heritage, amber heritage and maritime heritage. Attempts have been made to create a territorial and touristic brand. The most advanced activities were carried out by the Baltic Tourism Commission (BTC). An opportunity to continue territorial branding efforts is provided by the EU Strategy for the Baltic Sea Region.

Research limitations/implications: The article only identifies key resources and key stakeholders in the culture and tourism system. The evolution of the branding process is presented very briefly.

Practical implications: A tourism brand can play an important role in promoting the Baltic Sea Region as a tourist destination. It can connect stakeholders, inspiring them to work together effectively. There is a consensus among BSR stakeholders that a brand can bring them a number of benefits. There is an emerging need to develop systemic solutions. This paper may help in their development.

Social implications: A territorial brand that takes into account cultural assets can contribute to social integration and the development of a transnational identity. This is particularly relevant in the context of the labile geopolitical situation in the BSR.

Originality/value: The article synthesises the cultural heritage of the BSR, identifies the main stakeholders and analyses activities to date. It may be of interest to authorities and organisations related to BSR culture and tourism.

Keywords: tourism, culture, branding, destination, the Baltic Sea.

Category of the paper: Case study, General Review.

1. Introduction

A tourist brand is a complex and multidimensional category (Kuźniar, 2018; Gartner, 2014; Ibáñez, George, 2017). It is one of territorial brand forms (Feijó de Almeida, Cardoso, 2022). Its recipients are domestic and international travellers visiting a selected area called a destination (Barkhordari et al., 2023). Panasiuk (2013) emphasises that a tourist brand is tied to a tourist product. It reveals its uniqueness, facilitating a competitive advantage in the global tourist market (Miličević et al., 2016). It can also contribute to the prosperity of the destination's inhabitants (Horodecka, 2011).

A brand is an element of communication (Zalech, 2011). It is a message (Perzyńska, 2013) addressed to diverse target groups (investors, tourists, residents and employees). It facilitates integration with the internal and external environment (Sycha et al., 2021). It represents a commitment from its creator to its recipients (Armstrong, Kotler, 2014). It attracts people and convinces them that a product has specific qualities that it may actually lack in reality (Anholt, 2006).

Territorial branding is the process of creating and implementing in the minds of the public a vision representing a specific idea. This is done through the use of visual (logo, sign, symbol), verbal-semantic (keyword, slogan, thought), audio (melody, anthem) messages in a context clearly associated with the territory (Studzieniecki, Kurjata, 2010). According to Anholt (2006), a brand reflects the spirit of a community, sets a common purpose that unites an organisation, a place, a reputation derived from the product itself or the experience of consumers.

A specific case of destinations are cross-border destinations, located on the territory of at least two countries. These can be divided into natural (e.g. mountains, lakes) and anthropogenic (e.g. Euroregions, European Groupings of Territorial Cooperation, EU macro-regions). Branding cross-border destinations is more difficult than branding destinations located in one country (Nowak, Kruczek, 2022). According to L. de Chernatony (2003), one of the biggest challenges in the branding process 'is the coordination of all value-adding activities to achieve an integrated brand'. A transnational brand requires effective stakeholder cooperation (Góral, 2014; Keller et al., 2008), and the construction of an efficient marketing management system (Zdon-Korzeniowska, 2012). The identification of common cultural motives plays an important role in the creation of a transnational brand (Studzieniecki et al., 2023). Cultural heritage is seen as an element that influences the sense of identity and belonging of individuals or social groups (Smith, 2006).

1.1. The Baltic Sea region as a tourist destination

The Baltic Sea Region, also known as Baltic Europe (Zaleski, Wojewódka, 1977; Palmowski, 2021) is a combination of sea and hinterland. In this region, natural beauty meets rich history and cultural diversity (Ellefors, 2000). It is an area of unique geopolitical importance, where the interests and spheres of influence of different states and nations intersected. In other words, cooperation has always interchanged with rivalry in this region for centuries (Nocuń, Stępniewski, 2023).

Noteworthy is the conceptualisation of the Baltic Sea Region. The word ‘Baltic’ is probably derived from the Lithuanian word ‘Baltas’ meaning ‘white’ (Online Etymology Dictionary, 2024). The body of water that the Baltic peoples (Lithuanians and Latvians) and the Slavic peoples (Poles, Russians) call the Baltic Sea for Germans and Scandinavians is the East Sea (German: Ostsee, Swedish: Östersjön), for Estonians it is the West Sea (est. Läänemeri).

There is no consensus on what areas the Baltic Sea Region comprises. The issue of delimitation of this area is the subject of a lively scientific discourse. Klemeshev et al. (2017) analysing existing definitions and approaches suggests a threefold delimitation of this Region: narrow, extended and broad (Fig. 1). In the first version, the Region consists of 9 countries, including 6 countries in their entirety (Sweden, Denmark, Finland, Lithuania, Latvia, Estonia) and 3 countries in part (Poland, Russia and Germany). The extended version adds Belarus and Norway, which are located within the Baltic Sea catchment area. The broader version adds countries such as Ukraine, the Czech Republic, Slovakia and Iceland, which are functionally linked to the Region. Given that the Baltic became an internal sea of the European Union in 2004 (omitting the 3 oblasts of the Russian Federation) and that the European Union Strategy for the Baltic Sea Region (EUSBSR, 2024) was implemented in 2009, a new pragmatic conceptualisation of the CBSS emerged, encompassing 8 EU Member States plus Norway, which is a member of the European Economic Area. Russia and Belarus were invited to join. However, with the start of the Russian-Ukrainian war (Sliwa, 2023), cooperation with these countries was put on hold.



Figure 1. Triple delimitation of the Baltic Sea Region.

Source: Klemeshev et al. 2017.

In the context of the tourism function, the concept of triple delimitation must be modified (Studzieniecki, Palmowski, 2019). The narrowest delimitation, limited to the boundaries of the water body, is made for the purposes of maritime tourism, including cruising, ferry and sailing. Another one, encompassing countries (or parts thereof) located by the sea, is used for coastal tourism (leisure, recreational, health). The widest and most open delimitation is used for transnational tourism, including cultural tourism (Fig. 2).

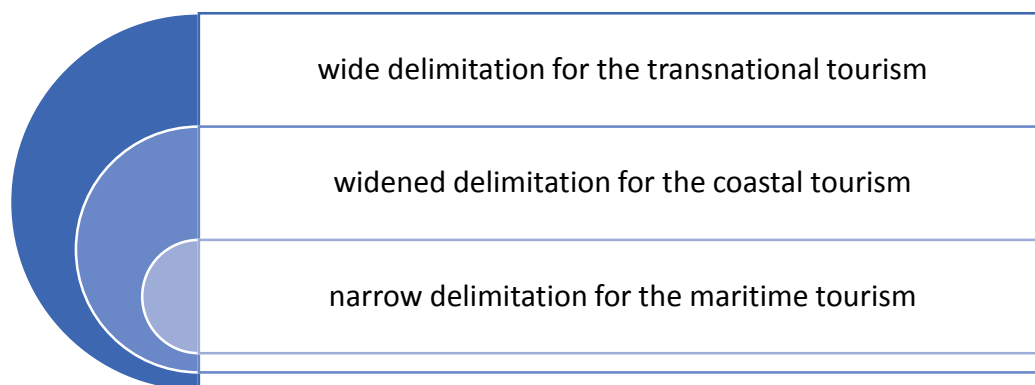


Figure 2. Triple delimitation of the Baltic Sea Region for tourism purposes.

Source: own study.

In its promotional materials, the international organisation Cruise Baltic (2024) admits that the weather on the Baltic is not the best. Winters are long and the food can be strange. However, they mention assets such as historic architecture and contemporary design. It is demonstrated that the oldest monarchies in the world, the youngest democracies, art, crafts, festivals and fairy tales can be the attractions that draw tourists. The Baltic Sea Region is an area characterised by a multicultural identity. Multiculturalism defines a social space in which inhabitants adhere to different normative, religious or customary systems and are aware of these differences (Nikitorowicz, 2018; Śliz, Szczepański, 2020).

There are 122 UNESCO World Heritage sites in the BSR (in nine countries). The majority of these (111 sites) are cultural heritage sites (UNESCO, 2024). The highest number of sites are in Germany (55 sites), the fewest in Estonia (2 sites). The UNESCO-listed sites include urban, sacred, military and industrial heritage, among others.

The shared cultural heritage of the BSR is reflected in the European Cultural Routes. The BSR countries appear on 37 of the 48 European Cultural Routes. In most cases, this heritage is pan-European (e.g. Via Habsburg, Destination Napoleon) and therefore cannot be a distinctive feature of a destination. The region is also characterised by industrial heritage including shipyards, steel mills, mines and chemical plants (ERIH, 2024). Most of the Baltic States have sites included in the European Cemetery Route.

Looking for typically Baltic motifs, it can be seen that all the BSR states are associated with the Hanseatic and Viking cultures. Formally, 8 out of 9 BSR states belong to the two European routes, but in reality the Hanseatic and Viking heritage covers the entire analysed area. Some cultural routes reflect the heritage of only certain BSR countries. An example is the St. Olaf Route covering the Scandinavian countries. The fame of this route in the Middle Ages rivalled those of the pilgrim routes to Santiago de Compostella. For nearly four centuries, thousands of pilgrims peregrinated to the tomb of St Olaf in Trondheim Cathedral (Duda, 2016).

An important transnational cultural theme of the BSR is the heritage associated with amber. This includes, among others, museums, galleries and manufacturies (Cudny et al., 2023). This primarily concerns the South Baltic countries, i.e. Poland, Russia (Königsberg Oblast), Lithuania, Latvia and Estonia. Work on the development and promotion of the international amber route has been going on for many years (Studzieniecki, 2022). Unfortunately, it has not yet been included in the list of European routes. When promoting the BSR as an attractive transnational tourist destination, it is worthwhile to make use of the prestigious awards and prizes given for achievements in the field of cultural preservation and development (Table 1).

Table 1.
European Culture Routes in the Baltic Sea Region states

No.	Year	Route	PL	DE	DK	SE	NO	FI	EE	LV	LT	Σ
1.	1987	Santiago de Compostella Pilgrim Routes	+								+	2
2.	1991	Hansa	+	+		+	+	+	+	+	+	8
3.	1993	Viking Route	+	+	+	+	+	+	+	+		8
4.	2004	European Route of Jewish Heritage	+	+							+	3
5.	2004	European Mozart Ways		+								1
6.	2005	Saint Martin of Tours Route	+	+								2
7.	2005	Cluniac Sites in Europe	+	+								2
8.	2005	Via Regia	+	+								2
9.	2007	The Romanesque Routes of European Heritage		+								1
10.	2010	European Cemeteries Route	+	+	+	+	+		+			6
11.	2010	Prehistoric Rock Art Trails					+	+				2
12.	2010	European Route of Historic Thermal Towns	+	+					+			3
13.	2010	Route of Saint Olav Ways			+	+	+	+	+			5
14.	2012	European Route of Ceramics	+	+			+					3
15.	2013	European Route of Megalithic Culture		+	+	+						3
16.	2013	Huguenot and Waldensian Trail		+								1
17.	2014	Architecture of Totalitarian Regimes of the 20th Century In Europe's Urban Memory	+									1
18.	2014	Réseau Art Nouveau Network		+			+			+		3
19.	2014	Via Habsburg		+								1
20.	2015	European Routes of Emperor Charles V		+								1
21.	2015	Destination Napoleon	+	+								2
22.	2015	In the Footsteps of Robert Louis Stevenson		+								1
23.	2016	Fortified Towns of the Grande Region		+								1
24.	2018	Impressionisms Routes	+	+	+			+			+	5
25.	2019	European Route of Industrial Heritage	+	+	+	+	+	+		+		7
26.	2019	Iron Curtain Trail – EuroVelo 13	+	+			+	+				4
27.	2019	Le Corbusier Destinations : Architectural Promenades		+								1
28.	2019	Liberation Route Europe	+	+				+				3
29.	2020	European Route of Historic Gardens	+	+								2
30.	2020	Via Romea Germanica		+								
31.	2021	Alvar Aalto Route – 20th Century Architecture and Design		+	+			+	+			4
32.	2021	European Route d'Artagnan		+								1
33.	2021	Iron Age Danube Route		+								1
34.	2022	Historic Cafés Route			+							2
35.	2022	European Fairy Tale Route		+							+	2
36.	2022	Women Writers Route	+									1
37.	2023	Transhumance trails				+						1
38.	2024	European Route of Historic Pharmacies									+	1
Total			18	30	8	7	9	9	6	4	6	97

Source: own study based on: COE, 2024.

The distinguished ones include cities from all the BSR countries. One of the more well-known awards is the title of European Capital of Culture. In practice, only larger cities have the chance to receive this title. Therefore, awards such as the BSR Pearl of Culture deserve attention. This is a new award that enables smaller cities to support the use of cultural resources and improve the quality of life of their residents. This award is a typically Baltic one.

Table 2.

Prestigious awards and prizes for cultural preservation in the BSR

No.	State	Category and city			
		<i>European Capital of Culture</i>	<i>European Heritage Token</i>	<i>EDEN award (culture)</i>	<i>Pearl of Culture RMB</i>
1.	Poland	Kraków, Wrocław	Gdansk, Lublin, Warszawa, Łużna, Łambinowice, Wrocław		
2.	Germany	Berlin, Weimar, Essen	Hambach, Muenster, Onabruck, Leipzig, Altranft, Stuttgart		Kiel
3.	Danemark	Copenhagen, Aarhus		Middelfart	Svendborg
4.	Sweden	Stockholm, Umeå			
5.	Norway	Bergen, Stavanger			
6.	Finland	Helsinki, Turku	Jyväskylä, Kalevala Helsinki	Fiskars	Jakobstad
7.	Estonia	Tallinn, Tartu	Tallin, Tartu	Viljandi	
8.	Latvia	Riga	Riga, Turaida	Cēsis, Rezekne	Rūjiena
9.	Lithuania	Vilnius, Kaunas	Kaunas	Pakruojis, Paliesius	

Source: own elaboration based on: COE, 2024.

2. Cultural heritage in the development of the BSR tourism brand

2.1. Origins of the Baltic Sea Region tourism brand development

The need for creating a common tourist brand for the BSR emerged at the end of the 20th century with the development of international tourism cooperation between the countries bordering the Baltic Sea. This cooperation was carried out by numerous organisations bringing together tourist sector entities, government and local administrations, universities and non-governmental organisations (Kizielewicz, 2012).

There was a growing awareness of a common identity among BSR stakeholders. The Baltic society has been united by a maritime tradition that had created common values over the centuries. The concept of ‘Homo Balticus’ emerged to identify the cultural attributes of a Baltic Sea resident (Gebhard, 2009). It was believed that ‘Homo Balticus’ was deeply rooted and integrated into the marine environment, fully aware of the common destiny, open to other languages, cultures and religions (Pacuk, Palmowski, 1999). Another idea that was supposed

to reflect a common identity was ‘Balticness’ (Chekov, 2023). Balticness functioned as an imagined community, rooted in the history of human interactions with a particular focus on trade links, independent of nationality (Nocuń, Stępniewski, 2023). Poznański (2020) rightly notes that the concept of ‘Baltic identity’ is highly ambiguous and should also take into account regional variation. *‘If we assume that we should all be the same (identical), we obviously fall into a blind trap. We are different in our Baltic Sea region. We have different histories, cultures, languages and, despite globalisation, we have different economies and even education systems. We often look at supposedly obvious facts from different perspectives, understanding their meaning in different ways.’*

2.2. National tourism brands

In the context of tourism, each of the BSR countries has its own promotional policy (Jordan, 2014), builds its own territorial brands (Andreja, 2018), including tourism brands (Fig. 3).



Figure 3. Logos of national tourism brands of the BSR countries.

Source: own elaboration based on websites.

When analysing the logos of individual countries, one can notice their considerable diversity. A common feature of most logotypes is the exposure of the countries name and the colours of the flag. The reference to the colours of the flag can be subtle (e.g. the logo of Poland) or expressive, as in the case of the logos of Sweden and Norway.

The logos differ in concept and message. The Estonian logo is characterised by minimalism, while the Finnish logo is inspired by abstractionism. Poland emphasises nature (tree, mountain, water), while Lithuania emphasises beauty in its promotional slogan. Denmark, in turn, refers to love through the use of the heart. Noteworthy is Latvia's logotype, in which the idea of sustainable development can be seen.

2.3. Attempts at creating a transnational BSR brand

Independently of national branding, attempts have been made to create a common BSR brand. Noteworthy are the 4 organisations that have taken action in this regard (Fig. 4). Their logos refer to the sea, represented by waves.



Figure 4. Logos of selected international organisations of the Baltic Sea Region.

Source: own study.

The first international organisation to attempt to create a tourism brand was the Baltic Tourism Commission (BTC). It was established in the 1980s. It functioned successfully for 30 years. Its statutory objective was to promote the BSR as a cross-border tourist destination (Ellefors, 2000). Marketing activities also included the development of cross-border tourist products. These made use of the common cultural heritage (Studzieniecki, 2000) including themes such as:

1. Hanseatic heritage.
2. Viking heritage.
3. Amber heritage.
4. Maritime heritage.

Popular products at the time were themed coach tours and Baltic Sea cruises. Marketing activities used the slogan 'Fjords, forests, fauna - culture, history, sauna'. The BTC logo appeared in promotional materials, including brochures, maps and tourist catalogues.

Building the BSR brand is also on the spectrum of interests of the intergovernmental organisation established in 1992, the Council of Baltic Sea States (CBSS, 2024).

The organisation's activities have focused on 3 priorities:

1. Regional identity.
2. Safe and Secure Region.
3. Sustainable and Prosperous Region.

It was recognised that developing a Baltic Sea Region identity would increase people's sense of belonging to a common area. The development of a regional identity implied the activation of people-to-people contacts through dialogue, macro-regional networks and international institutions.

On the initiative of the CBSS, the Baltic Sea Heritage Committee was established in 1998. Its aim became the promotion of cultural heritage as a strategic factor in the development of the CBSS. The Committee was composed of experts nominated by the state authorities of the Baltic Sea States. The Committee addressed both heritage protection issues and the implementation of sustainable management principles. Within the Committee, 6 working groups were established (Table 4). The objectives of the working groups' activities determined the directions of the work on the protection and promotion of cultural heritage.

Table 3.

Working groups and objectives of the Baltic Sea Heritage Committee.

No.	Working group	Aims
1.	Cultural underwater heritage	Developing and coordinating a regional agreement on the protection of underwater cultural heritage in the Baltic Sea. The objects of interest are historic wrecks and underwater archaeological structures.
2.	Cultural coast and maritime heritage	Deepening cooperation between authorities in the field of coastal culture and its development and supporting strategies for the sustainable use of coastal areas. The subject of interest is the documentation and promotion of coastal culture in the field of research and exhibitions.
3.	20 th century building & design heritage	Deepening knowledge of post-war building heritage, with particular emphasis on architecture. Supporting urban planning that takes into account cultural heritage. Assisting in mediation and decision-making.
4.	Cultural heritage and climate change	Exchange of knowledge on the impact of climate change on cultural heritage in the BSR. Identification of key issues that heritage management organisations should prioritise (e.g. adaptation strategies for cultural heritage buildings, threats to archaeological sites).
5.	Illegal trading with cultural goods	Strengthening of the legal framework and enforcement mechanisms that prevent illicit trade in cultural artifacts. Regional cooperation to increase awareness, improve monitoring, prevent looting and unauthorized sale of historical objects.
6.	Culture routes	Promoting and more effectively using the Council of Europe Cultural Routes programme in the Baltic Sea Region. This programme supports cooperation between the cultural heritage and tourism sectors and serves as a tool for developing sustainable cultural tourism.

Source: own study based on CBSS, 2024.

Another organisation that attempted to create a brand was the Baltic Development Forum. The organisation was founded in 1998. Its founders were politicians associated with the Danish Ministry of Foreign Affairs. The BDF's mission was to make the Baltic Sea Region one of the most dynamic, innovative and competitive growth centres in the world (BDF, 2024). The organisation initiated action by organising a workshop with BSR stakeholders. The workshop was coordinated by Simon Anholt - a territorial branding expert. The workshop resulted in the identification of 3 transnational themes and an accompanying 'story'.

Table 4.*BSR branding themes by Simon Anholt*

L.p.	Motive	Story
1.	$E + W = B^2$	The Baltic Sea region is an optimal cultural mix, combining the vigour, appetite, talent, creativity and resources of the emerging Baltic States, Poland and Russia with the cultural, technical, economic, social, political maturity, stability, experience and confidence of Scandinavia and northern Germany. It is the perfect combination of the developing and the developed; the best of both worlds; a wise head in a young body.
2.	Born in the age of globalisation	The Baltic Sea Region is the only economically significant place on earth that was born for and in a global world. Unlike most other regions, it is not struggling to cope with a different world order to the one in which it grew up, but is itself a product of globalisation and therefore has global competitiveness within it.
3.	The world's smartest region	The Baltic Sea Region is a model of a talent economy; its main resource is brainpower. Therefore, one can be absolutely certain about the long-term sustainability of the region's economic growth, the qualifications of its workforce, the scope of its interests and the stability of its political framework: this region is smart enough.

Source: own study.

A new phase in the construction of a regional identity began with the birth of the European Union Strategy for the Baltic Sea Region (EUSBSR, 2004). This was the first macro-regional strategy of the EU. It covered the 8 European Union countries bordering the Baltic Sea. It had 3 main objectives (protection of the sea, integration of the region and increasing prosperity) and 9 specific objectives (Palmowski, 2021). The governance model of the Strategy has evolved. It is now based on 14 thematic areas linked to the main objectives. One such area is Culture. Poland and the German federal state of Schleswig-Holstein became the coordinators of this area. The protection of the cultural heritage of the Baltic Sea region and the strengthening of regional identity were identified as one of the priorities. In 2024, a workshop organised by the OT Culture coordinators was held in Visby during the annual EU Strategy Forum, during which participants called for the continuation of efforts to develop the territorial brand of the BSR.

3. Conclusions

The creation of a BSR tourism brand based on cultural heritage is quite a challenge. There is no consensus on the delimitation and conceptualisation of the area. The BSR does not have as rich a cultural heritage as the southern European countries. The number of UNESCO-listed sites is moderate outside Germany. Countries located in the BSR have sites included in many European Cultural Routes. However, the number of routes covering the typically Baltic heritage is limited. As in other regions, the BSR states simultaneously cooperate and compete in a competitive tourism market. Studzieniecki and Kurjata (2010) emphasised that the branding of the Baltic Sea region is very complex. The region itself is shaped by a huge diversity of cultures, languages, traditions, histories and levels of pace and economic development. Its identity has only been partially identified. For many years there was no political need for

branding. Often differences arose, which were the cause of many conflicts and disputes between the countries of the region.

Numerous organisations have attempted to create a tourism brand. The closest to success was the Baltic Tourism Commission, which accurately identified transnational motifs and succeeded in marketing tourism products. Transnational cultural motifs are not viewed with the same enthusiasm by all countries. The Hanseatic motif has Germanic roots, the Viking motif may be associated with a bleak history. The amber motif is not attractive to Scandinavians, while the story of St. Olaf is of moderate interest to Slavs.

The territorial brand motif proposal suggested by S. Anholt is worth a closer look. Unfortunately, these were only proposals that were put to practice. According to Andersson (2007), the most significant barrier to brand development is the lack of a single decision-making body and the lack of unity of purpose among potential stakeholders. In the last few years, this problem has been recognised by the coordinators of the EU Strategy for the Baltic Sea Region. A structure has emerged that is able to continue working towards the creation of a territorial brand and an associated tourism brand. The success of this work will depend on the determination of the coordinators of the Thematic Areas (such as OT Culture and OT Tourism) and on the commitment of the BSR shareholders.

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AN ALGORITHMIC SOCIETY AND ITS IMPACT ON THE COMPETITIVENESS OF ORGANIZATIONS

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Purpose: This article aims to provide a deeper understanding of how algorithms influence competitive advantage, organizational decision-making, and potential ethical dilemmas.

Design/methodology/approach: The primary research assumption is that the integration and use of algorithms significantly affect organizational competitiveness and communication. Algorithms offer opportunities for enhanced efficiency, improved decision-making, and product differentiation, but they also pose challenges related to transparency, organizational dynamics, and ethics. The central research question is: how do algorithms influence the creation and maintenance of competitive advantage, the dynamics of organizational communication, and decision-making processes within organizations?

Findings: The research highlights differences in the adoption and use of algorithms (including artificial intelligence) across countries, identifies the most common application areas of generative AI in organizations, and examines cost reduction and revenue growth driven by GenAI implementation. Additionally, the study explores the level of personal understanding of GenAI and its perceived impact on business processes across various industries.

Research limitations/implications: The study faces limitations in assessing the nuanced impact of algorithms on human interactions and in adapting findings to diverse industries. Practically, organizations must balance automation with human oversight to ensure ethical and effective decision-making. Navigating these dynamics is critical to fully leveraging the benefits of algorithms while addressing associated risks.

Originality/value: This research provides a comprehensive exploration of how algorithms shape organizational dynamics and competitiveness. It offers practical insights into the diverse applications of algorithms and highlights challenges such as transparency and communication dynamics posed by AI integration. By bridging theoretical perspectives with practical implications, the study delivers valuable guidance for organizations adapting to the transformative impact of AI.

Keywords: algorithms, competitiveness, organizational decision-making; generative artificial intelligence (GenAI); business transformation.

Category of the paper: scientific research.

1. Introduction

The rise of artificial intelligence and machine learning has given birth to an algorithmic society, where algorithms influence decision-making processes in organizations including communication (Gillespie, 2014; Wang, 2019; Cormen et al., 2022).

As organizations seek to enhance their efficiency, agility and competitiveness, algorithms have become a strategic asset. These technologies are redefining competitive advantage by enabling more precise data-driven insights, optimizing operations, and enhancing decision-making. However, while the algorithmic society offers significant benefits for competitiveness, it also introduces challenges related to human interaction and governance and the risk of over-reliance on opaque systems. This article explores the impact of an algorithmic society on organizational competitiveness and communication, examining its potential to drive efficiency and innovation and at the same time reshaping decision-making, and human interactions. Taking into account that today's dynamic business environment is characterized by volatility, uncertainty, complexity, and ambiguity (VUCA) as well as brittleness, anxiety, nonlinearity, and incomprehensibility (BANI) (Cascio, 2020; Grabmeier, 2020) algorithms are playing an increasingly significant role in shaping organizational decision-making and communication. In a VUCA world, algorithms may help organizations navigate uncertainty by offering data-driven solutions that can anticipate market changes and disruptions. This enhances organizational agility and enables quicker responses to unpredictable situations. However, the complexity and ambiguity inherent in a VUCA environment can complicate the effectiveness of algorithms, as they may struggle to account for rapidly changing variables or emergent trends, leading to potential communication breakdowns or misinformed decisions. Similarly, in the context of BANI, the brittleness of algorithmic systems can create rigid decision-making structures that may overlook the nuances of human interaction or lead to a lack of empathy in organizational communication. Algorithms, while efficient, can also foster anxiety among employees. The lack of transparency related to use of algorithms can erode trust, making it difficult for employees to understand how decisions are being made, and hindering effective communication.

2. Literature review

In today's dynamic global economy, the ability to process and analyze large volumes of data is critical for maintaining competitive advantage. Algorithms enable organizations to make faster and more informed decisions by identifying patterns and trends in complex datasets. This capability allows firms to optimize their supply chains, manage customer relationships

more effectively, and predict market movements with greater accuracy (Agrawal, Gans, Goldfarb, 2018). For example, predictive analytics helps companies anticipate customer demand, allowing them to adjust production levels and reduce operational costs (McAfee, Brynjolfsson, 2012). Moreover, the integration of algorithms into product development processes fosters innovation. Algorithms can analyze vast amounts of market data to inform the creation of products that better meet consumer needs. In sectors like e-commerce and digital marketing, recommendation algorithms have become essential for personalizing customer experiences and driving engagement, directly impacting profitability and competitive positioning (Kellogg et al., 2020; Shin, 2021).

One of the most significant contributions of algorithms to organizational competitiveness is their ability to enhance operational efficiency. Automated decision-making tools and algorithmic management systems reduce the time required to perform routine tasks, enabling organizations to redirect human resources toward more strategic activities (Wilson, Daugherty, 2018). For example, in manufacturing, algorithms are used to streamline production processes, reducing waste and improving quality control, which ultimately enhances competitiveness (Buxmann, Hess, Thatcher, 2021).

Another key application of algorithms that contributes to cost reduction is robotic process automation. By automating repetitive tasks like data entry and transaction processing, employees can focus on higher-value tasks. This automation not only reduces labor costs but also minimizes errors and increases the speed of operations (Autor, 2015). Such efficiency gains allow firms to maintain competitive pricing strategies while offering high-quality products and services, enhances their standing in the market.

Algorithms significantly enhance decision-making capabilities by offering real-time insights and data analysis that would be impossible for human workers to process manually. Machine learning algorithms analyze large datasets to identify trends and correlations, offering organizations actionable insights for decision-making. This is particularly important in industries such as finance and healthcare, where the ability to make rapid, data-driven decisions can be the difference between success and failure (Davenport, 2018). For example, in financial markets, algorithms are used to execute trades at lightning speed, allowing firms to capitalize on fleeting market opportunities. Similarly, risk assessment algorithms enable banks to evaluate the creditworthiness of borrowers more accurately, reducing default rates and enhancing profitability (Agrawal, Gans, Goldfarb, 2018). Such advantages in decision-making enhance an organization's strategic positioning by allowing them to outmaneuver competitors and respond more quickly to market changes. The ability of algorithms to process vast amounts of data has also significant implications for innovation and product differentiation. Algorithms enable organizations to harness big data for insights that drive product development, personalization, and market differentiation. In the context of e-commerce, for instance, firms that deploy sophisticated recommendation algorithms can tailor product suggestions to individual customers, increasing satisfaction and driving business benefits (Shin, 2021).

In industries where disruptive innovation is key to maintaining competitiveness, algorithms facilitate the identification of new business models, markets, and product lines. Firms that effectively integrate AI and algorithms into their innovation processes are better positioned to create unique, differentiated offerings, ensuring long-term competitiveness in dynamic markets (Buxmann, Hess, Thatcher, 2021).

In addition to the above-mentioned impact of algorithmic technologies on the competitiveness of organizations, the impact on organizational communication was also given attention in the research. In particular it should be noted that algorithms introduce complexities to organizational communication. Traditional structures, based on hierarchical flows, are evolving as decision-making shifts to algorithms, altering interactions within organizations. Automated systems, such as chatbots, streamline communication but can reduce transparency and create gaps in understanding, as decisions made by algorithms are often hard for employees to interpret (Pasquale, 2016; Gulbrandsen, Just, 2024; Hassan, 2024). Algorithms increasingly support or even replace human decision-making in areas like recruitment and project management (Dastin, 2018). This can lead to faster decisions but also raises concerns about fairness and accountability, especially where encoded biases affect outcomes, potentially eroding trust between staff and management. Trust, a core element of communication, may weaken in environments where algorithms overlook social nuances, risking perceptions of unfairness. Also transparency is critical as algorithms take on decision-making roles. Often opaque algorithms can foster employee alienation (Beer, 2017; Ananny, Crawford, 2018).

3. Methods

Given the complex, evolving nature of algorithmic integration in business environments, a comprehensive literature review was conducted to thoroughly examine organizational behaviors, perceptions, and responses to algorithmic influences on competitiveness. This review aimed to explore how algorithms impact decision-making, communication dynamics, and competitive strategies within organizations, providing a theoretical foundation for understanding their transformative effects.

The research utilized a triangulation approach to data reviewing in documents related to algorithmic initiatives, performance reports, and academic literature. This will allow for an assessment of how algorithms affect the competitiveness of organizations.

The collected data will be analyzed using a thematic analysis approach to extract key themes related to the impact of algorithms on competitiveness and help in understanding of the role algorithms play in shaping competitive advantage.

4. Results

In analyzing the implications of an algorithmic society for organizational communication and competitiveness, recent studies highlight both transformative potentials and key challenges.

However, the situation in terms of using algorithms (artificial intelligence) in their businesses varies significantly across countries. Chart 1 shows the percentage of companies using this type of tool in selected countries.

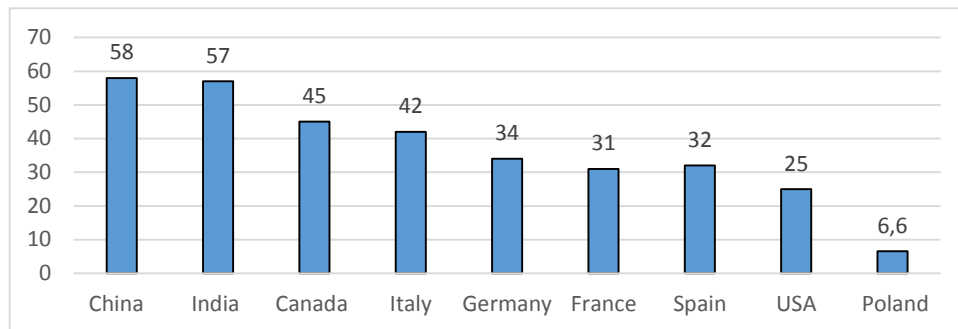


Figure 1. Percentage of enterprises adopting advanced artificial intelligence (AI) algorithms across selected countries, illustrating the varying levels of AI utilization in corporate practices globally [%].

Source: Own elaboration based on Polish Economic Institute, Economic Weekly PIE, 2024, https://pie.net.pl/wp-content/uploads/2024/06/Tygodnik-PIE_24-2024.pdf

The PIE report highlights significant economic trends tied to artificial intelligence (AI). Key findings include the transformative role of AI in boosting productivity across industries, especially through automation and predictive analytics. The report indicates that AI is most commonly implemented by service companies, with 20% adoption. In contrast, AI usage is minimal in construction, where only 0.06% of firms report employing it. Similarly, the trade and transport sector shows low adoption rates, at just over 2.5%. Sectors with higher AI adoption tend to believe more strongly in its transformative impact on their operations and industry dynamics.

Another result of the research is the analysis of the areas of application of generative artificial intelligence in organizations. Figure No. 2 shows the adoption of generative AI (GenAI) tools across various organizational functions.

Chatbots and customer interactions have the highest adoption, with 43% already using GenAI and 39% planning to adopt it within the next 6-12 months. Text and image generation are also prominent, with 34% and 27% currently using these tools, respectively, and strong plans for future adoption. Price optimization and customer journey mapping are less commonly used, with only 14% adoption for price optimization.

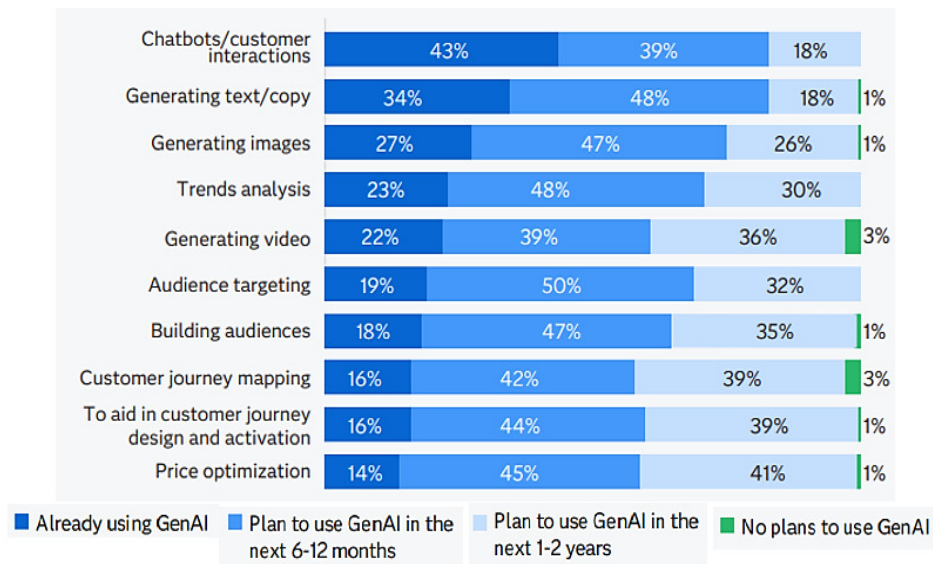


Figure 2. Key application areas of generative artificial intelligence (GenAI) in organizations, detailing current usage levels and future adoption plans across functions such as customer interactions, content creation, and analytics.

Source: SAS Institute Inc. Marketers and GenAI: Diving Into the Shallow End.2024. <https://www.sas.com/content/dam/SAS/documents/marketing-whitepapers-ebooks/ebooks/en/gen-ai-for-marketers-research-report-114003.pdf>

Another analysis shows cost reduction and revenue growth driven by the implementation of generative AI (Figure 3).

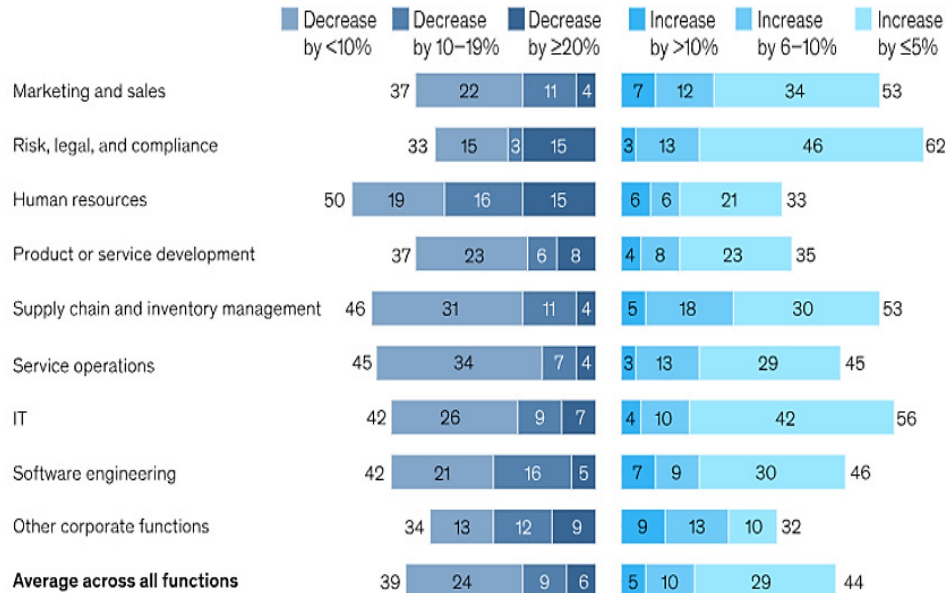


Figure 3. Impact of generative AI on cost reduction and revenue growth across various organizational functions, showing percentages of increases and decreases by different ranges of magnitude.

Source: McKinsey. The state of AI in early 2024. <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai#/>

The results shown on Figure 3 highlight the impact of AI adoption across various organizational functions. Revenue has notably increased in "Risk, legal, and compliance", with 62% of respondents reporting improvements. Substantial boosts have been realized

in IT (56%) whereas "Marketing and sales", and "Supply chain, and inventory management" are the next two functions achieving similar gains (53%). Costs also decreased across all functions, with the largest decrease observed in People Management (50%).

The SAS Institute report also shows interesting results regarding assessment of personal understanding of GenAI and its potential impact on business processes. As can be seen from Figure 4, the greatest understanding of the impact of GenAI was observed in the Health sector, while surprisingly the smallest in the Banking sector.

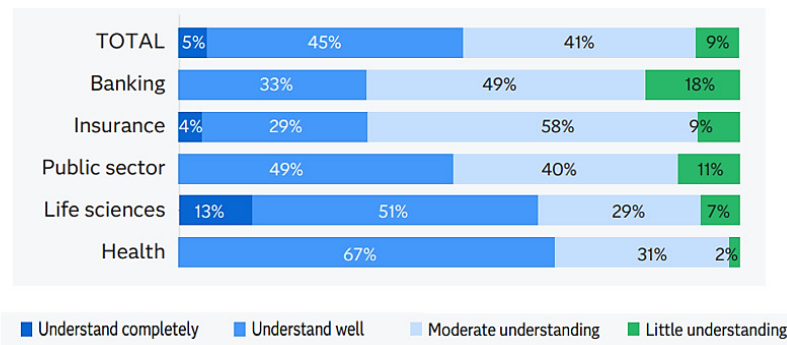


Figure 4. Survey results showing the level of personal understanding of Generative AI (GenAI) and its perceived impact on business processes across various industries, categorized by the depth of understanding.

Source: SAS Institute Inc. Marketers and GenAI: Diving Into the Shallow End.2024.

<https://www.sas.com/content/dam/SAS/documents/marketing-whitepapers-ebooks/ebooks/en/gen-ai-for-marketers-research-report-114003.pdf>

As can be seen from the above results, the impact of algorithmic systems on the organizational environment varies across sectors, but common themes across sectors include increased efficiency, enhanced decision-making capabilities, and new communication dynamics. In the area of communication, algorithms in particular contribute to more efficient information dissemination, enable more tailored and timely internal communication, which can improve response times and increase staff engagement. However, there is also a risk that overreliance on algorithmic communication can undermine human-centered interactions, affecting collaboration and empathy in the workplace.

The adoption of GenAI varies significantly across sectors due to differing industry dynamics and challenges. For instance, in construction, regulatory barriers and strict safety standards often delay the integration of AI solutions. The construction sector's low AI adoption rate (0.06%) reflects the complexities of aligning innovative technologies with compliance frameworks and physical-site operations. Conversely, e-commerce, driven by high consumer demand for personalization and efficiency, exhibits greater AI integration. In this sector, GenAI powers customer service chatbots, personalized marketing, and inventory management, helping businesses maintain a competitive edge in a fast-paced market.

Algorithms can offer organizations a strategic advantage by enabling rapid processing of data and generating insights that are key to competitive positioning in rapidly changing markets. For example, in industries such as e-commerce and finance, algorithms are integral to analyzing

consumer behavior and financial trends in real time, allowing companies to quickly adjust strategies and remain competitive. However, the absence of governance frameworks for algorithmic decision-making can lead to ethical and operational risks, including biases and transparency issues.

According to the SAS Institute report, which examines and compares how marketers and IT professionals perceive the benefits and challenges of integrating generative AI (GenAI) into organizational data analysis and operational workflows, both groups recognize its significant potential. Specifically, 61% of marketers and 53% of IT professionals strongly agree that GenAI enhances customer personalization and engagement, underscoring its perceived value in customer-centric strategies. A notable portion of respondents, 58% of marketers and 57% of IT professionals, believe that GenAI will drive innovation and help maintain a competitive advantage. Efficiency gains and cost savings are also highly anticipated, with 56% of marketers and 49% of IT professionals expressing agreement. In terms of predictive analytics and real-time decision-making, over half of marketers (56%) and IT professionals (53%) recognize GenAI's role in improving predictive analytics accuracy. However, fewer respondents see real-time decision-making as a top benefit, with 46% of marketers and 37% of IT professionals agreeing on its importance. Challenges associated with integrating open-source large language models (LLMs), such as issues related to data privacy and compatibility, are acknowledged, but they are largely viewed as manageable, with 48% of marketers and 40% of IT professionals expressing this sentiment. Overall, marketers tend to have a slightly more optimistic view of GenAI's potential to transform customer engagement and drive innovation, likely reflecting their focus on consumer interaction. IT professionals share this enthusiasm but place greater emphasis on practical challenges, such as data privacy. Despite these differences, both groups broadly agree on the substantial potential of GenAI to improve organizational efficiency and predictive analytics, underscoring its growing importance in strategic operations (SAS, 2024).

5. Discussion

The research results highlight the transformative impact of algorithms on organizational communication and competitiveness. While algorithms enhance communication efficiency, they may create standardized patterns that lack personal nuances and contextual awareness, which are essential for fostering effective human interactions. For example, chatbots used in team collaboration can streamline routine queries and provide immediate responses, reducing response times (Sharma et al., 2024). Similarly, automated reporting tools generate real-time performance dashboards, enabling quicker decision-making without manual intervention (Gurjar et al., 2024). Additionally, natural language processing (NLP) algorithms facilitate sentiment analysis in employee feedback, providing managers with insights into team morale

and engagement (Rayhan et al., 2023). Overreliance on such systems can hinder interpersonal collaboration and reduce workplace creativity. This underscores the need for organizations to strike a balance, leveraging algorithmic tools while preserving human-centric communication practices to maintain the depth and quality of interactions (Helberger et al., 2020).

Algorithms have significantly advanced the competitive position of organizations by enabling sophisticated data analysis and predictive capabilities. Industries such as finance and e-commerce particularly benefit, as algorithms provide real-time analysis crucial for rapid market adaptation. However, this competitive advantage introduces challenges, including the reinforcement of biases in decision-making and the difficulty of developing governance frameworks that ensure ethical and transparent use. In VUCA environments, where uncertainty and complexity are prevalent, organizations must implement agile governance systems to adapt algorithms to dynamic market conditions.

Effective governance frameworks are vital for ensuring that algorithmic systems align with ethical principles and organizational objectives. Challenges such as transparency and accountability are increasingly relevant as algorithms mediate interactions between stakeholders. Moreover, the relationship between algorithms and innovation reveals a paradox: while algorithms enhance data-driven insights, they may stifle creativity by imposing rigid structures and prioritizing measurable outcomes. Addressing this paradox requires balancing algorithmic efficiency with a culture that encourages human intuition and open-ended problem-solving.

In summary, algorithms play a dual role in enhancing competitiveness while challenging traditional communication norms. For organizations to effectively leverage these systems, a strategic approach that balances efficiency with ethical and human-centered considerations is essential. As algorithmic influence permeates organizational practices, further research into governance and communication frameworks will be crucial for ensuring the sustainable and responsible use of algorithms in the evolving business landscape.

Limitations of the research include the difficulty of understanding the impact of using algorithms on human interactions and adapting findings across diverse industries. Additionally, rapid technological advancements make predicting future effects challenging.

The use of algorithms has a number of practical and social implications. Practically, balancing automation with human oversight is essential to ensure ethical and effective decision-making. Transparent governance frameworks, tailored industry strategies, and structures preserving interpersonal communication are necessary for responsible implementation. Organizations must carefully navigate these dynamics to leverage algorithms' benefits while mitigating associated risks.

6. Conclusion

The research results demonstrate that while algorithms significantly enhance organizational competitiveness and communication, they introduce complex challenges associated with human interaction, governance, and innovation. To effectively operate in the VUCA and BANI environments, organizations must balance leveraging algorithmic capabilities with maintaining robust human oversight. This balance ensures that algorithmic systems remain aligned with organizational values and foster meaningful communication. Transparent, adaptable, and ethically sound algorithmic decision-making processes are paramount for organizational success in an increasingly volatile and uncertain landscape.

Human-algorithm interaction is reshaping workplace dynamics, mediating communication and decision-making processes. While this enhances operational efficiency, it risks reducing empathetic engagement and collaboration among teams. Organizations must ensure that algorithmic systems promote transparency and fairness while adapting to rapid technological changes. Agile governance frameworks and ongoing stakeholder feedback are essential for aligning algorithmic practices with ethical standards and organizational values.

In conclusion, algorithms are transformative but pose complex challenges that require nuanced strategies to address. Organizations must focus on integrating human oversight with algorithmic efficiency to foster adaptability and innovation. Further research should explore how human-centric approaches can be harmonized with algorithmic processes to preserve the value of interpersonal communication and decision-making. Additionally, investigating industry-specific applications will provide actionable insights for leveraging algorithms responsibly and effectively, ensuring long-term organizational success in competitive and rapidly evolving markets.

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REGIONAL IDENTITY OF THE INHABITANTS OF SMALL TOWNS IN LOWER SILESIA

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Purpose: The aim of the article is to identify and assess the regional identity of the inhabitants of small towns in Lower Silesia in the context of different types of territorial identity.

Design/methodology/approach: The research design employed qualitative and quantitative approaches. The desk research determined the state of research on the regional identity of the inhabitants of Lower Silesia. The quantitative research employed an online survey, carried out on a sample of 579 residents of small towns in the region. Data analysis was performed in the Statistica program.

Findings: The survey of the inhabitants of small towns in the Lower Silesian region has made it possible to assess the regional identity of the residents and relate it to other types of territorial identity. Based on the study, the sense of regional identity among the surveyed residents is quite strong. The respondents identify themselves as members of the Lower Silesian community more strongly than members of the local and European communities. However, national (Polish) identity is still stronger than regional identity among the inhabitants of small Lower Silesian

Research limitations/implications: The research is limited to determining the regional identity of the region's inhabitants based on the self-identification related to the sense of territorial belonging. Identification of territorial identity is related to selected variables: demographic characteristics, the degree of participation in the life of the local community and interest in the region's history. The research has a diagnostic character, so future studies could indicate changes in the regional identity of the inhabitants.

Originality/value: The research determined the regional identity of Lower Silesia inhabitants related to identifying the sense of territorial belonging. The analysis of the research results made it possible to assess the regional identity of the inhabitants of small towns in relation to other types of territorial identity.

Keywords: regional identity, territorial identity, identity measurement, Lower Silesia.

Category of the paper: Research paper.

1. Introduction

Nowadays, when the image is an important aspect of territorial competition, the importance of identity, linked to the search for safer anchor points and more sustainable values in a changing world, is increasing. Regional identity and the associated socio-cultural distinctiveness in many regions result from many years of history and tradition. The essence of regional identity is a sense of belonging and identification with a territory and its community. Strong identity can affect both the emotional connection to a region and the desire to participate in activities for regional development.

Understanding identity is complex and necessitates systematic research, especially in regions that have developed social and cultural distinctiveness later than others. Such a region is Lower Silesia whose various territorial units and places have a long history, but due to the complex situation and changes resulting from historical, geo-political, social and cultural conditions, its regional identity began to take shape after World War II.

To date, there are few studies on the region's identity, much of it of a fragmented nature, and the last broader study referring to the identity of the inhabitants was conducted in 2011 (Żuk, 2011). Previous regional identity studies did not focus on residents of small towns in Lower Silesia. Such research is important, because residents of smaller territorial units play an important, although often underestimated, role in shaping the regional identity and co-building the region's image. Especially since the currently implemented image strategy of the Lower Silesian Voivodeship emphasizes the urgent need for actions to promote small towns of the region (Strategia komunikacji..., 2021).

The article aims to identify and assess the regional identity of the inhabitants of small towns in Lower Silesia in the context of different types of territorial identity. The research design employed both qualitative and quantitative approaches. The desk research determined the state of research on the regional identity of the inhabitants of Lower Silesia. The quantitative research employed an online survey, carried out on a sample of 579 residents of small towns in the region. The research focuses on determining the regional identity of the region's inhabitants based on the self-identification related to the sense of territorial belonging. The measurement used a modified identity measurement scale proposed by Sobecki (2018).

The analysis of research results made it possible to assess the regional identity of the residents and relate it to other types of territorial identity. Identification of territorial identity is related to selected variables: demographic characteristics, the degree of participation in the life of the local community and interest in the region's history.

2. Regional identity and related concepts

Regional identity refers to individuals' close ties to a particular region and is reflected in a sense of belonging and commitment to that region. Regional identity is rooted in the region's history, its landscape, its dominant language or dialect or other specific regional characteristics (Pohl, 2001). Regions are not immutable but dynamic in time and space. The same applies to regional identity, which can be subject to change and reinterpreted. Regional identity formation is a process involving phenomena of a social, spatial, historical and cultural nature that is associated with both stability and change (Raagmaa, 2002).

Regional identity is close to self-identity, which does not exist for itself, but is formed in social interactions. Personal identity is linked to individuals' social environment. In the same way, regional identity is not only a personal feeling towards a place but is part of a collective. There is no personal identity without being embedded in a community, and there is no collective identity without reference to the self-definition associated with the belonging of individuals (Pohl, 2001).

From a personal perspective, territorial identity can be seen as part of self-identity and the expression of personal attachment to a region. Personal ties to the region can vary in intensity: from a vague sense of belonging, close attachment, and strong and confessed identification to active engagement in the region (Pohl, 2001). Self-perception in the context of regional identity is influenced by knowledge of others having similar feelings for the region.

Regional identity is shaped by social interactions and is closely tied to collective identity (Pohl, 2001). Within this view, regional identity is closely linked to the concept of community, a relatively stable group of people who share common beliefs and values in direct and multilateral relationships (Taylor, 1982). Community members may differ individually, but communities are always rooted in the space in which they operate (Raagmaa, 2001). In a social context, it is also worth noting that territorial identity is linked to the attachment to a community and can influence engagement in the development of a region (Lewicka, 2005).

Both in a personal and collective sense, regional identity refers to consciousness and the answer to the question 'Where do we belong?' (Paasi, 2003). The belonging to a region relates to the area at the mesoscale and is, therefore, somewhere in the middle between local identity and national identity (Pohl, 2001). Local, regional, and national identities are interconnected constructs that reflect the complex ways individuals relate to their communities and nations. According to some authors, territorial identity refers to larger areas such as continents. It is, therefore, possible to speak of a European identity, referring to self-identification in the context of a transnational group of people based on the possession of common cultural roots and living in the same area - the continent of Europe (Miluska, 2007; Sobecki, 2018).

The distinguished types of territorial identities can coexist as defined constructs with varying degrees of relationship. The research can also identify the dominant territorial identity of a region's inhabitants. For example, in some regions, subnational identities may challenge national identification, indicating a complex interaction of territorial identities among citizens (Schnaudt et al., 2016).

Previous research has approached the issue of differences in territorial identity between residents of rural and urban communities, focusing on community type as a determinant of territorial identity (Belanche et al., 2021). Research has shown that there is no difference between the two communities in terms of cognitive place identity. However, residents of rural communities show higher levels of affective and evaluative place identity than urban residents. Furthermore, age moderates the effect of community type on the affective and evaluative dimensions of place identity. The study found the importance of community type and personal meaning. The research helped to clarify how territorial identity is developed differently in rural and urban locations (Belanche et al., 2021). However, there is a lack of research that addresses regional identity in the context of the type and size of urban communities.

3. Lower Silesia characteristics and the state of research on regional identity

Lower Silesia is a region that covers the south-western part of Poland. It is the seventh largest voivodeship in Poland in terms of area, which is 19,947 km², and has a total population of 2.9 million. The Lower Silesian area includes 92 towns, 73 of which are small towns. In recent years, these towns have undergone significant transformations, evolving from centres serving the surrounding agricultural areas to typical service hubs (Litwińska, 2011). Due to diverse natural landscape and numerous historic architectural sites, the Lower Silesian province is an attractive area from the perspective of the tourism industry. Located in Lower Silesia, the high level of medicinal and thermal waters favours the development of health and recreational tourism (Strategia Rozwoju..., 2023).

Lower Silesia is a region with a rich but complex history that has influenced both its territorial, cultural and social definition. After the end of the Second World War, many Central European countries revised and changed their territorial borders. As a result of the Potsdam Conference in 1945, Lower Silesia, which had previously belonged to Germany, was incorporated into Poland (Kacprzak, 2010). This decision resulted in demographic and social changes in the region. One of the most important consequences of the incorporation of Lower Silesia into Poland was changes to the region's population, including the exodus of some and an influx of new residents.

Migration movements concerning the region were complex and included, among others, forced resettlement of Germans and planned settlement actions of Poles coming from different areas of the country as well as from the former eastern borderlands (Damurski, 2006; Szarota, 1969). New communities were established in Lower Silesia, often finding the unfamiliar or distant cultural landscape (Chylińska, 2022). The formation of a common regional identity was hampered by the fact that the inhabitants of the region as a whole were not united by common values and elements of cultural and historical heritage referring to a common past (Kocój, 2015).

The adaptation of the inhabitants in the Lower Silesian areas resulted, among other things, in the disposal of elements of German culture and heritage, which were remnants of the previous inhabitants of the area (Banaś, 2009). Over the years, the new inhabitants of Lower Silesia progressively formed their own regional identity, different from the one that existed before 1945. The creation of a new regional identity was a process dominated by the transformation of space and the adaptation of existing structures to the new, Polish reality, while at the same time building a social community on the basis of the experiences and different traditions of the migrants, rather than the old historical ties to the area (Nowosielska-Sobel, 2015).

The identity of the inhabitants of Lower Silesia was also influenced by the top-down historical policy of the region's authorities from the second half of the last century, which in the cultural context was geared towards the Polonisation of the area and the consolidation of Polish history and customs (Nowosielska-Sobel, 2015). As late as the 1990s, the national narrative began to be abandoned in creating the identity of the Lower Silesian Voivodship. It was then that a concept began to be implemented, on the basis of which Lower Silesia was to be seen as an original cultural mix compared to the rest of the country (Wiszewski, 2021). It should be emphasised that for many years the region was commonly perceived through the prism of its capital, Wrocław, whose identity and image was supposed to refer to a "multicultural Central European metropolis" (Traba, 2007, pp. 45-46).

The contemporary inhabitants of Lower Silesia are descendants of second-, third- or fourth-generation migrants (Thum, 2011). Since the post-war era, they have faced the challenge of reinterpreting and shaping their own regional identity (Kurpiel, 2018), which is largely due to a break in natural historical, cultural and social continuity. Therefore, research on both the state and changes in the regional identity of Lower Silesia is so important.

To date, the most comprehensive study on the regional identity of the inhabitants of Lower Silesia remains the survey conducted in 2011. The survey among Lower Silesian residents found that more than half of the respondents were unable to identify regional commonalities, and one in three had no associations associated with the region they lived in. Nevertheless, the vast majority of respondents (75%) felt proud to be a Lower Silesian (Žuk, 2011).

In the current image communication strategy of Lower Silesia for 2021-2030, one of the strategic goals set is to support the building of a distinctive regional identity for the inhabitants (Strategia komunikacji..., 2021). The strategy's authors encourage a discussion on the current

emerging identity of the inhabitants, which is important from both a social and an image perspective.

In the context of the conducted research, it is also important to refer to the objective included in the region's image strategy, which refers to increasing the attractiveness of small and less popular Lower Silesian towns. Smaller towns play an important but often underestimated role in shaping the Lower Silesian identity. Furthermore, on the basis of the literature review, it has been noticed that there is a lack of scientific studies relating to the regional identity of the inhabitants of small Lower Silesian towns.

Researchers dealing with the issue of territorial identity also point to the need for research on the identity of Polish regions due to the narrative dominating the Polish public space for many years about a homogeneous, collective national identity resistant to cultural diversity (Sidorenko, 2019). At the same time, academic studies also emphasise the importance of research relating to the identity of regions that became part of Poland again after the Second World War, such as Lower Silesia (Chylińska, 2022). Lower Silesia is a special region due to its unique history of migration and population exchange, which meant that the new inhabitants had to not only adapt to a foreign space but also gradually build their regional identity from scratch.

In researching the identity of Lower Silesia consideration should be given to the complicated situation of the inhabitants in terms of regional identity compared to other Polish voivodships. Due to social and historical changes, identifying and defining the regional identity that exists among the inhabitants of Lower Silesia is interesting from a scientific and cognitive perspective, as well as from a management perspective. Based on a review of available sources, a research gap in regional identity focused on the self-perception of residents of the small towns was identified. This also applies to previous studies on Lower Silesia that have largely overlooked the identity of small-city residents.

4. Regional identity of Lower Silesian residents in the context of other types of territorial identity

4.1. Research methodology

The empirical study aimed to identify and evaluate the regional identity of residents of small towns in Lower Silesia. The research design employed both qualitative and quantitative approaches. An analysis of the content of strategic documents of the Lower Silesian Voivodship supported the review of previous publications on the identity and image of the region. The desk research enabled identifying the current state of research on regional identity and recognising of a gap in research on measuring the identity of residents in small towns. Due to the region's history and multicultural character, the measurement of regional identity was related to other

types of territorial identity. The research used a partially modified scale by Sobecki (2018), which was developed by the author to diagnose the profile of socio-cultural identification. Ten categories of the original version of the scale included those related to territorial space and religious community (Sobecki, 2018, p. 96).

In this study, the authors focus only on regional identity and related types of territorial identity. The study identified territorial identification profiles, based on the four types identified: European, national, regional, and local. The dominant profile of territorial identity among residents of small towns in the Lower Silesian Voivodeship was identified using a quantitative approach. Regional identity was assessed by measuring the self-identification of the inhabitants in terms of territorial affiliation (sense of territorial belonging), based on 4 scale items:

1. Member of the European community (European).
2. Member of the nationwide community (Pole).
3. Member of a regional community (Lower Silesian).
4. Member of the local community (city dweller).

For each item of the territorial identity scale, respondents rated it using a 5-point Likert scale with assigned values. The Likert scale items were described as follows:

1. I definitely do not feel connected to this community.
2. I rather do not feel connected to this community.
3. It's hard to say.
4. I rather feel connected to this community.
5. I definitely feel connected to this community.

The survey was conducted through phone, interviews using a computer script with previously designed questions (CATI). The collected data was analyzed using Statistica software. The research was carried out on residents of small towns in Lower Silesia Voivodship.

According to Statistics Poland (Polish National Statistical Office), in 2023, there were 73 small cities, defined as territorial units with city rights and less than 20000 inhabitants. Based on data from the Local Data Bank, the total population of the 73 small towns studied was calculated to be 485,712, as of 31.12.2023 (Local Data Bank, 2024). Based on the formula for determining the minimum sample size considering the known population size (Jabłońska, Sobieraj, 2013, p. 46), the required sample size was found to be 384 people. Ultimately, 579 respondents participated in the study, which resulted in a maximum error of 4% at a confidence level of 95%.

Table 1.
Characteristics of the sample

Residents of small towns in the Lower Silesian Voivodship		
Respondents by gender	n	%
Female	309	53,4
Male	270	46,6
Respondents by age	n	%
18-29	81	13,98
30-39	101	17,44
40-49	124	21,42
50-59	124	21,42
60 and more	149	25,73
Respondents by level of education	n	%
Primary education	44	7,6
Vocational education	178	30,7
Secondary education	223	38,5
Higher education	134	23,1
Respondents by duration of settlement in a current city of residence	n	%
1-5 years	60	10,4
Over 5 years	376	64,9
Since birth	143	24,7
Total	579	100

Source: own elaboration.

The study involved 579 adult residents from all 73 small cities in Lower Silesia, 309 women (53,4%) and 270 men (46,6%). Among the five age groups, the largest group of respondents was people aged 60 and over (25,7%). The smallest number of respondents belonged to the youngest group of 18-29 years (14%). Among the surveyed residents of small towns, people with secondary education predominated (223). The next question regarding the length of residence in the city was a single-answer question. People who had lived in the city for less than one year did not participate in the survey. 178 respondents had vocational education (30,74%), 134 participants had higher education (23,14%), and 44 had primary education (7,6%). Respondents were also asked about the longevity of settlement in their cities of residence. Residents living in their city for at least one year participated in the survey. Most respondents (64,9%) have lived in the small Lower Silesian city since birth, 143 people for over 5 years (24,7%), and 60 people for 1-5 years (10,4%). The detailed characteristics of the sample are summarised in Table 2.

The research made it possible to define the regional identity of the inhabitants of Lower Silesia in the context of other types of territorial identity. The analysis related to the determination of the dominant identity was related to the characteristics of the sampled residents and was also linked to an assessment of the degree of participation in the life of the local community and interest in the region's history.

4.2. Research results

The regional identity of the inhabitants of small towns in Lower Silesia was determined by defining their territorial identity, by self-identification of the territorial belonging. The assessment referred to four types of territorial identity: European, national, regional and local. In the first stage, the dominant, declarative sense of territorial identity among all respondents was analysed. The variables presented on the Likert scale, referring to the individual types of identity, were treated as ordinal variables. National identity was dominant among the surveyed residents of small Lower Silesian towns (4,62). The average assessment of the sense of being a member of a regional community (Lower Silesian) was 4.2 (Fig. 1).

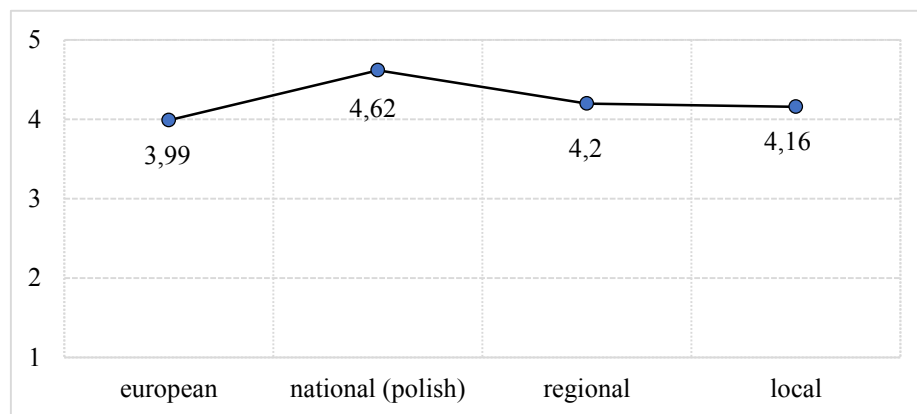


Figure 1. Territorial identity of respondents.

Source: own elaboration.

Next, it was checked whether there were any differences in the sense of territorial identity due to the age of the respondents. For this purpose, the average values of the individual types of territorial identity were determined in each of the 5 age groups. Again, national identity was the strongest among all groups, regardless of age. The difference in profiling is visible among the youngest age group. This group is the only one with a higher sense of belonging to the European identity than the local one. At the same time, local identity is the weakest in the case of the youngest group of respondents. Regional identity is second among most groups, except those aged 50-59. The most significant differences occur between the youngest and oldest age groups. Figure 2 graphically presents the average values of the territorial identity of the respondents according to their age group.

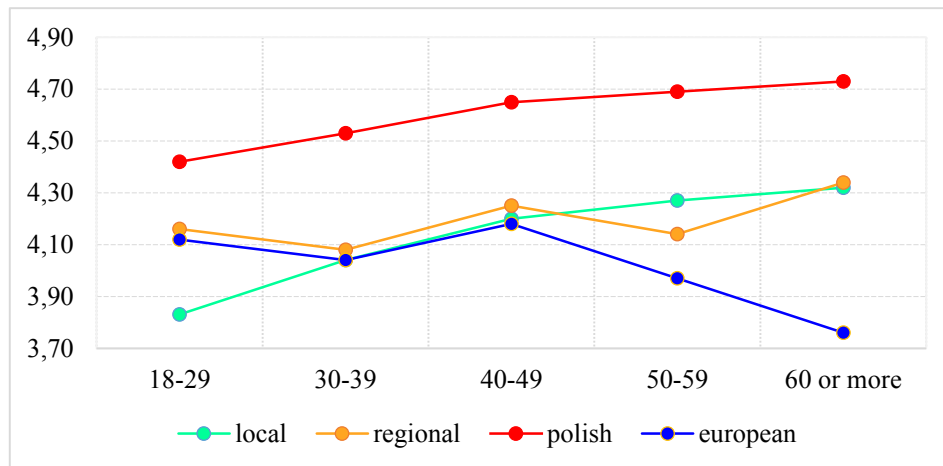


Figure 2. Self-assessment of the territorial identity of inhabitants of small towns in Lower Silesia - average values by age groups.

Source: own elaboration.

The relationship between the age group of respondents and the degree of dominant territorial identity was analyzed using a nonparametric chi-square test of independence. The strength and direction of the relationships between variables were then determined. The analysis found no statistically significant relationship between age and the degree of identity as a Pole or a member of a regional and local community ($p > 0,05$). However, there is a statistically significant relationship between age and identification as a member of a European community ($\chi^2 = 20,09$; $p < 0,01$), with a weak, negative correlation ($R_s = -0,11$). This indicates that younger people identify more strongly as members of a European community.

The study also identified differences in terms of a sense of territorial identity depending on the length of residence in the hometown. Regardless of the city's residence length, the national profile dominates among all respondents. The average level of sense of identity as a member of a regional community is the highest among people who have lived in a small Lower Silesian town since birth (Fig. 3).

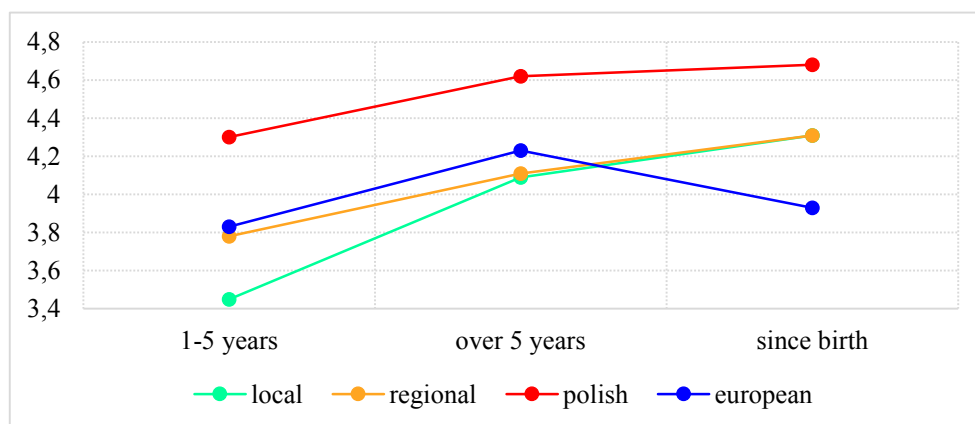


Figure 3. Self-assessment of the territorial identity of inhabitants of small towns in Lower Silesia - average values by length of residence in the city.

Source: own elaboration.

Based on the chi-square test, it was found that there is a statistically significant relationship between the length of residence and the degree of identification as a member of the national ($\chi^2 = 35,12$; $p < 0,001$), regional ($\chi^2 = 23,06$; $p < 0,001$) and local ($\chi^2 = 40,53$; $p < 0,001$) community. Then, the strength and direction of the relationships were measured. There is a positive but rather weak relationship between the length of residence and identification as a member of the national ($R_s = 0,18$), regional ($R_s = 0,18$), and local ($R_s = 0,21$) community at the given significance level of $p < 0,05$. The highest correlation between variables concerns the length of residence in the city and the degree of identification as a local community member.

Respondents were also asked about their participation in the city's local life. The question used a 5-point Likert scale, where 1 meant "definitely not" and 5 "definitely yes". The average response to the question was 2,93. The most common response was "rather not" (144 people), while the least common was "definitely yes" (71 people).

In the analysis the respondents' sense of territorial identity was linked with the degree of participation in the city's local life. The national identity was dominant among the respondents with different involvement in the local community. The most significant differences were observed between those who actively participated in the city's local life and those who did not participate at all (Fig. 4).

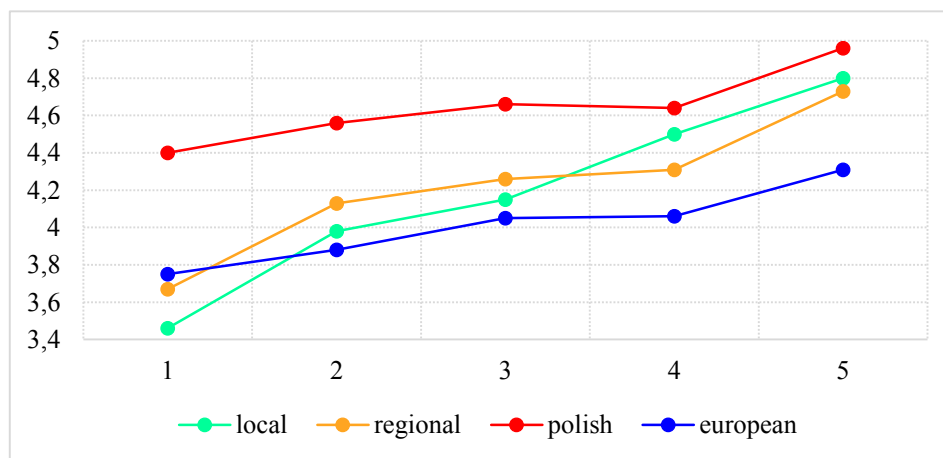


Figure 4. Self-assessment of the territorial identity of inhabitants of small towns in Lower Silesia - average values according to the degree of participation in the city's local life.

Source: own elaboration.

Based on the chi-square test, it was found that there is a statistical relationship between participation in the local life of the city and the degree of identification as a member of the European community (European) ($\chi^2 = 18,96$; $p < 0,05$), national community (Pole) ($\chi^2 = 26,33$; $p < 0,001$), member of the regional community (Lower Silesian) ($\chi^2 = 64,23$; $p < 0,001$) and local community (resident of the city) ($\chi^2 = 88,94$; $p < 0,001$). A positive, moderate correlation occurs to the highest degree between the sense of local identity and participation in the city's local life ($R_s = 0,36$). A positive, relatively weak, but statistically

significant correlation also occurs between participation in the city's life and regional identity $R_s = 0,28$.

Respondents were asked if they were interested in the history of the region they inhabited. The question implemented a 5-point Likert scale, where one indicated "definitely not" and five indicated "definitely yes". On average, the response to the question was 3,09. The most common response was "rather yes" (144 people), while the least common was "definitely not" (78 people).

The distribution of the respondents' average values of the sense of territorial identity was determined according to their interest in the region's history. Again, national identity was dominant among the respondents with different interests in regional history. The highest differences were noticed between individuals who were not interested in Lower Silesia's history and those who declared the highest interest (fig. 5).

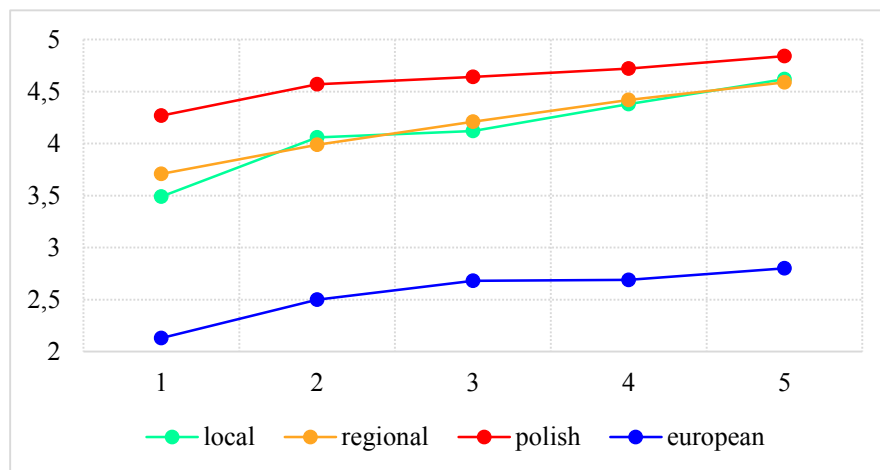


Figure 5. Self-assessment of the territorial identity of inhabitants of small towns in Lower Silesia - average values according to their interest in the region's history.

Source: own elaboration.

According to the chi-square test conducted, it was determined that there is a statistically significant relationship between the interest in the history of Lower Silesia and the level of identification as a member of the European community ($\chi^2 = 76,69$; $p < 0,001$), national ($\chi^2 = 53,92$; $p < 0,001$), regional ($\chi^2 = 89,74$; $p < 0,001$), and local ($\chi^2 = 81,8$; $p < 0,001$). Additionally, there is a moderately positive correlation ($R_s = 0,29$) between the interest in the region's history and regional identity. This indicates that the degree of identification as a member of the Lower Silesian community increases with the interest in the history of the region.

The last of the variables analyzed in conjunction with self-evaluation of territorial identity is education (fig. 6). Also, in this case, among all groups of residents with different levels of education, national identity was the strongest. Based on the data and the graphical interpretation of the distribution of average scores, it can also be noted that a sense of regional identity is highest among respondents with primary education. As the analysis shows, European identity is lower among those with vocational education.

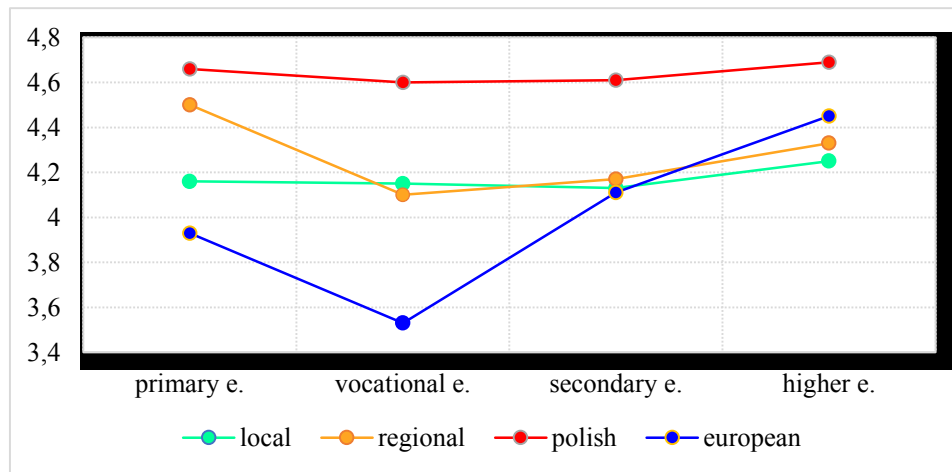


Figure 6. Self-assessment of the territorial identity of inhabitants of small towns in Lower Silesia - average values according to the level of education.

Source: own elaboration.

Based on the chi-square test, a statistically significant relationship between education and the sense of territorial identity occurs only regarding the degree of feeling as a member of the European Community ($\chi^2 = 38,31$; $p < 0,001$). There is a positive, low, statistically significant correlation ($R_s = 0,16$) between the level of education and the identification of residents as Europeans. This indicates that with the increase in education, the degree of identification as a member of the European community increases.

A nonparametric Kruskal-Wallis test was conducted to check the existence of other relationships between professional groups and territorial identity. This type of test was the basis for determining whether the answers given among different professional groups differed statistically significantly from the others.

Table 2.

Kruskal-Wallis test with average rank values

To what extent do you consider yourself a member of the European community?	Kruskal-Wallis test: H (3, N= 579) =45,79988 p = 0,0000			
	Higher e. R:349,06	Secondary e. R:299,84	Vocational e. R:230,46	Primary e. R:301,16
Higher education	-	0,043	0,000	0,596
Secondary education	0,043	-	0,000	1,000
Vocational education	0,000	0,000	-	0,072
Primary education	0,596	1,000	0,072	-

Source: own elaboration.

A nonparametric ANOVA test was conducted for the variable grouping *education* and the degree of sense of belonging to the European community (table 2). The significance level of the test ($p = 0,000$) allows us to state that at least two professional groups differ in a statistically significant way in their answers to the question regarding the degree of identification as European. Then, an equivalent of the post-hoc test was conducted (multiple comparisons of mean ranks for all groups). People with higher education ($R = 349,06$) significantly more often than people with secondary education ($R = 299,84$; $p = 0.04$) and

vocational education ($R = 230,46$; $p = 0.00$) identified themselves more strongly as members of the European community.

5. Conclusions

The survey of the inhabitants of small towns in the Lower Silesian region has made it possible to assess the regional identity of the residents and relate it to other types of territorial identity. Based on the conducted study, the sense of regional identity among the surveyed residents is quite strong. The respondents identify themselves as members of the Lower Silesian community more strongly than members of the local and European communities. However, national (Polish) identity is still stronger than regional identity among the inhabitants of small Lower Silesian.

The results of our study cannot, of course, be directly compared with studies on regional identity carried out by other researchers, due to differences in the scope and methodology of the research. However, it is worth noting that the conclusions of the study conducted in 2011, suggested that the regional identity of Lower Silesians is relatively weak and is rather in the building phase than occurring (Żuk, 2011).

The research allowed us to describe the relationship of self-identification of regional identity and other types of identity with other variables. The relationships were noted between the regional identity of the surveyed residents and the length of residence in the city, education, participation in the city's local life, and interest in the region's history.

However, regardless of belonging to a specific group due to demographic characteristics, the strongest among residents of small Lower Silesian towns is national identity. The reason may be the long-standing policy of the region focused on nationality, homogeneity and emphasising the features characteristic of Polish culture.

The study's results may be relevant from the perspective of the authorities of the Lower Silesian Voivodship and small territorial units. They justify continued support for programs and initiatives to strengthen the regional identity, which is one of the goals of the currently implemented image strategy of the Lower Silesian Voivodeship. Given that a strong regional identity affects the competitiveness and uniqueness of the region, managers of territorial units should actively encourage the members of the regional community to increase interest in the region and participate in regional life.

The research focused on the regional identity of Lower Silesia inhabitants related to identifying the sense of territorial belonging. This represents both a value and a limitation of the study related to its scope. In future research, the scope can be widened in order to gain a deeper understanding of the different dimensions of regional identity. The assessment of the

regional identity of the inhabitants in relation to other types of territorial should be carried out in the long term, which suggests carrying out studies of a cyclical nature.

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CHALLENGES AND METHODS OF MEASURING TOURIST FLOW IN REGIONS

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Purpose: The aim of this paper is to identify the barriers and challenges associated with measuring tourist flow at a regional level, and to explore data collection methods used by Regional Tourist Organizations in Poland.

Design/methodology/approach: This article employs a qualitative research methodology. Fifteen individual in-depth interviews (IDIs) were conducted with representatives from Regional Tourist Organizations.

Findings: The research findings indicate that Regional Tourist Organizations recognize difficulties in accurately collecting data on tourist flow, and in most cases, utilize at least several different sources of data on tourists and visitors. The paper identifies key barriers and challenges such as the lack of uniform measurement standards and budget constraints, which impact the quality and availability of tourist flow data.

Research limitations/implications: The research findings presented include an analysis of qualitative data derived from interviews with representatives of Regional Tourist Organizations in Poland. However, the results obtained may serve as a foundation for further, more in-depth research in this area among other stakeholder groups.

Practical implications: The findings of the study can contribute to a better understanding of the issues associated with accurate measurement of tourist flow in regions.

Originality/value: The article offers a fresh perspective on the challenges associated with measuring tourist flow in regional areas. The study provides insights into the effectiveness and limitations of current measurement practices, such as difficulties in obtaining accurate data and privacy issues, as well as identifying the most significant needs related to data collection on tourist flow, which can contribute to improved tourism management in regions.

Keywords: tourist flow, measurement of tourist flow, Regional Tourist Organization.

Category of the paper: research paper.

1. Introduction

Tourism plays a pivotal role in both national and regional economies, contributing to increased employment, investment, and improved quality of life for local communities. However, the growing mobility of tourists presents challenges related to managing tourist flows, environmental protection, and the preservation of cultural heritage. Effective management requires up-to-date and reliable data on tourist movements, which are essential for strategic planning and monitoring the effectiveness of initiatives. Traditional data collection methods, such as accommodation statistics or surveys, are insufficient, particularly in the context of day tourism and informal accommodations. The lack of standardized measurement practices complicates data comparison and the development of insights. Regional Tourism Organizations require credible information to fulfill their statutory responsibilities. Therefore, it is necessary to discuss the implementation of more efficient methods for measuring tourist flows and the standardization of practices, which would enable Regional Tourism Organizations to manage tourism more effectively and address the challenges of the contemporary market.

The aim of this article is to identify the barriers and challenges associated with measuring tourist flows at the regional level and to examine the methods used by Regional Tourism Organizations to collect data on tourist movements. The authors base their analysis on empirical material obtained through 15 in-depth interviews. The findings provide insights into best practices in measurement and serve as the basis for recommendations to improve data collection processes.

2. Literature review

Measuring tourist flow constitutes a fundamental component of planning and managing tourism, enabling the understanding of tourists' behaviors, preferences, and their impact on visited areas (Freuler, Hunziker, 2007; Zubiaga et al., 2019; Vašaničová, 2024). Additionally, the measurement and real-time prediction of tourist flow can be utilized in crisis situations, supporting the activation of emergency plans and preventing accidents related to safety (Lu et al., 2020). It is crucial from the perspective of contemporary tourism economy requirements to develop a method for continuous monitoring of tourist flow (Borkowski, Seweryn, 2010). However, monitoring and analyzing tourist flow encounter numerous difficulties, both technical and methodological, partly due to the fact that they cover a wide range of research topics (Gu1 et al., 2023), which often makes them estimative and conducted using varying methodologies (Schägner et al., 2017). Technical difficulties may also arise from

the imperfections of devices and technologies used to measure tourist flow (Rogowski, Piotrowski, 2022), yet these devices are employed for monitoring and managing tourist flow, for example, in national parks where such traffic should be regulated due to its environmental impact (Maršálek, Houdek, Pecharová, 2013).

According to Borkowski (2018), data collection poses numerous challenges, including the diversity of tourism types and forms, their dispersed nature, irregular occurrence, and high variability. The diversity of source materials, inconsistent in nature, impedes both detailed analyses and precise, comprehensive representation of the phenomenon across the studied area. This is particularly evident in monitoring tourist flow in national parks, which employ various methods and do not maintain a uniform frequency of studies (Spychała, Graja-Zwolińska, 2014). This hinders their comparison, also because they typically focus only on selected, most popular spots within their territories (Zbucki, 2022). This also applies to large tourist destinations managed by regional tourism organizations, where studies are conducted with varying frequency, using different methodologies and gathering diverse information about tourists and day visitors (see: Szmatuła et al., 2016; Borkowski, 2020; Ziółkowski, 2020; Szpara, Gierczak-Korzeniowska, Stopa, 2023).

Studying tourist flow is a unique methodological challenge (Szpara, Gierczak-Korzeniowska, Stopa, 2023). Official government statistics only cover tourists, i.e., those who use accommodation facilities (additionally, only those required to report to the Central Statistical Office of Poland). At the same time, the increasing number of day visits and non-rental of lodging places (visits without overnight stay) requires adapting the tools for studying tourist flow to changes in tourists' behaviors (Daas, Puts, Buelens, 2015). Various attempts are made to "estimate" the traffic comprising day visitors (based on counters at national park gates, scale of ticket sales, contact at tourist information points, observations in dining establishments or within tourist attractions (Kruczek 2016; Rogowski, 2017).

One of the key aspects of conducting studies on tourist flow is information technology, which also plays a leading role in the development of the tourism industry (Buhalis, Law, 2008). Interactions between tourists and technological solutions, and consequently, increased use of mobile phones during travel, not only affect the management of the tourist region (Werthner, Klein, 1999; Benckendorff, Sheldon, Fesenmaier, 2014; Xiang, 2018) but are also used to study tourist flow (Alejziak, 2009; Piechota, 2014; Qin et al., 2019).

New technologies are also used to monitor tourist flow and manage it appropriately in the context of increasingly popular sustainable tourism (Novas et al., 2017; Bertocchi, Van der Borg, Camatti, 2021). Zubiaga et al. (2019) additionally point out that new technologies (Internet of Things, Big Data, and geographic information systems) networked together provide much better quality data on tourist flow, thus enabling intelligent management of tourist flow, especially in places that require a sustainable approach.

In 2018, studies showed that Americans spent 3.6 hours a day on mobile devices, representing a twelvefold increase over 10 years. In 2020, the number of hours spent using mobile internet rose to about 4 hours a day, and the time spent in mobile apps increased by 88% (Safaa, Eman, 2022). Mobile phones have become the preferred devices for accessing the internet (Wang, Park, Fesenmaier, 2012), also playing a crucial role in providing information about tourists.

The accuracy of tourist flow measurements is also affected by technological limitations, such as lack of mobile network access in remote locations or concerns about the privacy of tourists. However, traditional methods, such as surveys and observations, although useful, can be time-consuming and do not always yield representative results. In response to these challenges, further advanced digital tools are being developed, such as data analysis from payment cards, mobile network logins, and the use of GPS technology. The application of a combined approach of Big Data and small data can solve the problem of methodological imbalance and generate mutually reinforcing insights at multiple levels, thereby complementing the data analysis process on tourist flow (Xu, Nash, Whitmarsh, 2019). So-called smart tourism, which requires collecting and analyzing data from various sources, is an emerging research trend (Buhalis, 2020), responding to the rapidly changing needs of travelers and accelerating the digitization of travel (Ilhan, 2021).

The difficulties and limitations in conducting studies on tourist flow in no way diminish the necessity of their conduct (Szpara, Gierczak-Korzeniowska, Stopa, 2022). Acquiring comprehensive data on tourist flow is very important. They allow for the development of strategic documents and planning actions, marketing and promotional activities in the development of tourism, managing tourist directions, tailored to local needs and conditions (Więckowski, Saarinen, 2019). They become the basis for spatiotemporal simulations: intensity of tourist flow, potential directions of tourist penetration spread, or serving to prevent conflicts between tourists and residents. Moreover, they enable the management of tourist flow and the appropriate preparation of tourism infrastructure and offerings in line with visitors' expectations (Zbucki, 2023).

3. Methodology

The authors collected empirical data by conducting individual in-depth interviews (IDI) with representatives from Regional Tourism Organizations in Poland. For the purposes of the article, 15 interviews were carried out, each lasting between 45 to 75 minutes, with a total of 19 participants involved. The research process commenced in August and concluded in September 2024. The primary research tool was an interview guide, which included open-ended questions that allowed participants to freely and uninhibitedly express their opinions.

In qualitative research, sampling is understood as a method for collecting carefully selected “cases” that represent a set of empirical examples, facilitating thorough analysis of the phenomenon under study (intentional sampling) (Flick, 2010). Qualitative studies focus on in-depth analysis of a given phenomenon (Rószkiewicz et al., 2021) and allow for creative and flexible approaches. Methodologists note that these studies also require sensitivity to the socio-organizational contexts of participants (Glinka, Czakon, 2021).

The in-depth interview is a qualitative research technique that involves conducting individual conversations with a limited number of respondents to explore their perspectives on a specific topic. The authors opted for individual in-depth interviews (IDI) for several reasons: (1) they are useful when the problem requires detailed knowledge from participants; (2) they are applicable in studies involving hard-to-reach groups; (3) they not only assess but also help understand the formation process of a phenomenon and facilitate the free, open expression of opinions; (4) they foster a conducive atmosphere for intimate discussions (Bryman, Bell, 2007; McDaniel, Gates, 2010; Glinka, Czakon, 2021). The primary advantage of in-depth interviews is that they provide highly detailed information. However, the results are not representative and cannot form the basis for statistical inference.

Before collecting empirical data, the authors defined the exploratory goals and the research problem, and then formulated general interview questions. The research question was articulated as follows: What are the data collection needs of Regional Tourism Organizations regarding the volume of tourist flow in regions, and how do they assess the usefulness of the information gathered? The objective of the study was to gather opinions from representatives of Regional Tourism Organizations about the tools available for measuring tourist flow.

The empirical material obtained allowed the authors to address the following research questions:

- RQ1. What are the data collection needs of Regional Tourism Organizations regarding tourist flow?
- RQ2. How do Regional Tourism Organizations currently collect data on tourist flow?
- RQ3. What barriers hinder Regional Tourism Organizations from measuring tourist flow?

The interviews were recorded, transcribed, and then analyzed considering qualitative aspects. The analysis involved organizing the collected data and interpreting it. The research process followed these steps: data sorting, data reduction and coding, final interpretative analysis, and conclusion formulation (Gibbs, 2018). During data analysis, open coding was applied, which meant there was no preconceived conceptualization. The aim was to define key issues, not to impose interpretations of events based on previously formulated theories. This approach allowed for a deeper understanding of the needs and barriers faced by Regional Tourism Organizations. Thus, it was possible not only to identify difficulties and challenges in measuring tourist flow but also to propose specific solutions that could enhance the effectiveness of data collection and analysis in this area. The findings may also inspire future research in the field of data management concerning regional tourist flow.

All Regional Tourism Organizations operating in Poland were invited to participate in the study. Ultimately, 15 out of 16 Regional Tourism Organizations participated, including:

1. Lower Silesian Tourism Organization.
2. Kuyavian-Pomeranian Regional Tourism Organization.
3. Lublin Regional Tourism Organization.
4. Lodz Regional Tourism Organization.
5. Lesser Poland Tourism Organization.
6. Masovian Regional Tourism Organization.
7. Opole Regional Tourism Organization.
8. Subcarpathian Regional Tourism Organization.
9. Podlasie Regional Tourism Organization.
10. Pomeranian Regional Tourism Organization.
11. Silesian Tourism Organization.
12. Holy Cross Regional Tourism Organization.
13. Warmian-Masurian Regional Tourism Organization.
14. Greater Poland Tourism Organization.
15. West Pomeranian Regional Tourism Organization.

Participant characteristics were presented in Table 1.

Table 1.
Research Participants' Profile

IDI number	Characteristics of interview participants		
	IDI Participant Position	Gender	Research designation
1.	Director of the Office	M	E1
2.	Specialist in Organizational and Formal Affairs	F	E2
3.	Managing Director	M	E3
4.	Director of the Board Office	F	E4
5.	Director of the Office	M	E5
6.	Social Media Specialist	F	E6*
7.	Senior Specialist for Promotion and PR	M	E7*
8.	Director of the Office	F	E8
9.	Office Coordinator	M	E9
10.	Director of the Office	F	E10
11.	Deputy Director of the Office	F	E11
12.	Director of the Office	F	E12
13.	Office Coordinator	F	E13*
14.	Senior Specialist in the Tourism Division of the Department of Tourism, Sports, and Foreign Affairs, Marshal's Office	F	E14*
15.	Senior Specialist in the Tourism Division of the Department of Tourism, Sports, and Foreign Affairs, Marshal's Office	F	E15*
16.	Marketing Specialist	M	E16
17.	Director of the Board Office	M	E17
18.	Director of the Office	M	E18*
19.	Director of the Office	F	E19*

*the interview was conducted with the participation of two or three people at the same time.

Source: own elaboration.

The interviews were conducted with representatives of Regional Tourism Organisations who in most cases held management positions (directors or deputy directors) in these units or were in charge of marketing area, including promotion and social media. In each organisation, the director decided who would participate in the interview. These were employees with the most experience and knowledge in using data on tourist traffic in the region.

4. Results

Based on individual in-depth interviews, key areas and methods of collecting data on tourist flow in various regions were identified. The diversity of approaches and technologies used by Regional Tourism Organizations reveals a varied level of methodological advancement across regions. During the interviews, participants expressed their views on the needs and methods of gathering data on tourist flow and discussed the challenges and barriers that complicate this process.

Initially, interview participants were asked about their data needs regarding tourist flow, aiming to address the first research question (**RQ1**). Responses highlighted a clear demand for both quantitative and qualitative data about tourists. All interviewees emphasized the importance of regularly collecting this information, which is supported by the following statements: "without reliable data on the number of tourists and their behaviors, it is difficult to consider promoting and developing tourism in the region" (E19), "data on tourist preferences are essential for creating offers that meet their expectations" (E2), and "they are needed because they provide us with feedback, allowing us to identify areas that may require more promotion (...), and also facilitate future actions" (E16).

During discussions, representatives of Regional Tourism Organizations emphasized the need for more detailed, current, and comprehensive data on tourist flow in the region. According to research findings, the data needs of Regional Tourism Organizations were classified into five key categories:

- 1) Current/Operational – includes up-to-date data on the number of tourists arriving in the region, including their seasonality and intensity in different locations. Monitoring tourist flow dynamics helps analyze trends and supports adjusting actions to changing demand.
- 2) Developmental/Strategic – long-term planning for the development of tourism in the region requires comprehensive data on trends in tourist flow. Regional Tourism Organizations need analyses that include forecasts and changing traveler preferences to minimize the negative impacts of mass tourism and support sustainable development of the region.

- 3) Marketing, in terms of:
 - Tourist segmentation – the need to acquire demographic and behavioral data, such as age, origin, preferences, and spending patterns of tourists, which are crucial for precisely targeting promotional campaigns and developing offers that meet the specific needs of different tourist groups;
 - Assessing the effectiveness of marketing actions – the need to obtain data that enables the evaluation of marketing activities, which allows for the optimization of marketing strategies and efficient resource allocation.
- 4) Reporting – Regional Tourism Organizations are required to report the results of their activities to local authorities and stakeholders. Reliable data on tourist flow forms the basis for developing credible reports that can justify future plans, investments, and necessary financial support.
- 5) Cooperation and collaboration – needs reflecting the tourism industry's aim for integrated cooperation in data collection, which would help achieve common goals and enhance benefits for all members in individual regions.

In seeking answers to the second research question (**RQ2**), interview participants were asked about their previous experiences and methods of collecting data on tourist flow in the region. During the interviews, a few representatives of Regional Tourism Organizations indicated that they do not feel a shortage of data on tourist flow and consider the methods used so far for gathering information as satisfactory (E2, E10, E18, E19).

Identified methods of collecting data on tourist flow utilized by Regional Tourism Organizations for this article were classified into three groups.

The first group includes conducting primary research on tourist flow. Regional Tourism Organizations conducting detailed surveys using questionnaires in the field, for instance using tablets with an application that directly transmits results to the database of the Regional Tourism Organization (E2), represent a few cases in the country. Surveys cover major tourist centers but also (though much less frequently) smaller localities in the region, and the data obtained allow for the analysis of tourist routes and preferences of visitors. However, interview participants emphasized the lack of systematic collection of this data (E3, E5, E11). In the context of understanding tourists' needs and expectations, a representative of one of the Regional Tourism Organizations pointed out: "A few years ago we collected data (...), what tourists expect, what they need in different places throughout the region" (E4). Few entities analyzed conduct their own empirical research annually (E2) or every two years (E8).

The analysis of the results of the conducted studies indicates that the situation in other regions is quite different. Despite recognizing the need to have this type of data, Regional Tourism Organizations do not conduct systematic primary research on tourist flow, as evidenced by the following statements from participants: "we as a Regional Tourism Organization have never conducted our research (...), as for such regular studies on tourist flow, they have never taken place. These were things done pointwise in selected years" (E3),

"we do not conduct research in a formalized form" (E13) or another statement "we have a very big problem with this for many years (...). We should actually conduct research on tourist flow every year. Unfortunately, there is a lack of understanding in the decision-making bodies managing the province, hence there is a lack of funds" (E5). Despite highlighting in interviews that qualitative data about tourists constitute a valuable source of information for most Regional Tourism Organizations, there were also statements such as: "we do not collect qualitative data" (E13) or "in recent times, there have been no such regular studies" (E3).

In studies on sources of information used by Regional Tourism Organizations, particular attention during interviews was paid to statistical data and various information collected by local partners and tourist information points, classified in the article as desk research sources representing the second group of data on tourist flow. Data from the Central Statistical Office (Poland) are valued by interview participants for their systematic nature and repeatable methodology, which allows for identifying trends in tourist flow.

As one respondent noted, "Central Statistical Office data have the advantage of being collected systematically, based on a repeatable methodology of studies over many years, which allows building a trend line and searching for repeatable phenomena" (E6). However, the limitations of this data, such as the lack of information about day tourists or not including lodging facilities with fewer than 10 places, are significant problems in comprehensive analysis of tourist flow (E6, E8). As one participant emphasized: "These data are incomplete, because they depend on whether a given tourist facility fully transmits information. Moreover, Central Statistical Office data do not include day tourists (...). Data from tourist facilities are also incomplete, because not every tourist uses ticketed attractions, which can also lead to errors" (E6). On the other hand, there was also the following comment: "As far as trends are concerned – yes, these data are sufficient" (E8).

Regional Tourism Organizations also use data from local sources, such as statistics conducted by the administration of tourist attractions, tourist information points, or partner organizations. These provide detailed data on the number of visitors and their origins. This is evidenced by the following statement: "We have information from tourist information points, which provide us with valuable data. The number of tourists who visit these points often exceeds certain thresholds, which gives us important information (...), indicating the directions from which tourists come, which is very important for us" (E9). However, this process is not sufficiently satisfactory from the perspective of interview participants, as the lack of qualitative data limits the ability to fully understand the profile of tourists, their motivations, or ways of planning trips (E5, E8). As interview participants emphasize, it is important to regularly monitor tourists' opinions and collect them preferably in many different places such as tourist information points or cultural attractions and others (E1, E2, E3, E4, E9, E13, E14, E18, E19).

This is evidenced by the statement of one participant: "We collect information from our members, asking them to provide such data. These are both tourist attractions, so we ask for the number of guests who bought tickets or visited a given place (...). It is a far from satisfactory

method (...), but unfortunately, that's what it looks like. Thus, we do not have detailed information about who comes to us, why, from where they obtained such information and (...) from where they come to us" (E5). A similar position regarding data collection from ticketed attractions was presented by another participant: "For over 10 years we have been researching attendance at tourist attractions (...), it is done through the declaration of the number of tickets sold" (E17). For example, in the northern coastal region, data from partners, such as transport operators, the airport, and the highway manager, are also used, allowing for monitoring the flow of visitors at key entry points to the region (E3). Additionally, Regional Tourism Organizations use statistics from websites and social media to estimate tourist flow (E8, E12, E16).

Moreover, Regional Tourism Organizations use industry studies, provincial city studies, or publicly available reports, as confirmed by the following statements from participants: "We also read reports published by the Polish Tourism Agency and other studies commissioned by it, which allows us to obtain a broader, albeit general, knowledge" (E6) or "Since 2007, we have been using the same research method – the annual Omnibus Study" (E10).

Increasingly, modern technologies such as bicycle and multimodal traffic counters are used in the analysis of tourist flow, which allows for precise monitoring of the number of visitors and analyzing hourly and daily trends. As emphasized in one of the interviews: "the method we have been using for several years are bicycle counters based on induction loops (...), we also tested a multimodal counter that counts cyclists, pedestrians, and cars" (E13).

Data collected in this way are systematically analyzed by Regional Tourism Organizations to develop conclusions about the seasonality and congestion of tourist infrastructure in the region (E3). However, from a methodological perspective, relying on information obtained exclusively from lodging facilities, without the obligation of reporting, leads to significant distortions in the picture of reality. As a result, studies based on such incomplete data do not reflect the actual scale of tourist flow, which limits their usefulness in planning and managing tourism at the regional and national levels.

Experts in their statements emphasized the growing importance of data derived from mobile phone traffic analysis, classified in this article as the third group of data on tourist flow. Regional Tourism Organizations that have purchased data from tracking mobile devices are still few cases in the country (E2, E4, E17, E18, E19). Experts recognize the potential of Big Data analysis in the context of improving the quality of studies on tourist flow in regions and planning promotional activities (E12). As one respondent noted: "For the past three years, we have also been conducting research using the Big Data method (...). Thanks to this method, we receive data on the number of tourists, where they came from, and how long they stayed, but we cannot examine other parameters, such as how much money they left" (E10). This approach provides valuable information on the dynamics of tourist flow, although it still has its limitations.

Another study participant pointed to the role of Big Data in tourism research, noting that: "having Central Statistical Office data and Big Data, we use them primarily to get a picture of what tourist flow in the region looks like" (E18). Moreover, as emphasized in another statement, data based on Big Data technology are more precise and reflect the real picture of the tourism market, which is changing due to the development of new forms of accommodation: "Big Data is to some extent more reliable. Central Statistical Office surveys lodging facilities with more than 10 people, which with a market that largely consists of apartments, some sales systems through applications, accommodations and so on, provides a more true picture resulting from applications, studies. This helps us understand where most people are" (E18).

Such technologies allow for even more accurate monitoring of tourist flow in regions, which can provide valuable information in the context of developing tourism based on the actual needs and preferences of visitors. In the context of these statements, data based on mobile phone and Big Data are gaining importance, offering not only a more precise picture of tourist flow but also indicating directions for future research and analysis. Sources of data acquisition about tourist flow indicated by interview participants are presented in Figure 1.



The size of the font used reflects the frequency of mentions during the interviews.

Figure 1. Sources of information on tourist flow used by Regional Tourism Organizations.

Source: Own development using Word Art.

It should be emphasized that all interview participants employ a multi-faceted approach that integrates various (and regionally available) sources of data on tourist flow. This is evidenced by statements such as, "we use three methods from which we triangulate data" (E2), and "we need to compile all these sources and compare them. Only then can we extract the best and most reliable answers" (E4). According to the interview participants, diversity is necessary because while Big Data, commissioned from external companies, assists in analyzing the number of tourists, primary research allows for a better understanding of tourists' opinions about the region (E2, E18, E19). However, most experts pointed out the need to expand the

scope of data collected on tourist flow in the future compared to current efforts. This is indicated by the statement: "we always lack qualitative information. I would like to have more data, especially in the context of using Big Data" (E8).

Regional Tourism Organizations most commonly utilize a combination of data obtained from field surveys and information provided by local business partners (E1, E2, E4, E9). The triangulation of results and obtaining a fuller picture of tourist flow was emphasized in the following statement: "However, I imagine that ideal research for regions, conducted year to year, should be a mix of data – from credit card users, through mobile phone data, to information concerning airports, ferry terminals, or entry to attractions. Additionally, data on why tourists appear in the region and what happens during their stay are useful" (E3). This is also confirmed by another expert: "I think we need to compile all these sources and compare them. Only then can we extract the best and most reliable answers to the questions that concern us" (E4).

In seeking answers to the third research question (**RQ3**), interview participants were asked about the barriers that hinder the measurement of tourist flow in their region. The obtained responses are presented in Figure 2.



The size of the font used reflects the frequency of mentions during the interviews.

Figure 2. Barriers to measuring tourist flow in regions identified during interviews.

Source: Own development using Word Art.

Based on the research results, four main barriers related to measuring tourist flow were identified:

- 1) Financial barrier – associated with the high costs of conducting research and acquiring data.
- 2) Organizational barrier – linked to the lack of appropriate structures, systems, or coordination of research activities within Regional Tourism Organizations.
- 3) Personnel barrier – related to the attitudes of institutional employees, including reluctance to share information, fears, and resistance to cooperation in terms of collecting and sharing data.
- 4) Social barrier – associated with tourists' attitudes, referring to their reluctance to participate in research due to concerns about privacy, time, or lack of awareness of the purpose of the studies.

The most significant barrier, as indicated by respondents during the interviews, is the financial barrier. It results from the high costs associated with conducting their own research or outsourcing it, as well as purchasing data derived from mobile telephony. This is confirmed by the following opinions: "We continuously lack comprehensive statistics that could cover various areas. Wanting to conduct qualitative research, we have to specially order it, which is expensive" (E13, E14) and "We are one of the smallest Regional Tourism Organizations in terms of budget in Poland, which also prevents us from taking a systematic approach to research. We do not have the funds for it, and on the other hand, the world has moved forward so much that returning to paper surveys is now completely pointless, because it is an expensive study" (E11). It is worth emphasizing that all participants confirmed that acquiring data on tourist flow is highly costly.

The next significant barrier turned out to be the organizational barrier, related to the lack of proper structures and human resources to conduct systematic research. Respondents pointed to difficulties in organizing research activities, especially in smaller units that do not have sufficient funds or an adequate number of employees to conduct large-scale studies.

Additionally, interview participants emphasized that the negative attitude of local partners towards sharing data and a general reluctance to share information constitute a serious barrier identified as personnel-related. This issue affects representatives of various institutions and organizations. Resistance from the managers of institutions and employees of cooperating organizations, who are not always open to collaboration in terms of data exchange, was also highlighted. Moreover, participants pointed out difficulties arising from a lack of trust in the quality of data provided by other entities, which exacerbates concerns about the reliability and accuracy of the information collected in this way.

A social barrier, difficult to overcome, though less frequently mentioned during the interviews, was also the reluctance of tourists themselves to participate in research. This is particularly evident when collecting qualitative data, which requires the engagement of tourists and is time-consuming.

During the interviews, several difficulties related to the data collection process were pointed out (Figure 3), which were linked to the previously identified barriers. Interview participants highlighted the lack of a coherent and coordinated approach to data collection within the activities undertaken by Regional Tourism Organizations. The fragmentary nature of the collected information was also emphasized, which is often difficult to compare due to the diversity of research methods used in different regions. The absence of a unified monitoring system and irregularity in analyzing tourists' opinions posed additional challenges. Varied methodological approaches limit the possibilities for analysis and complicate the drawing of conclusions and identification of trends. Moreover, the insufficient engagement of employees responsible for conducting research proved problematic, which in some cases hindered the continuity and reliability of research processes. There was an indication of the need to improve work organization and increase staff motivation to ensure, for example, the systematicity and precision of conducted research.

the data is fragmented
 lack of a cohesive system
 diverse methodological approaches to data collection
 each region does it differently
 lack of systematic data gathering
 the data is difficult to compare
 irregularity in monitoring tourists' opinions
 the issue of employee involvement

The size of the font used reflects the frequency of mentions during the interviews.

Figure 3. Difficulties in measuring tourist flow in regions.

Source: Own development using Word Art.

In various provinces, one can observe different approaches to researching tourist flow. Only a few Regional Tourism Organizations regularly conduct survey studies, which allow for understanding the opinions and experiences of tourists. Data on tourist flow, although fragmentary, are also collected at tourist information points and in popular tourist spots, enabling the adaptation of reports to the specifics of local needs and monitoring changes in tourist flow throughout the year. Another group consists of data derived from the use of advanced digital tools, including Big Data and analyses based on mobile telephony. From the perspective of representatives of Regional Tourism Organizations, to obtain as complete a picture as possible of tourist flow in a region, it is essential to combine various sources of information, with special emphasis on Big Data, industry reports, and their own research, which are considered by IDI participants as the most reliable sources.

5. Discussion

The interviews conducted enabled the identification of barriers and challenges associated with measuring tourist flow by Regional Tourist Organizations, as well as an understanding of their needs and practices regarding data collection. The results confirmed a need for the accumulation of reliable and accurate tourism flow data. This general need, articulated in interviews, was specified in detailed justifications, which were categorized as follows (RQ1): operational/current, developmental/strategic, marketing, reporting, and related to the implementation of activities focused on cooperation with other tourism market entities.

The findings from the interviews provided valuable knowledge about the practice of collecting data on tourist flow (RQ2). Regional Tourist Organizations fulfill their statutory tasks in this area by selecting one, two, or three of the following options: conducting primary research on tourist flow, analyzing secondary data on tourist flow, and analyzing data from mobile phone traffic analysis. These methods are considered the most traditional, aligning with methods indicated by other researchers. Wolf, Hagenloh, and Croft (2012) evaluated four techniques for monitoring visitors to a site, concluding that GPS tracking of tourists is the most reliable and provides the most detailed data. However, they considered conducting primary surveys among tourists as a supplementary method, noting that surveyed tourists do not always accurately recall all visited sites and vary in their ability to describe them. Real-time location information from mobile phones is used to monitor tourist flows and analyze behavior at specific tourist attractions (Qin et al., 2019), with the significance and utility of these data also highlighted by interview participants. In some cases, methods used for analyzing and predicting precise tourist flow in popular tourist sites in real time are based on more complex neural network models that utilize data from multiple sources (Lu et al., 2020); however, these are methods not yet employed by the Regional Tourist Organizations analyzed in the article.

Own research conducted for the article allowed for the creation of an extensive list of categories of barriers that, according to the declarations of representatives of Regional Tourist Organizations, hinder the measurement of tourist flow (RQ3). Among these constraints, the following barriers were identified: financial, organizational, personal, and social. Barriers related to measuring tourist flow were also studied by Gul et al. (2023). According to their results, the main limitations to reliable measurement of tourist flow include technical and methodological barriers. Additional challenges are associated with inaccurate measurement of tourist flow by the devices and technologies used (Rogowski, Piotrowski, 2022), with this aspect also highlighted during the interviews, particularly in the context of collecting such information only in selected locations. Entities involved in measuring tourist flow often conduct superficial research, focusing, for example, on counting the number of tourists but not delving into the motives for their arrival or analyzing behavior at the site (Buckley et al., 2008). The results obtained in the interviews thus indicate a greater number of barriers encountered by Regional Tourist Organizations in Poland than those discussed in the literature, allowing for a more comprehensive view of the issues related to measuring tourist flow.

6. Conclusion

The conducted research facilitates an understanding of the functioning of the tourist flow measurement system in Poland. An analysis of in-depth interviews with representatives of Regional Tourist Organizations has identified key areas requiring improvement. The study

highlighted a fundamental need for access to current quantitative and qualitative data on tourist flow, with particular emphasis on the need to develop a uniform methodology for data collection at the national level, coordinated by the Polish Tourist Organization. Regional Tourist Organizations currently employ varied data collection methods, integrating traditional approaches with modern ICT technologies. However, the research indicates that the level of methodological advancement significantly varies between regions. Identified barriers to measuring tourist flow focus on four main areas: financial (insufficient funds), organizational (limited staff and time resources), personal (negative attitudes of institutional employees, including reluctance to share information), and social (tourists' reluctance to participate in studies). A solution to overcome these barriers may be found in the proposal by the authors for an integrated system of tourist flow monitoring through cooperation between Regional Tourist Organizations, local authorities, business, and the academic community, and the implementation of modern technologies, especially in the area of Big Data and mobile analytics aimed at developing a dedicated mobile application to streamline the measurement of tourist flow.

The research results also provide a basis for formulating recommendations for tourism policy at the regional and national levels. Further actions by the research team will focus on developing models of intersectoral cooperation and research methodologies that take into account the specifics of the Polish tourism market in the context of ongoing technological and social changes.

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ASSESSMENT OF SATISFACTION WITH ENTREPRENEURIAL EDUCATION AMONG GENERATION ALPHA

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Purpose: The study aims to examine student satisfaction with entrepreneurial education among Generation Alpha in Poland. It seeks to identify strengths, gaps, and unmet needs within current educational practices and to formulate evidence-based recommendations for improving the quality, relevance, and inclusiveness of early-stage entrepreneurial education.

Design/methodology/approach: The study employed a structured questionnaire survey among 252 students aged 7-12, using a simplified, gamified format tailored to their developmental stage. The data were analyzed using three complementary tools: the Student Satisfaction Index, Importance-Performance Analysis, and Importance-Satisfaction Gap. This integrated methodological design enabled the quantification of satisfaction levels, prioritization of improvement areas, and precise diagnostic insight into perceived educational quality from the learner's perspective.

Findings: The study found that while students assign high importance to entrepreneurial skills, their satisfaction with practical implementation – particularly in areas such as financial literacy, project execution, and school-based initiatives – remains comparatively low. Socio-demographic analysis revealed that students from rural areas and those aware of their parents' entrepreneurial background reported higher levels of satisfaction. The application of a combined framework integrating structured satisfaction metrics, performance prioritization, and gap analysis was effective in identifying latent discrepancies not captured by conventional assessment methods.

Research limitations/implications: The study is limited to a single region in Poland, restricting the generalizability of findings to other socio-cultural contexts. Additionally, the exclusive use of quantitative methods limits the depth of interpretive analysis.

Practical implications: The findings support the need for more practice-oriented, context-sensitive, and personalized pedagogical strategies. Recommendations include strengthening financial and managerial competencies in everyday learning, clarifying the practical value of civic elements, and tailoring content to reflect students' socio-demographic backgrounds.

Social implications: By enhancing the design and delivery of entrepreneurial education at earlier stages, the study contributes to equipping Generation Alpha with essential 21st-century skills, including initiative, responsibility, and problem-solving.

Originality/value: This paper is among the first to apply a structured and multi-dimensional evaluation framework that integrates satisfaction measurement, performance analysis, and diagnostic gap identification to assess entrepreneurial education among Generation Alpha.

Keywords: entrepreneurial education, generation alpha, satisfaction index, importance-performance analysis.

Category of the paper: Research paper.

1. Introduction

The fundamental role of Entrepreneurial Education (EE) in shaping 21st-century skills has been consistently confirmed by researchers and policymakers, leaving little doubt about its importance (Council of the European Union, 2018; Rodriguez, Lieber, 2020).

Despite this recognized significance, EE has not yet been fully integrated into compulsory education systems. This shortfall is attributable to multiple factors, including insufficient methodological and personnel support, as well as the persistent conservatism of national education systems.

According to the Global Entrepreneurship Monitor (GEM), the Entrepreneurial Education at School (EES) indicator ranked last among all thirteen Entrepreneurial Framework Conditions in 30 out of 49 participating economies in GEM 2023, clearly identifying it as the weakest element of national entrepreneurial ecosystems. Notably, EES received a score of 5 or higher – on a scale from 0 to 10, indicating sufficiency or better – in only five economies, while over half of the countries recorded average scores below 3.0, confirming the persistent weakness of school-level entrepreneurial education across most national contexts (GEM, 2023).

These persistent shortcomings have increasingly gained attention at both the expert level and in broader public discourse, prompting debates, media engagement, and public appeals from educators, entrepreneurs, and civic actors (Education Business, 2022; Carvalho et al., 2022). This rising visibility underscores the urgency of policy-level reform and reflects widespread concerns regarding the relevance and inclusiveness of current educational models.

At the same time, Generation Alpha (born after 2010) has fully entered primary and lower secondary education (corresponding to levels 1 and 2 of the International Standard Classification of Education – ISCED), replacing previous cohorts and demonstrating a high degree of digital literacy and an early interest in entrepreneurial activities (Visa, 2023; Tassin, Briggs, 2025). Despite growing interest in EE at these levels, the field continues to suffer from a lack of standardized curricula, pedagogical coherence, and quality assurance mechanisms. Given the low degree of formalization of EE in early education, student satisfaction has

emerged as a valuable – sometimes the only available –indicator for evaluating program effectiveness and identifying improvement areas.

A critical gap in current research concerns the lack of effective methods for systematically assessing both the quality of entrepreneurial education and student satisfaction with it at the primary and lower secondary levels. While structured satisfaction indices are commonly applied in higher education (McLeay et al., 2017), their use among younger learners remains largely underexplored, primarily due to the absence of age-appropriate instruments.

This study aims to examine satisfaction with EE among Generation Alpha, with the goal of supporting its systematic improvement through the application of the Student Satisfaction Index (SSI) and Importance-Performance Analysis (IPA). This approach provides valuable insights for policymakers, educators, and curriculum developers, offering actionable recommendations for optimizing EE in line with the cognitive, emotional, and behavioral characteristics of Generation Alpha as a new cohort of educational service consumers.

2. Literature review

Despite significant differences in institutional approaches to the development of entrepreneurial education systems, the emphasis on entrepreneurial competencies has become a global priority. This is reflected in the strategic documents of various countries, and the European Union (EU) has officially included entrepreneurship as one of the eight key competences for lifelong learning (Council of the European Union, 2018). An analysis of EU framework documents on entrepreneurial education has shown that in secondary education, it is closely linked to the development of 21st-century skills but does not always include training in financial literacy, risk management, or the commercialization of ideas (Seikkula-Leino et al., 2021).

In contrast, the United States follows a decentralized paradigm in which entrepreneurial education is primarily promoted by non-governmental organizations that have developed national content standards serving as voluntary guidelines for individual states (Rodriguez, Lieber, 2020). Unlike the EU, where entrepreneurial education is often integrated into broader curricula, the U.S. model places a stronger emphasis on ensuring that students acquire practical business planning experience by the end of K-12 education (Solomon, 2007).

Despite growing attention, the accessibility and quality of entrepreneurial education at primary and lower secondary levels remain unresolved issues (Toutain et al., 2019; GEM, 2023). According to a study conducted across 33 countries, only 31.4% of schoolteachers reported having access to methodological guidelines for entrepreneurial education, including lesson plans, teaching scenarios, and examples of best practices (European School Education Platform, 2022). Similarly, in the United States, entrepreneurship courses remain rare in K-12

schools and are most often offered as electives or embedded within career and technical education programs, rather than being part of the core curriculum (Hussain, 2023).

With the emergence of Generation Alpha (born after 2010) in classrooms, the issue of accessibility and quality of entrepreneurial education has become particularly relevant. A UK-based study commissioned by Visa reveals that 76% of children aged 8-14 declare an intention to start their own business, run a small enterprise, or pursue a side hustle. Moreover, 78% reported earning money in the past year, with 43% using digital technologies to support these activities (Visa, 2023). This generation, characterized by high digital literacy, demonstrates entrepreneurial potential from an early age, necessitating a reassessment of educational strategies (Cassandra Report, 2022).

Primary and lower secondary schools remain largely unprepared to address this challenge, due to several systemic factors. First, entrepreneurship components are almost entirely absent from official ISCED level 1 and ISCED level 2 curricula (Brauckmann-Sajkiewicz, Pashiardis, 2022). In most cases, entrepreneurial competencies are developed through an interdisciplinary approach, often superficially incorporated into geography, mathematics, and social studies courses (Palmér, Johansson, 2018). Second, traditional teaching methods effective for Generations Y and Z fail to yield expected results for Generation Alpha (GWI, 2023). Generation Alpha students grow up interacting with artificial intelligence and touch-based technologies, learning through trial and error (Höfrová et al., 2024). This necessitates a revision of educational strategies at ISCED levels 1 and 2 and the adoption of new teaching methods incorporating gamification, tailored to the characteristics of the digital generation (Šramová, Pavelka, 2023).

As a result, many education systems lack a clear understanding of which knowledge, skills, and attitudes should be developed through entrepreneurship components at primary and lower secondary levels (Jardim et al., 2021; Carvalho et al., 2022), what educational materials should be used, and which methods would be most effective for Generation Alpha. The absence of standardized content has led to high variability in education quality across schools, with entrepreneurial education often relying on the enthusiasm and initiative of individual teachers rather than systematic policy implementation (González-Tejerina, Vieira, 2021).

Experts argue that the lack of standardization and regulation of entrepreneurship components at ISCED levels 1 and 2 – unlike core subjects such as mathematics, history, and geography – has made it difficult to effectively assess the development of entrepreneurial competencies (Pepin, St-Jean, 2019). As a result, developing robust methodologies for enhancing entrepreneurial education at the primary level remains a significant challenge.

Given this low degree of formalization, student satisfaction has emerged as a valuable – sometimes the only available – indicator for evaluating program effectiveness and identifying improvement areas (Oberman Peterka et al., 2015). Recent research indicates that despite its subjective nature, student satisfaction is increasingly recognized as a key metric in assessing education quality and effectiveness in compulsory schooling (Lodi et al., 2019). It reflects

students' perceived usefulness of education, engagement, and motivation, which directly correlate with improved academic outcomes (Simonsen, Rundmo, 2020). Experts also note that this approach expands opportunities for ISCED level 1 and 2 institutions, where student voices have traditionally been underrepresented, and attendance is mandatory (Van Der Scheer et al., 2018).

Although systematic studies specifically focused on assessing student satisfaction with entrepreneurial education at ISCED levels 1 and 2 remain limited, available research provides valuable insights into key trends and outcomes. For example, the Spanish *Junioremprende* program reported high student satisfaction due to its interactive format and focus on fostering initiative, creativity, and self-confidence (Maldonado Briegas et al., 2021). In Canada, evaluation of school-based entrepreneurial programs (Pepin, St-Jean, 2019) showed that students appreciated opportunities to launch real ventures, collaborate in teams, and experience ownership. In Sweden, findings revealed that students were most satisfied with value-creation projects aimed at helping others, while projects focused only on idea development were perceived as less meaningful (Lackéus, 2020).

These findings underline the importance of pedagogical design and experiential learning in shaping satisfaction with entrepreneurship education. This is especially relevant for Generation Alpha, whose learning preferences differ significantly from those of earlier cohorts. Traditional models often fail to meet their expectations, resulting in reduced engagement and satisfaction (Kato, 2024; Tsimayeu, 2024). Despite growing scholarly recognition of the need to adapt entrepreneurial education to Generation Alpha, empirical studies explicitly targeting this cohort remain scarce. In existing research with mixed-age samples, Generation Alpha is not delineated as a distinct analytical group, limiting the ability to generate generation-specific pedagogical insights (Bisanz et al., 2019; Gorenc et al., 2023; Jardim et al., 2023).

Assessing student satisfaction at the primary and lower secondary levels presents unique methodological challenges. Due to developmental differences in attention, cognition, and communication, traditional research tools may not yield reliable results. As emphasized in recent work, effective measurement requires age-adapted, interactive methods designed specifically to capture satisfaction among younger learners (Dix et al., 2023).

Among well-established methods for assessing student satisfaction, two approaches stand out for their structured design and practical utility. The Customer Satisfaction Index (CSI), originally developed for service quality evaluation, integrates multiple dimensions of the student experience into a single model, providing quantifiable insights and highlighting areas for enhancement (Santini et al., 2017). In turn, Importance-Performance Analysis (IPA) compares perceived importance with satisfaction to determine priority areas for targeted improvement (McLeay et al., 2017). Together, these methods enable a structured and effective approach to improving entrepreneurial education.

Although widely applied in higher education, CSI and IPA remain underutilized at ISCED levels 1 and 2. Nevertheless, preliminary studies show promise for their adaptation in early education, particularly in contexts where entrepreneurial curricula are not yet formalized (Yanova, 2015; Chiou et al., 2024).

Despite increasing interest in student satisfaction and entrepreneurial education, significant gaps remain. Addressing these gaps requires targeted, systematic research focused on Generation Alpha in primary and lower secondary contexts. This includes: (a) developing age-appropriate assessment tools for this cohort; (b) applying reliable methodologies that combine structured satisfaction metrics such as CSI and IPA. A systematic assessment of student satisfaction among Generation Alpha can help schools identify areas for curriculum and instructional improvement, ultimately enhancing the quality, relevance, and impact of entrepreneurial education.

3. Research methodology

This study employed a structured questionnaire survey conducted in 2022 among primary school students of Generation Alpha (born after 2010) in Poland's West Pomeranian Voivodeship. The aim was to assess their satisfaction with entrepreneurial education as direct consumers of educational services.

The research was part of a broader study on entrepreneurial education at the primary level, covering three interrelated thematic blocks: (1) satisfaction with the quality of entrepreneurial education, (2) entrepreneurial attitudes and intentions, and (3) entrepreneurial competencies.

The questionnaire comprised 24 questions, including 18 core items and six socio-demographic variables. The present article focuses exclusively on the first thematic block – student satisfaction with entrepreneurial education – while the results of the second block are presented in a separate publication (Tsimayeu, 2023).

The target population consisted of students aged 7 to 12, enrolled in grades 2 to 6 of primary schools. A simple random sampling method was applied. All respondents met the inclusion criteria: residence in the study region and attendance at the same school for at least 12 months. A total of 259 students were surveyed, of whom 244 submitted fully completed and valid responses to the first thematic block (response rate – 96.8%).

Data collection was carried out using the PAPI (Pen and Paper Personal Interview) method under the supervision of trained researchers. The questions were structured using age-appropriate phrasing, simplified syntax, and accessible vocabulary. To enhance engagement and reduce stress among respondents, the survey incorporated gamified elements, including a star-based visual rating system.

Each of the 15 entrepreneurial skills and knowledge areas was evaluated twice on a 7-point Likert scale: first in terms of perceived importance (from “definitely not important” to “definitely important”), and later in terms of satisfaction (from “definitely dissatisfied” to “definitely satisfied”) regarding how well each element was implemented in school.

To avoid cognitive anchoring and encourage independent judgment, the survey used a methodological decoupling technique: importance ratings were collected at the beginning of the questionnaire, while satisfaction ratings were recorded near the end. This structural separation aimed to reduce response bias and increase diagnostic precision.

In line with the study’s objectives, three analytical tools were used to assess and interpret student satisfaction with entrepreneurial education:

1. Student Satisfaction Index (SSI). To assess satisfaction, the Student Satisfaction Index was calculated using Equation (1):

$$SSI = \left(\frac{\sum_{i=1}^n \left(\frac{MIS_i}{\sum_{i=1}^n MIS_i} \times MSS_i \right)}{MPS} \right) \times 100\% \quad (1)$$

where:

SSI – Student Satisfaction Index, expressed as a percentage;

MIS_i – Mean Importance Score for item i , calculated as the arithmetic mean of respondents’ importance ratings;

MSS_i – Mean Satisfaction Score for item i , calculated as the arithmetic mean of respondents’ satisfaction ratings;

n – Total number of assessed attributes;

MPS – Maximum Possible Score, defined by the 7-point Likert scale used in the study.

SSI was calculated and interpreted based on the author’s adaptation of the evaluative model proposed by Irawan (2003), which classifies results into five levels of satisfaction:

81.00-100.00 – “Very satisfied”;

66.00-80.99 – “Satisfied”;

51.00-65.99 – “Quite satisfied”;

35.00-50.99 – “Less satisfied”;

0.00-34.99 – “Not satisfied”.

2. Importance–Satisfaction Gap (ISG). To identify mismatches between students’ expectations and their perceived satisfaction, the Importance–Satisfaction Gap (ISG) was calculated using Equation (2):
3. Entrepreneurial Education Priority Matrix (EPPM). To analyze the strengths and weaknesses of entrepreneurial education, the Entrepreneurial Education Priority Matrix was applied. This matrix, developed based on the IPA approach (Martilla, James, 1977), includes the following components:

- A two-dimensional matrix with the Y-axis representing MIS and the X-axis representing MSS;
- Division into four quadrants: (1) “Concentrate Here,” (2) “Keep Up the Good Work,” (3) “Low Priority,” and (4) “Possible Overkill”;
- Quadrant boundaries established using the mean values of MIS and MSS across all attributes.

A pilot study was conducted with 26 students to test the clarity, usability, and psychometric reliability of the questionnaire. Based on the pilot, minor adjustments were made to improve comprehension. Reliability testing of the main instrument showed high internal consistency, with Cronbach’s alpha at $\alpha = 0.90$, indicating robust reliability (threshold $\alpha > 0.60$).

4. Empirical results

As shown in Table 1, the sample of 252 primary school students was relatively balanced by gender and included respondents from all targeted age and grade groups, as well as from both urban and rural areas of varying sizes. In line with the sampling design, the students were stratified into four grade-level groups (grades 2-3, 4th grade, 5th grade, and 6th grade) and four corresponding age groups (7-9, 10, 11, and 12 years). Older students (12 years old and 6th grade) constituted the largest proportion of the sample, which aligns with demographic trends in the West Pomeranian Voivodeship, where a decline in birth rates has been observed since 2010 (Statistics Poland, 2017).

Table 1.
Demographic profile (N = 244)

№	Indicator	Options	Structure, %
1	Gender	girl	50.97
		boy	49.03
2	Age	7-9 years	19.63
		10 years	20.06
		11 years	27.98
		12 years	32.33
3	Place of residence	village	23.65
		city of up to 50K population	29.92
		city of 51K-300K population	24.40
		city of over 300K population	22.03
4	Grade	2-3 grade	16.26
		4th grade	24.13
		5th grade	23.21
		6th grade	36.40

Source: Own study.

Table 2 presents the results of the student satisfaction assessment related to entrepreneurial education, structured across three main domains: Core Entrepreneurial Education, Entrepreneurial Culture, and Entrepreneurial Civic Education. The overall SSI for entrepreneurial education reached 66.65%.

Table 2.
Entrepreneurial education satisfaction analysis

№	Skill/Competency	MIS	MSS	ISG	SSI	Satisfaction Level
1.	Core Entrepreneurial Education	5.37	4.77	-0.60	68.21%	Satisfied
1.1	Developing own ideas and creating plans	5.18	4.60	-0.58	65.67%	Quite satisfied
1.2	Recognizing personal talents	5.81	5.43	-0.38	77.58%	Satisfied
1.3	Planning expenses and saving money	5.62	4.87	-0.75	69.62%	Satisfied
1.4	Selling products and earning money	4.78	4.26	-0.52	60.85%	Quite satisfied
1.5	Carrying out individual projects and tasks	5.34	4.59	-0.75	65.56%	Quite satisfied
2.	Entrepreneurial Culture	5.19	4.77	-0.42	68.17%	Satisfied
2.1	Finding good solutions to conflicts	5.27	4.89	-0.38	69.88%	Satisfied
2.2	Effectively communicating personal stories	4.25	4.09	-0.16	58.46%	Quite satisfied
2.3	Describing a future profession	4.98	4.64	-0.34	66.22%	Satisfied
2.4	Creating new useful objects from materials	4.55	4.53	-0.02	64.69%	Quite satisfied
2.5	Organizing events and interacting with people	5.13	4.47	-0.66	63.91%	Quite satisfied
2.6	Setting and achieving difficult goals	5.74	5.00	-0.74	71.43%	Satisfied
2.7	Utilizing personal strengths and talents	6.07	5.47	-0.60	78.20%	Satisfied
3.	Entrepreneurial Civic Education	4.60	4.17	-0.43	59.62%	Quite satisfied
3.1	Engaging in charitable activities	4.82	4.46	-0.36	63.76%	Quite satisfied
3.2	Presenting evidence to support opinions	4.84	4.33	-0.51	61.90%	Quite satisfied
3.3	Participating in volunteer work	4.04	3.64	-0.40	51.93%	Quite satisfied
	Entrepreneurial Education	5.15	4.67	-0.48	66.65%	Satisfied

Source: Own study.

Among the three domains, Core Entrepreneurial Education demonstrated the highest aggregate satisfaction (SSI = 68.21%). Within this category, the highest satisfaction score was recorded for Recognizing personal talents (SSI = 77.58%), while the lowest was associated with Selling products and earning money (SSI = 60.85%). The most important competency, according to student ratings, was Planning expenses and saving money (MIS = 5.62), which also revealed the largest importance–satisfaction gap (ISG = -0.75).

The domain of Entrepreneurial Culture yielded a comparable SSI value of 68.17%. The highest satisfaction in this category was associated with Utilizing personal strengths and talents (SSI = 78.20%), whereas Effectively communicating personal stories received the lowest satisfaction score (SSI = 58.46%) and the lowest importance rating (MIS = 4.25). Setting and achieving difficult goals was rated as the most important competency (MIS = 5.74) and was also linked to a significant gap (ISG = -0.74).

The lowest domain-level satisfaction was observed for Entrepreneurial Civic Education, with an SSI of 59.62%. The competency Participating in volunteer work received the lowest satisfaction score across all categories (SSI = 51.93%) and was also rated lowest in importance (MIS = 4.04). Presenting evidence to support opinions had the highest importance in this domain (MIS = 4.84) and demonstrated a moderate gap (ISG = -0.51).

Table 3 details satisfaction levels with entrepreneurial education across various socio-demographic groups. Female respondents demonstrated marginally higher overall satisfaction (SSI = 67.11%) compared to their male counterparts (SSI = 66.26%). When analyzing satisfaction according to respondents' place of residence, students from rural areas reported the highest overall SSI (70.68%), whereas those from large urban areas (cities exceeding 300,000 inhabitants) exhibited the lowest overall satisfaction (SSI = 60.30%). Grade-level analysis revealed that the highest satisfaction was among 6th-grade students (SSI = 69.87%), with 4th-grade students reporting the lowest satisfaction levels (SSI = 60.32%).

Table 3.

Entrepreneurial education satisfaction by socio-demographic groups

Indicator	Options	SSI, %			
		Core Entrepreneurial Education	Entrepreneurial Culture	Entrepreneurial Civic Education	Overall
Gender	girl	69.56	68.35	59.00	67.11
	boy	67.02	68.01	60.21	66.26
Place of residence	village	71.51	73.55	61.53	70.68
	city of up to 50K pop.	71.24	69.94	60.02	68.65
	city of 51K-300K pop.	65.21	69.29	58.45	66.01
	city of over 300K pop.	63.46	58.92	57.89	60.30
Grade	2-3 grade	69.85	70.88	59.69	68.41
	4th grade	64.32	59.51	54.84	60.32
	5th grade	68.93	69.08	54.64	66.58
	6th grade	69.36	72.04	65.16	69.87
Have any of your parents started a company?	No	68.64	68.77	59.35	67.07
	I don't know	62.84	58.91	52.83	59.12
	Yes	70.58	72.62	64.66	70.46
My parents have a higher education	No	70.43	72.13	67.51	70.70
	I don't know	66.31	63.80	53.26	62.79
	Yes, one	68.87	70.44	57.92	67.69
	Yes, both	69.37	70.82	64.46	69.16

Source: Own study.

Students whose parents possessed entrepreneurial experience had higher SSI scores (70.46%), while respondents uncertain about their parents' entrepreneurial background demonstrated notably lower satisfaction levels (SSI = 59.12%). In addition, respondents whose parents lacked higher education recorded the highest satisfaction (SSI = 70.70%), whereas the lowest satisfaction was indicated by students unsure of their parents' educational status (SSI = 62.79%).

Figure 1 presents the Entrepreneurial Education Priority Matrix, which reflects a differentiated landscape of entrepreneurial competencies, highlighting areas where students' expectations are either fully met or remain unaddressed.

A clear concentration of core entrepreneurial competencies is observed in the upper quadrants, with several items – such as Recognizing personal talents and Utilizing personal strengths and talents – positioned in the Keep Up the Good Work area, indicating both high importance and high satisfaction.

At the same time, a cluster of competencies – Developing own ideas and creating plans, Carrying out individual projects and tasks, and Organizing events and interacting with people – are located in the Concentrate Here quadrant, reflecting areas of perceived significance that are not yet matched by corresponding satisfaction levels.

Most civic-oriented items are grouped in the Low Priority quadrant, suggesting limited perceived value and relatively low engagement. Notably, Describing a future profession stands out as the only competency placed in the Possible Overkill quadrant, indicating a potential misalignment between instructional emphasis and student-perceived relevance.

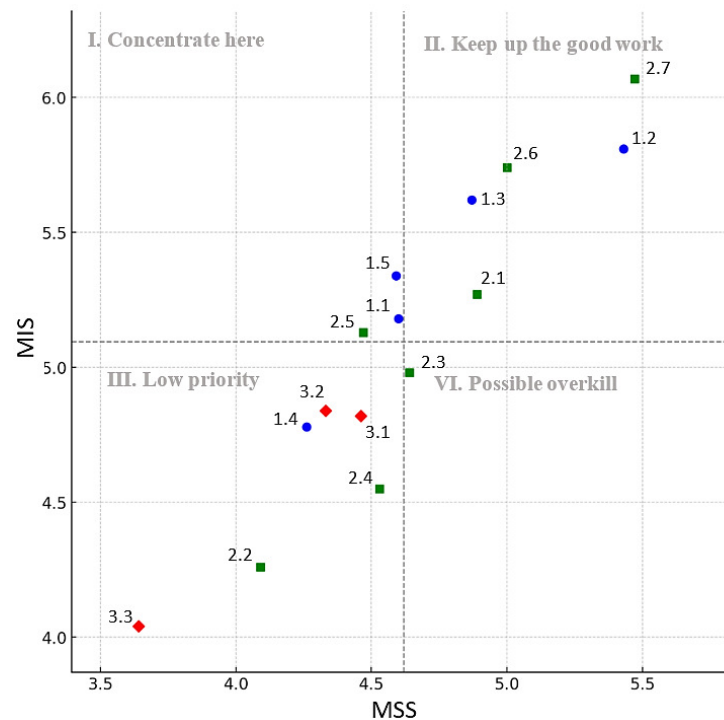


Figure 1. Entrepreneurial Education Priority Matrix.

Source: Constructed from own data based on the IPA model by Martilla & James (1977).

5. Discussion and conclusions

The conducted research indicates that assessing satisfaction and perceived needs among Generation Alpha provides relevant insights for educators, school administrators, and policymakers aiming to improve the quality of entrepreneurial education. Understanding which aspects of learning are most valued by this cohort of hyperconnected learners, which instructional methods they find most effective, and where significant gaps remain allows for the development of more systematic and adaptive approaches to entrepreneurship education at the school level.

Although the overall SSI score was relatively high (66.65%), lower satisfaction levels related to financial, managerial, and communication competencies are consistent with prior research by Pepin & St-Jean (2019), who noted that Generation Alpha increasingly demands a more practice-oriented approach to topics such as financial literacy, project management, and storytelling. These results underscore students' expectations for a more systematic and embedded integration of such content into everyday learning processes (Tsimayeu, 2024).

At the same time, the consistently low ratings in both importance and satisfaction concerning elements of Entrepreneurial Civic Education appear to reflect students' perception of these components as overly formal or disconnected from real-life contexts. This perception may arise from a limited awareness of the practical relevance of such competencies in everyday situations and future professional trajectories. This finding appears to diverge from recent survey data and expert assessments suggesting that Generation Alpha demonstrates a strong sense of social responsibility and engagement with community issues (Visa, 2023; Kato, 2024). These findings are nonetheless consistent with the conclusions of Studdard et al. (2016), who highlight the limited understanding of social entrepreneurship among students at early educational stages, often shaped by a stronger orientation toward individual achievement rather than collective or societal outcomes.

In this context, it is crucial to underscore that the perceived low importance of certain competencies does not necessarily reflect their objective secondary status or lack of relevance. Instead, it may point to a lack of clarity and persuasiveness on the part of educators in articulating the applied value of these skills for students' personal and professional development, which, according to Bisanz et al. (2019), represents a key barrier to the effective integration of civic-oriented content in entrepreneurship education.

The strategic prioritization of entrepreneurial education components using the EEPM and the IPA framework revealed that competencies particularly critical for Generation Alpha – and thus requiring targeted pedagogical focus – include the development of leadership, communication, and networking skills through the organization of events, as well as the ability to design and implement original ideas and projects.

To support a comprehensive and multi-layered assessment of entrepreneurial education, the analytical framework based on SSI and EEPM was extended through the integration of ISG. The inclusion of ISG enhances diagnostic precision by quantifying discrepancies between MIS and MSS.

The relevance of this integrated approach is illustrated by the evaluation of EE elements such as Planning expenses and saving money and Setting and achieving difficult goals. Both elements achieved satisfactory SSI scores (69.62% and 71.43%, respectively), which, when viewed in isolation, suggest adequate performance. However, the corresponding ISG values (-0.75 and -0.74) indicate significant gaps between perceived importance and satisfaction – gaps that were not reflected in the EEPM, as these elements did not fall into the Concentrate Here quadrant. Without the inclusion of ISG, such discrepancies would have

remained undetected, leading to a potential misjudgment of pedagogical priorities and the omission of areas requiring urgent instructional attention.

These findings are consistent with previous research by McLeay et al. (2017) and Julian et al. (2022), which emphasizes the added value of ISG in diagnostic analyses within satisfaction studies. Accordingly, SSI should serve as the foundational metric for general assessment, EEPM as a strategic planning tool, and ISG as a precision instrument for identifying latent discrepancies.

The results further indicate that students' perceptions of entrepreneurial education are strongly influenced by their socio-demographic context. A higher SSI among pupils from rural areas, compared to their peers in major urban centers, may reflect the use of more individualized or locally adapted approaches to integrating entrepreneurial content into the curriculum in smaller communities (Zollet et al., 2024). This disparity may also be linked to differences in the perceived practical value of entrepreneurial learning and to the more limited availability of educational programs and extracurricular initiatives in rural settings.

The analysis also shows that pupils who are unaware of their parents' entrepreneurial experience or educational attainment tend to report substantially lower satisfaction levels. This pattern suggests that awareness of one's family background may contribute to the formation of clearer educational expectations and a more positive perception of school-based entrepreneurial learning (Fidan, Arıcı, 2022). In contrast, the absence of family dialogue around education and career pathways appears to undermine students' ability to recognize the relevance of entrepreneurial elements in their learning. This observation reinforces the argument that open family communication regarding education and future planning plays a vital role in fostering students' meaningful engagement with school-based entrepreneurship education (Bae et al., 2014).

From a theoretical standpoint, the findings of this study make a meaningful contribution to the development of assessment and analytical approaches in entrepreneurial education targeted at Generation Alpha at the primary and lower secondary levels. By integrating new methodological elements, the study extends existing conceptual models and frameworks (Höfrová et al., 2024). In particular, the proposed comprehensive approach – combining SSI, EEPM, and ISG – addresses key limitations of traditional single-factor models used to evaluate educational quality and student satisfaction.

From a practical standpoint, the key findings of this study lead to several actionable recommendations for educators and policymakers:

1. Enhance the practical content and applied orientation of financial, managerial, and communication components within entrepreneurial education by integrating them more actively into students' everyday learning and project-based activities.
2. Revise instructional strategies for teaching social and civic competencies, with a focus on improving the clarity and persuasiveness of how their real-world relevance is communicated to students.

3. Adapt entrepreneurial education programs to reflect students' residential and family contexts, emphasizing the role of family engagement in shaping students' educational expectations and career-related discussions.

Despite the methodological rigor and analytical depth of this study, several limitations should be acknowledged. First, the sample was restricted to a single region, which limits the generalizability of the findings across diverse socio-cultural and educational contexts. Second, the exclusive reliance on quantitative methods constrained the ability to explore the underlying reasons behind low satisfaction levels or perceived importance of specific elements. These factors may affect the interpretive depth of the analysis and warrant caution when applying the results to broader educational environments.

Building on the present outcomes and taking these limitations into account, future research should incorporate qualitative approaches to gain a more nuanced understanding of students' motivations, expectations, and perceptions regarding the relevance of entrepreneurial education. Further studies are also needed to examine the relationships between satisfaction, the level of entrepreneurial competencies, and students' entrepreneurial intentions at the primary and lower secondary levels.

In conclusion, adopting a comprehensive and age-appropriate approach to assessing both satisfaction and perceived relevance of competencies in entrepreneurial education makes it possible to identify not only general satisfaction patterns, but also specific "pressure points" that call for immediate pedagogical and organizational action.

Building on these findings – and considering the growing scholarly consensus on the uniqueness of Generation Alpha as a future-defining cohort of educational service consumers – there is a clear need to develop long-term research agendas and adaptive educational strategies. These strategies should be specifically oriented toward anticipating changes in how Generation Alpha learns, what they expect from education, and which entrepreneurial competencies will be defined by the evolving social narratives of a rapidly developing and maturing generation of digital natives and hyperconnected learners.

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COMPETITIVE REGIONAL DEVELOPMENT AND THE COHESION POLICY OF THE EUROPEAN UNION AS A MEANS OF COUNTERACTING DEVELOPMENT DISPARITIES

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Purpose: The main objective of the article is to characterize and analyze the cohesion policy of the European Union in the context of competitive regional development and counteracting excessive development disparities. In implementing the formulated objective, it was assumed that cohesion policy should be evolve towards: greater networking, realising the endogenous potential of the regions, a holistic approach to the continent's space and strengthening Europe's position in global competition. It should also be based on a long-term strategic vision.

Design/methodology/approach: The article uses a method of analysis of literature in the field of regional studies referring to the problems of competitiveness in regional development. The reference point of the analyses are the main assumptions of the EU cohesion policy setting out the framework for the functioning of regions in the conditions of European integration. The thematic scope of the article includes an analysis of the basic factors and determinants of competitiveness in regional development, presentation of the main causes and dimensions of interregional development divergence and characterization of EU cohesion policy with particular emphasis on its impact on competitiveness and reduction of development disparities in the regional dimension. In the summary of the article, an attempt was made to outline a new model of cohesion policy. The challenges for regional cohesion policy in the context of contemporary global trends and transformations are also presented.

Social implications: The impact of the characteristics and analyses contained in the article may be manifested in the scope of objectives, directions and practices implemented by public authorities within the framework of pro-development regional policy. It can contribute to raising the awareness and knowledge of the regional community in terms of targeted, sustainable *and* competitive development at regional level within the context of the implementation of the priorities and principles of EU cohesion policy.

Originality/value: The value of the article is based on a focused analysis of the issue of competitiveness of regional development and showing its determinants in the perspective of EU cohesion policy. The characteristics and analyses of the subject issues contained in the article are included in the current of regional studies dealing with the issue of reducing disparities between regions and counteracting their backwardness through the implementation of programs and policies strengthening economic and social cohesion.

Keywords: Competitiveness, inter-regional development disparities, EU cohesion policy.

Category of the paper: General review.

Introduction

The models for action in the European Union's regional policy, individual countries and regions have two main options. The first (classic) is to compensate for development differences by supporting problem regions (lagging regions), so that they effectively reduce their development distance in relation to growth poles. The second is to maintain the economic diversity of development by supporting the strongest regions and increasing their development potential so that development impulses spread to peripheral and marginalized areas. This model, unlike the classic pattern, is an attempt to win, not even out the differences. It involves using diverse features, resources and predispositions of regional socio-economic structures and taking into account equally diverse conditions and threats of development in the processes of allocation of funds (Pyszkowski, 2000, p. 74).

The European Union's cohesion policy is the EU's main investment tool. It covers all regions and cities in the European Union. Its main objectives are to support job creation, stimulate the competitiveness of enterprises, economic growth and sustainable development and improve the quality of life of citizens. In order to achieve these objectives and meet the diverse development needs of all regions of the EU, more than EUR 350 billion was allocated to cohesion policy in the period 2014-2020, representing almost a third of the EU's overall budget. A fundamental principle of the EU is solidarity and regional policy (and within it cohesion policy) allows this to be put into practice, especially in less developed regions, regions with serious demographic problems or in geographically disadvantaged (peripheral) regions.

The pursuit of cohesion does not run counter to the pursuit of competitiveness. In practice, it is not possible to fully compensate for regional differences and disparities. The aim of cohesion policy is to achieve a state of development differences that are socially acceptable. There have always been significant territorial and demographic differences in the European Union, which have been an obstacle to the process of European integration and development. The first solidarity mechanisms were created under the Treaty of Rome in 1957 in the form of the European Social Fund (ESF) and the European Agriculture Guidance and Guarantee Funds (EAGGF Guidance Section). Since the European Regional Development Fund (ERDF) was set up in 1975, regional development has become a key part of its focus. In 1994, a pro-development mechanism was created to compensate for regional disparities in the form of the Cohesion Fund (CF). Since 2008 (signature of the Lisbon Treaty), the three dimensions of EU cohesion – economic, social and territorial cohesion – have been supported by cohesion policy and the structural funds.

Competitiveness at the regional level

The term “competitiveness” is used in two ways: dynamic and static. In a dynamic sense, referring to a longer period, it concerns the analysis of factors determining long-term ability to compete. In a static sense, it refers to the assessment of this ability at a specific time point. Competitiveness in the regional dimension is the subject of numerous studies, research and analyses (Gorynia, Łaźniewska, 2012; Czyżewska, 2012). A competitive region is one that “enables the creation of ever new structural combinations, by using human and material resources, giving the advantage of commercializing its products” (Klamut, 2008, p. 50). In order to increase competitive capacity, developed technical and social infrastructure and a network system of relations in the region are necessary. Knowledge and information are considered as the basis for the competitiveness of regions. From this perspective, the factors of regional competitiveness in the form of human capital, social capital, economic entities, innovation and institutional infrastructure are analyzed (Przygodzki, 2007, pp. 103-147).

In the context of globalization, the most significant processes significantly impacting the situation of regions, particularly their competitiveness, are metropolitanization and the increasing role of transnational corporations (Markowska-Przybyła, 2005, p. 94). Metropolisation is a phenomenon typical of the last phase of urbanization, consisting in the transformation of urban spaces and the change of the relationship between the city constituting the center and its immediate surroundings and the discontinuous use of urbanized spaces (Jałowiecki, 1999, p. 29). The most visible manifestation of metropolisation in the dimension of regional links is the break-up of the economic ties of the central city with its regional hinterland and the emergence of contacts with other metropolises on a continental or global scale. The strength of network links between metropolises is growing and the importance of traditional links in the center-periphery system is decreasing.

The second process determining the dynamics and direction of transformations on a global scale is the growing role of transnational corporations and the value and pace of international capital flows. The growing importance of international corporations can have both positive and negative consequences for countries and regions (Markowska-Przybyła, 2005, p. 97). On the one hand, the inflow of foreign direct investment is a condition for the development of the economy and a source of structural changes (Markusen, Venables, 1999). In order to increase competitiveness, regions are seeking foreign investment, as it means the influx of new production technologies, methods of organization and management, as well as improving the quality of production and improving labor productivity and skills of workers. In addition, they create new jobs, increase competitiveness between national actors, and new development impulses flow to the regional economy. On the other hand, the possible negative effects of foreign direct investment may be due to the fact that international capital is guided by the criterion of its own merits. The most significant threat may arise from a multinational

corporation monopolizing the market and making the local economy dependent on a dominant entity, which in the event of an investment withdrawal could lead to severe difficulties and disruption of the local labor market. (Markowska-Przybyła, 2005, p. 97). In addition, corporations often practice transferring profits and thus limiting the further development of a given area. Attracting foreign investment within the framework of regional policy must therefore be accompanied by a reliable diagnosis in terms of identifying the benefits and possible risks associated with it.

The competition, which is intensifying under the conditions of globalization, involves both regional and central authorities to be active in increasing the international competitiveness of individual regions and the country as a whole by undertaking the following integrated actions: (a) development and modernisation of technical and economic infrastructure and creation of conditions for undertaking tasks in this scope by the regions themselves; (b) creation of conditions for development and modernisation of social infrastructure in the form of schools, cultural, educational institutions, etc.; (c) creation of conditions for the development and modernisation of institutional market infrastructure, support for entrepreneurship and business services; (d) building a national and European economic information base for entrepreneurs and modernisation of statistical services; (e) creation of an environment conducive to the emergence and diffusion of innovation and absorption of new technologies; (f) shaping modern scientific staff and stimulating the activity of researchers; (g) stimulating innovation and disseminating research results among entrepreneurs; (h) building a learning, information society by disseminating access to national, European and world information networks; (i) conducting effective international promotion of regions and the country (Jałowiecki, Szczepański, 2002, p. 254).

An important task of regional policy is to support the competitiveness of regions, which is one of the ways to compensate for disparities in regional development (Winiarski 2000; Korenik, 2003; Wyszowska, 2005; Gorynia, Łaźniewska, 2012; Murzyn, 2016). The analysis of the literature shows that the competitiveness of the region is understood differently and studied using various methods (Bronisz, 2013). The authors of analyses in the field of regional development point to two levels of competitiveness of regions in the contemporary global economy. One is determined by the competitiveness of companies located in a given territorial system (region). The second level is the competitiveness of the territorial systems themselves, which seek new income-generating capital, create jobs for highly qualified employees, able to create innovations and use modern, advanced technologies and to manage large corporations (Gorzela, Jałowiecki 2000:8). Both aspects of competitiveness are closely linked. On the one hand, the conditions that regions create for doing business significantly affect the competitiveness of companies. Unfavourable conditions can lead to the collapse of companies or their relocation to places where they are better. In such a situation, the region is experiencing negative economic and social consequences. On the other hand, companies, especially

technologically advanced ones, are willing to locate themselves in places that offer the most favourable conditions for conducting business.

Regional competitiveness is sometimes understood as a permanent advantage of one region over another, resulting from its characteristics: attractiveness of the service offer addressed to current and potential users of the region; the most important strengths of the region; productivity and export strength (Klasik, 2002, pp. 99-100). Competitiveness is defined as direct and indirect (subjective) competition. Indirect competition consists in creating conditions of the regional environment for companies operating in the region in areas not controlled by their activities. Direct competition of regions is the competition of empowered territorial units in pursuit of various benefits (Markowski, 1997, pp. 39-40). An important source of creating competitive advantages may be the regional innovation system, which is a set of companies and institutions connected in a separate territory, oriented toward innovative action or conducive to innovation processes and innovation progress in the economy (Markowski, 2008).

Regional competitiveness is influenced by many factors, both external and internal ones, which can be classified into several groups (Łaźniewska, Czyżewska, 2011, pp. 28-29). The first is created by microeconomic factors, which include the availability of capital, access to codified and silent knowledge, and the quality of education. The second group includes macroeconomic factors in the form of territorial accessibility, research infrastructure and the industrial structure of the region. The third group of regional competitiveness factors consists of institutional and cultural elements: institutional infrastructure, mechanisms and models of governance in the region, the size of the local market, entrepreneurship supporting territorial development and cluster formation, local culture, creative environment for local development. The fourth group consists of spatial factors in the form of *spill-over* and benefits of agglomeration. The last group of factors determining regional competitiveness is defined as relational factors, the most important of which are networking cooperation and trust, which are the basis for joint learning of partners at regional level.

Equalization of regional disparities should consist in equalizing not the effects but the development opportunities. Competitiveness cannot mean supporting only strong regions, as this would lead to greater inter- and intra-regional disparities. Regional policy should not refer only to efficiency criteria. However, this does not mean accepting the second extreme model of supporting only weak regions. The optimal solution seems to be to increase the competitiveness of all regions, taking into account the existing conditions in them, and above all their own resources and development potentials, without excluding, if justified, redistribution of funds (Markowska-Przybyła, 2005).

Interregional disparities in development (in the light of theoretical analyses)

In the literature of the field of regional studies, two groups of theories of development of backward (peripheral) regions can be distinguished. The first refers to exogenous development and the second to endogenous development (Grosse, 2007, pp. 48-52; Zajdel, 2011; Tuziak, 2019, pp. 134-138). The basic assumption of the concept of exogenous development is that it is impossible to initiate the development of backward (marginalized) areas based only on their own resources, because they are often insufficient. This group of concepts assumes the natural process of spilling experience, technological innovation and capital from highly developed (central) regions to peripheral regions. Regions lagging behind should seek external investment capital to ensure technology transfer.

The concepts of exogenous development assume division into countries and regions creating advanced, innovative technologies and others, in which the role only boils down to the implementation of innovative solutions in the field of production and organization. In the exogenous paradigm, the low absorptive capacity of underdeveloped, peripheral regions, expressed, *inter alia*, in low efficiency in attracting external investors and in the use of development support funds, is considered to be a serious problem of the underdeveloped, peripheral regions (Isaksen, Tripppl, 2017; Sadowski, 2020). On the basis of the concept of exogenous development, a uniform, linear model of development is assumed, in which regions form a hierarchical structure. At the top there are megacities, and at the bottom peripheral areas with poor socio-economic condition, which are developing thanks to the spread of development processes from highly developed regions.

Endogenous development concepts assume that sustainable development should be based mainly on intra-regional factors (Stimson, Stough, Nijkamp, 2011; Tuziak, 2013; Olejniczak, 2016). The use of endogenous factors and the accumulation of capital and knowledge in the region offer an opportunity for the region to avoid development dependent on national centers and external investors. The efficient use of own resources and capacities also allows for mitigating the unfavorable dependency pattern typical of the dual economy, characterized by a clear differentiation between development instruments for central and peripheral areas (Grosse, 2007, pp. 51-52; Hryniewicz, 2010, pp. 5-27). On the basis of the concept of endogenous development, the principle of the free spilling of development from the centers to the periphery is questioned. It is stressed that free market processes promote the accumulation of capital, human resources, knowledge and entrepreneurship in the central regions, while peripheral areas are becoming increasingly marginalized. In this way, they become only a source of resources for dynamically developing centers.

Regions lagging behind in development have problems with activating the factors that allow the process of self-propagation of development within the regional cooperation network. It is difficult to initiate processes of capital accumulation, knowledge and innovation, as well

as social and institutional capital. The endogenous approach assumes that each region has its own unique set of features that create its development potential. At the same time, the importance of exogenous factors and the benefits of transferring the experience of external institutions (e.g. the European Union) is not denied, provided that they are adapted to regional specificities and development needs.

Spatial disparities in the development of regions resulting in the peripheral and marginalization of certain areas are the subject of analyses on the basis of the theory of growth poles (Perroux, 1955). According to this concept, economic development is not uniform but rather point-like, concentrated in the most developed enterprises, sectors, and branches of industrial production, forming so-called growth poles that drive the entire economy. These competitive, innovative and most advanced entities have a well-developed network of cooperative links (Ejsmont, 2019). They effectively gain a monopoly position, subjugating and making other entities dependent on each other. The emergence of the poles of growth is an economic and political process, a natural, inevitable result, and at the same time an indispensable condition for growth (Grosse, 2002, p. 28).

On the assumption that the imbalance of socio-economic development is the result of uneven growth of economic sectors and spatial disparities in economic development, the concept of geographical growth centers is based (Hirshmann, 1958). Thanks to the dynamism and expansiveness of the growth centers and the enterprises, clusters and economic sectors located in them, development is spread to neighboring regions (Korenik, Zakrzewska-Półtorak, 2011; Dyjach, 2013; Tuziak, 2019, p. 136). Geographical growth centers are therefore the main stimulator of development processes. Innovation is the basis for the polarization of development, and the accumulation of its effects in development areas gives these territorial units a dominant position in relation to less developed regions. Broadly understood, innovation is today the main endogenous resource for development at the regional level (Tuziak, 2013). It is the capacity to innovate that gives centers a dominant position and a competitive advantage in the economic sphere.

Analyses of spatially differentiated economic development lead to the conclusion that regional disparities and inequalities are the result of a long historical process in which economic, social and cultural factors accumulate and interact (Myrdal, 1957). Mutual strengthening and coincident of economic, political and cultural causes increase in the diversity of the level of development in space. The reasons for the widening of the development gap between central (highly developed) regions and peripheral (lagging) regions are explained by the mechanism of cumulative and circular causality, which is in fact a self-perpetuating vicious circle that deepens the development gap between central regions and the periphery. Increasing regional disparities mean that the growth poles, which are the places of concentration of new locations of various industrial activities, are developing faster and faster, and areas of economic stagnation are becoming increasingly subordinated to economic, political and cultural poles of growth. While there is a positive spillover effect of development from economic centers, it is

simultaneously accompanied by a 'brain drain' effect, which involves the draining of developmental resources from peripheral areas and their increasing dependence on highly developed regions (Zimoch, 2013; Proniewski, 2012). The regions (especially Central European regions) are characterized by variability in the level of development and thus in the degree of peripherality (Strojny, Niewiadomski, 2023).

Polarization and inequality in regional development is also indicated by the model of the core and periphery (Friedmann, 1969). The core are highly developed areas (mainly metropolitan centers), where the economic activities of the most competitive, innovative industries and enterprises are located. Core regions dominate the periphery not only in the economic, but also in the political and cultural spheres. They gain the advantage, among other things, by creating a network of territorial systems characterized by a high level of capacity for innovative change. Economic centers contribute to initiating and stimulating the development process in backward and peripheral regions, but it is subordinated to the objectives and needs of central areas (Hryniewicz, 2010). The core-periphery model is a spatial scheme of the regional system structure, which is based on the assumption of uneven development. The concept of the core region is close to the concept of the polarized region (Boudeville, 1972), which – belonging to the category of the node region – constitutes a heterogeneous, hierarchical and integrated system comprising the pole and its spheres of influence. The pole is a metropolis constituting a spatial concentration of economic activity. It is characterized by great opportunities in terms of creating and absorbing innovations and economic growth, it also has a strong impact on its facilities (Czyż, 2002, p. 5; Tuziak, 2013, p. 154).

Theoretical concepts based on the assumption of spatial unevenness of development include the theory of the global network of economic relations (Castells, 2007). Research and analysis of global development trends show that economic growth is generated by the world's largest metropolises and technopoles, as well as by other territorial arrangements, such as industrial regions. These areas dominate the rest of the world in economic, political and cultural terms. Metropolises and technopoles concentrate the highest economic, technological, financial and innovative potential, making them the main centers of economic growth and the creation of new knowledge on a global scale. The modern, IT-based, and decision-making world economy is networked. It surrounds the globe with a system of structural, complex, numerous and multidirectional connections and communication channels through which information, scientific knowledge, technologies, goods and financial resources flow. Within the network structure, global transfers of capital, products and innovations are possible between all actors active in the global economy.

Summing up a brief overview of the most important theoretical concepts concerning the issues of interregional disparities and developmental disparities, it should be noted that there is no single theory that comprehensively explains the conditions and mechanisms of the emergence of differences in the level and dynamics of development processes at the regional level. In the literature, it is emphasized that no theory covers the scope of its characteristics and

analyses explaining all the factors determining spatial developmental imbalance (Dyjak, 2013). The complexity and multi-faceted character of regional development conditions is reflected in the wide range and substantive diversity of the scientific achievements of the theory of regional development in the economic and social sphere.

Cohesion Policy of the European Union in the context of regional development

The European Union has consistently strengthened its economic, social and territorial cohesion to ensure universal and sustainable development for the countries that make up the European community. In particular, the EU aims to reduce disparities in the development of European regions. Cohesion Policy provides the essential institutional framework and the legal and organizational basis for the EU's investment policy. It benefits many regions and cities in the EU and stimulates economic growth, job creation, business competitiveness, harmonious development and environmental protection.

The Cohesion Policy for 2021-2027 comprises four main funds:

1. The European Regional Development Fund (ERDF),
2. The Cohesion Fund (CF),
3. The European Social Fund (ESF),
4. Just Transition Fund (JTF).

The European Regional Development Fund supports actions to restore regional balance (to compensate for regional disparities) in the European Union. The ERDF shall contribute to supporting less developed regions and transforming declining industrial regions.

The Cohesion Fund grants financial support to environmental projects and trans-European networks in the area of transport infrastructure in those Member States where the gross national income per capita is less than 90% of the Union average.

European Social Fund (since 2021) ESF+) is the Union's main instrument supporting actions to prevent and combat unemployment, to develop human resources and to promote social inclusion in the labor market. The ESF+ supports initiatives promoting high levels of employment, equal opportunities for men and women, sustainable development and economic and social cohesion.

The Just Transition Fund is the main tool to support the areas most affected by the effects of the transition in order to achieve climate neutrality and to prevent the deepening of regional disparities. To achieve this goal, JTF supports initiatives in the areas of digital connectivity, clean energy technologies, emission reduction, industrial regeneration, retraining of workers, technical assistance.

The analysis of the amount and structure of transfers from the European Union budget indicates that the share of cohesion policy funds in total expenditure on development policy in Poland is about 55%. Poland's use of funds available under the cohesion policy creates opportunities for undertaking promotional and modernization activities as part of the current and future implementation of the Polish regional policy (Churski, 2023).

The scope of action taken within the framework of the European Union's cohesion policy is wide. It focuses on the implementation of several thematic objectives:

1. support for R&D and innovation,
2. improving the availability and use of information and communication technologies,
3. improving the competitiveness of small and medium-sized enterprises,
4. supporting the transition to a low-carbon economy,
5. promoting adaptation to climate change and risk prevention,
6. protecting the environment and promoting the sustainable use of natural resources,
7. promoting sustainable transformation and addressing bottlenecks in the core infrastructure network,
8. promoting employment and promoting labor market mobility,
9. promoting social inclusion and combating poverty,
10. investing in education, competences and lifelong learning,
11. strengthening institutional and administrative capacity.

All thematic objectives of the intervention measures within the cohesion policy have been appropriately specified and developed at the regional level. They serve to increase competitiveness at the regional level, among others by supporting the research and development sector and broadly understood innovation. At the same time, they promote sustainable development and the elimination of inequalities and asymmetry in various spheres of social and economic life.

Network links within the framework of cooperation of economic entities and the activity of clusters significantly determine the competitiveness of individual regions. The analysis of the impact of cohesion policy on the scale and scope of cooperation relations in the economy shows that at the regional level there were relatively rare intervention instruments supporting the formation and development of cooperation links, as well as those concerning the support of clusters (Szczucki, Gajewski, Kubajek, Witkowska, Sochaczewska, Kornacki, 2022). Therefore, a set of recommendations (algorithm of necessary actions) were formulated to improve the situation in this area:

1. within the framework of the Cohesion Policy for 2021-2027, specify more precisely which types of cluster projects can be supported from the national and regional level,
2. resumption of work of the body monitoring the implementation of cluster policy with the participation of representatives of central administration, regional governments, representatives of clusters, business environment institutions and business organizations,

3. continuing support for clusters in the period 2021-2027, considering a simplified mode of change for the companies participating in the cluster and decentralizing the implementation of the project,
4. promoting within the framework of the Cohesion Policy 2021-2027 the idea of cooperation between entities both in the economic area and in the sphere of building trust in mutual relations,
5. promotion of solutions providing support for projects implemented in moderate partnerships,
6. undertaking analytical work and dissemination of good models in terms of supporting companies concentrated in clusters,
7. encourage clusters to undertake activities promoting their industry and encouraging education in a given field and cooperation with schools (Szczucki, Gajewski, Kubajek, Witkowska, Sochaczewska, Kornacki 2022).

Due to the limited framework of the article, it is not possible to comprehensively present the issue of competitiveness and regional disparities in the context of cohesion policy. However, it is worth paying attention – as was done in the above paragraph of the article – to even one important “cooperative-cluster” aspect of regional competitiveness, which in the end serves sustainable development and thus increases regional cohesion.

Summary

The characteristics and analyses presented in the article suggest that it is worth considering the possibility of modifying the current concept of the European Union's cohesion policy toward a vision corresponding to a new, globally motivated model of regional policy. The new vision of cohesion policy formulated in the literature of the subject (Kukliński, 2003; Dziembala, 2016; Kwaśny, Mroczek, Ulbrych, 2018) opens up the possibilities of modern development corresponding to global challenges. It has a network, organic, holistic, extroverted and long-term character. The first element of the new cohesion model is networking, which should be understood as a system of movement of people, goods, information and innovation, directly conditioning the cohesion of the European space. It is a complex and comprehensive way of seeing cohesion as the process of merging the European continent into one organic whole with a clear identity on a global scale. The second element is the organic vision of cohesion, in which the unity of Europe is built on the conscious and creative use of its wealth in the form of the diversity of the European economy and culture. The organic vision of cohesion policy emphasizes the need to unleash endogenous efforts to overcome their weaknesses by developmentally backward regions and thus to increase their chances of becoming better placed on a European and global scale. Holism is the third element of cohesion policy; it entails

a comprehensive approach to the entire European Union, with a deeper focus on the EU's internal space and a broader, more preliminary approach to the entire continent. The main task of the policy understood in this way is to overcome the development gap separating the European center from the periphery. The fourth, extroverted component of the vision of cohesion policy is that it is trying to find an answer to the question of what needs to be done on a European scale in order to strengthen the position of this continent in the face of global competition. The last and fifth element is the long-term and strategic nature of the new concept, which is expressed in the need to go beyond the existing medium-term thinking horizons and develop a long-term vision.

And analysis of long-term development trends shows that Europe is converging both at the level of Member States and regions, measured by the scale of relative differences in GDP *per capita* (European Union, 2007). Despite the progressive convergence, large inequalities, measured in absolute terms, remain between European regions. These inequalities are in part the result of the enlargement of the EU to include new Member States. However, they also stem from the fact that economic growth tends to be concentrated in the most dynamically developing areas (regions) in individual countries.

The data contained in the European Commission reports indicate that economic prosperity in the EU is, however, becoming more evenly distributed geographically. The share of Europe's traditional economic core (the area between London, Paris, Milan, Munich and Hamburg) in the overall GDP of the European Union is declining, although the demographic potential of the area is relatively stable (Ahner, 2007, p. 27). The main reason for this change is the emergence of new growth centers in Europe (Madrid, Helsinki, Stockholm, as well as Warsaw, Prague, Bratislava, Budapest). It should be noted, however, that within individual Member States economic activity is generally concentrated in the region of capital cities, which means that the share of capital regions in the GDP of individual countries increases.

The European Commission documents also reveal more general problems and challenges that most EU regions are already facing or will face in the near future. The most important of these are: globalization, rising energy prices, climate change, demographic change (Ahner, 2007, pp. 26-30). It should be emphasized that the global changes that have been taking place in recent years are a serious challenge to cohesion policy. These include, above all, the COVID-19 pandemic and the war in Ukraine (Kotkowski, 2020; Dziembala, Kłos, 2021; Krzemiński, 2021; Krzykowski, 2022).

Globalisation and its inherent tightening of competition will certainly continue to be one of the main challenges for the development of European regions. There are many indications that the competitive pressure felt by regions may increase in the future. This pressure will force further adaptation changes and lead to the restructuring of regional economies across the European Union.

High energy prices could become a very serious problem for European regions. Higher energy prices will increase the scale and pace of changes leading to the implementation of less energy-intensive generation processes. They will also force far-reaching and costly changes in transport. Rising energy prices will also require intensive investment in innovation to increase the efficiency of existing renewable energy sources. The development of infrastructure and technology for the generation and use of renewable energy will also require considerable investment.

Climate change is another challenge that is highlighted in the context of the development of European regions and the implementation of cohesion policy. Many regions of Europe will increasingly experience the asymmetric impact of climate change. One result will be a high increase in energy demand and the need to develop technologies and procedures for more efficient use of energy.

Demographic trends specific to Europe are also a major challenge. A negative consequence of these trends is a decrease in the rate of population growth in Europe. Currently, one third of the total number of regions in the European Union are facing a decline in population due to negative birth rates. At the same time, Europe will have to face rapid aging of its population. Currently, for every person aged 65 years or older, there are four people of working age. In the next three decades, this proportion will change dramatically - for each person aged 65 years or older, there will be on average only two people of working age. In addition, many problems and social tensions will be generated by migration processes and an increasing number of visitors to Europe from other continents.

Most of the challenges mentioned above represent not only threats to European regions but also new development opportunities that need to be exploited. One of the most important tasks of cohesion policy in this context is to strengthen the capacity to anticipate change and to increase the capacity to respond to it consciously and adequately (Ahner, 2007, p. 30). Most of these problems and challenges have in common that they will affect all regions in varying degrees and in different ways, but they will probably not be avoided.

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INVESTMENTS IN R&D AS A COMPONENT OF MODERN BUSINESS COMPETITIVENESS

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Purpose: This paper explores the impact of investments in research and development (R&D) on the competitiveness of modern enterprises.

Design/methodology/approach: In article was use literature of subject in the theoretical part and the example of Northwood, a company from Gryfice, Poland in practical part.

Findings: It highlights how R&D initiatives contribute to creating competitive advantages by improving product quality, operational efficiency, and brand reputation. By implementing a comprehensive R&D strategy, Northwood achieved substantial gains in competitiveness within the wood production industry.

Practical implications: Using the case study of Northwood, a company from Gryfice, Poland, the study illustrates the practical applications of R&D in enhancing market position through sustainable practices, innovation, and technological advancements.

Originality/value: This paper examines the broader economic significance of R&D investments in driving national and international competitiveness, with an emphasis on their strategic value in business growth and resilience.

Keywords: Research and Development, Competitiveness, Innovation, Sustainable Business, Competitive Advantage.

Category of the paper: Case study.

1. Introduction

Modern businesses are compelled to engage in continuous competition to maintain their market position. Competitiveness against market rivals serves as a pathway to achieving a competitive advantage for an organization. On the contemporary market, competitive advantage can be achieved not only through the quality and usability of products and services offered but also through the image and reputation they hold among consumers. At the same time, innovative initiatives undertaken by companies play a crucial role in this regard. One key element of innovation initiatives is investment in research and development (R&D).

R&D investments are a critical factor for both modern economies and organizations. Their significance is essential from both macroeconomic and microeconomic perspectives. On the one hand, new investments contribute significantly to achieving high rates of economic growth and development at the national level, thereby enhancing international market competitiveness. On the other hand, for companies, R&D is also a factor that ensures a strong market position. Consequently, small and large economic entities, as well as the academic and government sectors, engage in research and development to foster technological, economic, and social progress.

The aim of this study is answer the question: whether and to what extent investments in the R&D department of a company can be a tool for building and improving the competitiveness of the company? This article, based on a literature review, also presents a case study of Northwood, a company from Gryfice in the West Pomeranian Voivodeship, which implemented pioneering R&D methods in its operations to establish its reputation within the regional and national wood production market, as well as internationally. Based on materials provided by the company, the article describes current R&D activities and their outcomes.

2. Competitiveness and Investments in Research and Development in the Enterprise

Competitiveness in the simplest terms refers to a company's ability to contend with other market entities and to achieve an advantage over them. A competitive advantage enables an organization to secure a superior position relative to competitors. This advantage is the result of actions and strategies through which a company, by offering products and services that are better than those of competitors, aligns with the needs and expectations of customers. However, competitive advantage does not have a clear-cut definition in the literature (Żabiński, 2000; Moroz, 2008).

Similarly, the concept of corporate competitiveness lacks a singular definition in theory. One definition, suggested by A. Kędzierska (2005), views corporate competitiveness as the ability to operate effectively within a free-market economy (Szymanik, 2016). This definition emphasizes that greater competitiveness correlates with a stronger position within an industry, and less vulnerability to external stimuli and economic downturns (2005).

E. Szymanik (2016) notes that definitions of corporate competitiveness can be considered narrowly or broadly. Narrow definitions focus on competition through new technologies, emphasizing modern products and services that differentiate a company from its market rivals. Hampden-Turner and Trompenaars (2000) suggest that "competitiveness is simultaneous rivalry and cooperation, leading to the understanding of essential technologies, customer needs, and requirements". Meanwhile, Hamel and Prahalad (1999) see competitiveness as a company's

ability to develop core skills more cost-effectively and swiftly than competitors, resulting in superior products.

Regardless of how competitiveness is defined, it is essential to identify the factors that shape it. Defining these factors is complex due to the lack of a universally accepted classification (Porter, 1990; Ma, 2000; Nowacki, 2015, 2017; Sołoducho-Pełc, 2016). R. Śliwiński (2011) proposes a categorization of competitiveness determinants into three groups: material resources, intangible resources, and their combinations. Material resources include employees with their experience, skills, resilience, and motivation; leadership and managerial abilities; physical capital such as buildings, land, and machinery; IT systems; computer equipment; and financial capital. Intangible resources cover knowledge, competencies, techniques and technologies, registered patents, utility models, intangible assets, sales models, product distribution systems, product characteristics, corporate culture, and organizational structure. The third group comprises factors like a company's strong reputation linked with quality and reliability, and market entry barriers for new competitors.

Among the factors influencing a company's competitiveness, innovation and creativity stand out, as they can significantly shape both material, intangible, and mixed resources. Innovative companies tend to be highly dynamic and successful in their activities (Moraes et al., 2021). Innovation itself does not create competitiveness but can greatly enhance it (Szymanik, 2016; European Commission, 2022).

In production enterprises, innovation may manifest in the introduction of new products and services, modernization of existing technologies, and improvement and optimization of operational processes. The adoption of new solutions often involves substantial financial investment. One way for companies to foster development is through research and development (R&D) activities (OECD, 2023; Dutta et al., 2023). R&D has a multi-dimensional nature as it enables growth, access to new resources, brand building, and the establishment of competitive advantage and corporate competitiveness in the fast-evolving market environment (Vrontis, Christofi, 2021).

According to the Higher Education and Science Act (Ustawa Prawo o Szkolnictwie Wyższym i Nauce, 2018), scientific research includes both fundamental and applied research. Fundamental research, comprising empirical or theoretical work, aims to acquire new knowledge about the foundations of observable phenomena without immediate application. Conversely, applied research seeks new knowledge and skills directed at developing or significantly improving products, processes, or services. The Act also defines development work as activities involving the acquisition, combination, formation, and utilization of available knowledge and skills for planning production and designing modified, improved, or new products, processes, or services, excluding routine and periodic changes made to them.

The Frascati Manual (OECD, 2015) also serves as a knowledge source on the specifics of R&D activities, outlining five distinguishing features: novelty, creativity, uncertainty, systematic nature, and transferability or reproducibility.

In recent years, Poland has seen an increase in corporate R&D activities, potentially driven by tax incentives and programs providing EU funding for R&D projects. Data from Statistics Poland (GUS) indicates that since 2015, investment in R&D within Polish enterprises has been rising. Gross domestic expenditure on R&D in 2022 was 44.7 billion PLN, marking an 18.6% increase compared to the previous year. In 2015, this expenditure was just over 18 billion PLN. The R&D intensity ratio, representing the share of internal R&D expenditure in GDP, reached 1.46% (compared to 1.43% in 2021 and 1.00% in 2015). The gross domestic expenditure on R&D per capita in 2022 was 1,182 PLN, a 19.2% increase from the previous year. Additionally, the number of entities engaged in R&D rose by 0.8% in 2022 compared to the previous year, reaching 7,431 entities (up from 7370 in 2021 and 4427 in 2015) (GUS, 2023).

3. Competitiveness and Investment in R&D within Enterprises¹

For the purposes of this article, in order to answer the research question posed in the introduction: whether and to what extent investments in the company's R&D department can be a tool for building and improving the company's competitiveness? this article presents an analysis of Northwood's operations in the town of Strzykocin, West Pomeranian Voivodeship.

Founded in 1992 by Bronisław Misikonis, Northwood specializes in producing wooden pallets, pallet boxes, and selling firewood and fuelwood. With a state-of-the-art machinery park, including an innovative gas drying system, the company meets international quality standards, as evidenced by its IPPC certificate (No. PL 32 436). Northwood collaborates with business partners across Europe, offering products made from resources acquired through contracts with the State Forests. The company prioritizes sustainable development, for example, by using solar energy in production processes and deploying vehicles that meet Euro VI emissions standards.

As an innovative company in the wood industry, Northwood has been conducting extensive research and development (R&D) on implementing a circular economy (CE) approach since 2020. The evolving environmental regulations, increasing consumer demands, and long-standing partnerships with Danish companies—pioneers in sustainable production—have motivated Northwood to adopt a strategy focused on maximizing resource utilization, minimizing waste, and optimizing production energy use.

In 2018, Northwood established an in-house Research and Development (R&D) department dedicated to innovation, testing, and optimizing both products and production processes. This R&D department plays a crucial role in maintaining the company's competitiveness and

¹ Prepared based on data provided by Northwood.

meeting the market's evolving needs for new technologies, improved products, and entirely new solutions. The R&D department focuses on scientific research and technical work aimed at:

- Development of new products – from concept to design, prototype testing, and implementation in production.
- Process optimization – identifying and eliminating waste sources, improving production efficiency, and reducing production costs.
- Enhancement of product durability and functionality – products are tested for strength, aesthetics, and user convenience.
- Sustainable development practices – minimizing environmental impact by employing technologies that save energy, conserve resources, and reduce waste.

The R&D Department at Northwood has consistently executed a broad range of projects aimed at implementing advanced technological solutions aligned with circular economy (CE) principles and sustainable development. These projects include:

3.1. Optimization of Energy Efficiency

With the support of the Enea Optima monitoring system, Northwood analyzes energy consumption every minute of the production process, allowing for the swift identification and elimination of waste. This system also provides detailed data that supports the development of cost-saving strategies. As part of its energy optimization efforts, Northwood introduced energy production from its own photovoltaic plant, significantly powering the facility. Charging of electric equipment, such as forklifts, electric vehicles, and pallet drying, primarily occurs during off-peak hours, minimizing operational costs.

3.2. Use of Recycled Materials and Lower-Grade Wood

Northwood has developed a production system that maximizes the use of recycled materials and lower-grade wood. Sawdust and wood chips, treated as secondary raw materials, are repurposed for manufacturing MDF boards, primarily produced by Kronospan in Poland, to whom Northwood supplies these materials. High-quality materials are carefully selected for production to ensure that even by-products maintain quality standards. New products, such as newly designed pallet types, undergo a complete production introduction phase involving prototype design, prototype testing, and production trials to ensure quality and durability. This approach enables Northwood to produce durable single-use pallets, suitable for multiple uses, enhancing the environmental profile of its products.

3.3. Testing, Prototyping, and Quality Control Processes

Before any new product series is launched, Northwood undertakes a multi-stage process of testing and prototyping, beginning at the design phase with technical drawings and 3D modeling. Each product is first developed in visual and technical form to optimize

functionality and quality. Subsequent stages include durability and functionality tests, with prototypes subjected to load testing to confirm resilience under real-world conditions. Finally, before mass production, each series undergoes testing as a trial batch to eliminate any material or technological imperfections. This rigorous evaluation process allows Northwood to produce high-quality products with extended life cycles that meet stringent environmental standards.

Since establishing the R&D Department, Northwood has continuously adapted its production policies to meet CE requirements. The integration of circular economy principles at Northwood involves:

- **Eliminating Waste of Materials and Energy** – Wood drying is supported by a heat recovery system, which recaptures and reuses heat, thereby reducing energy consumption. Sawdust and wood waste generated during production are converted into semi-finished products like particleboard, which can be used in other manufacturing processes.
- **Just-In-Time Production** – With streamlined logistics and production processes, Northwood has implemented a Just-In-Time model, reducing the need to store finished products and minimizing costs associated with handling and internal transport.
- **Transparency and Waste Elimination** – The production process is organized to minimize material, time, and energy losses. This enables Northwood to operate in line with Kaizen and Just-In-Time principles, reducing bottlenecks and optimizing each production stage.

A key factor in Northwood's innovative solutions is inspiration drawn from sustainable practices adopted by international partners. In 2012, Northwood began collaboration with the Danish Standards Foundation (DS), which facilitated the integration of the latest technologies and production methods used across Europe. DS, a standardization organization, supports the development of standards compliant with international requirements (ISO, IEC) and promotes an ecological and sustainable approach. Although Northwood no longer produces DS-certified pallets, it has retained practices acquired through collaboration, such as rigorous product testing and quality work before serial production, which continue to be applied.

Examples of initiatives resulting from Danish practices and Northwood's R&D activities include:

- **Implementation of the IMH Production Line** – The energy-efficient IMH production line, developed by a Swedish manufacturer, allows Northwood to reduce energy consumption and enhance production efficiency.
- **Optimization of Production Logistics** – Inspired by Danish production layouts, Northwood has simplified internal logistics, reducing unnecessary handling and using a Just-In-Time storage model.

- **Recycling Technology Integration** – Northwood has adopted advanced recycling technologies, enabling material recovery and reuse, significantly reducing waste. These technologies allow production waste to be converted into valuable products for new manufacturing processes.

3.4. Life Cycle Analysis (LCA) and Compliance with Circular Economy

The R&D Department at Northwood also focuses on life cycle assessment (LCA) to evaluate environmental impact at every stage—from production through use to recycling. In practice, this involves:

- **Durability Assessments and Material Analysis** – Products like single-use pallets are designed to meet high durability standards, allowing for prolonged use even though they are technically single-use items.
- **Lifecycle Optimization** – Northwood continually optimizes product longevity to reduce the need for new resources and minimize waste generation. LCA allows Northwood to assess product recyclability and environmental impact, supporting CE principles.

As part of Northwood's R&D initiatives, the company invests in employee education and training, recognizing that the long-term success of CE implementation depends on employee engagement at every production stage. Northwood provides training on environmental protection, resource management, and sustainable production.

Northwood's management invests in R&D as a foundation for innovation and growth. In highly competitive industries, where rapid improvements are essential, these actions respond to market realities. The R&D Department allows Northwood to improve product quality and competitiveness, reduce production costs through material and energy efficiency, meet environmental and legal standards increasingly required in international markets, and adapt to market trends and changing demands, such as ecological and technological advancements.

In the context of Northwood's primary product, pallets, the R&D Department focuses on:

- **Developing More Durable Pallets** – Pallets are subjected to load and durability testing to ensure longevity even under challenging conditions.
- **Optimizing the Use of Wood and Recycled Materials** – Solutions are implemented to maximize resource use, crucial for producing single-use pallets.
- **Recycling and Sustainable Resource Management** – The R&D team works on technologies for recovering and reusing materials that no longer fulfill their original purpose.
- **Designing New Types of Pallets** – Adapted to diverse market needs, such as environmentally friendly, reusable, or single-use pallets optimized for greater durability.

Through this approach, the R&D Department enables Northwood to develop environmentally friendly products while supporting economically efficient resource management.

4. Summary and Conclusions

The establishment of the R&D Department and the implementation of related initiatives at Northwood have had a profound impact on the company's growth, positively influencing customer and partner perceptions and contributing to the improvement in both the quality and volume of orders fulfilled. Northwood's R&D activities underscore the positive impact of its strategic decision in 2018 to focus on research and development as a core growth strategy.

The initiatives presented demonstrate that a carefully planned, company-specific R&D approach—executed methodically and systematically—can significantly enhance a company's competitiveness in the marketplace. The benefits Northwood has realized from its R&D endeavors may serve as a signal to other institutions and organizational leaders of the value of supporting core activities with a strong R&D foundation.

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USING THE EXPERIENCE OF BUSINESS PARTNERS IN IMPLEMENTING THE CONCEPT OF SUSTAINABLE DEVELOPMENT (ON THE EXAMPLE NORTHWOOD)

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Purpose: The aim of the article is to answer the question: whether and to what extent less experienced companies can benefit from the experience of more developed business partners using their sustainable development practices?

Design/methodology/approach: The first part of the article presents selected aspects of the literature on sustainable development issues. The empirical part of the article uses materials made available by Northwood in the form of internal company materials for the years 2009-2022.

Findings: The article shows that not only the financial side of business is important, but also far-reaching awareness and long-term implementation of cooperation, and partnership for cooperation and environmental protection is particularly important.

Research limitations/implications: The considerations carried out for the purposes of the article were based on data provided by business partners, however, it must be aware that due to competition, some of the information was not obtained (e.g. financial data).

Practical implications: The results of the analysis are a signal to companies, including managers and people managing production companies, that for the purposes of company development it is worth using the experience of partners, building partnership and implementing sustainable development goals.

Originality/value: The article and the company presented in it can be both an example and a source of inspiration for other companies, not only those operating in the same industry.

Keywords: sustainable development, Agenda 2030, partnership.

Category of the paper: Case study.

1. Introduction

In-depth discussions on implementing sustainable development initiatives and analyzing the processes accompanying this development, continuously occurring in modern times, are aspects that should always remain of interest to both science and practice. The idea of

sustainable development involves meeting the needs of the present generation without compromising the ability of future generations to meet their needs. Sustainable development represents intergenerational solidarity, which involves finding solutions that ensure continued growth while allowing all social groups to actively participate in development processes and benefit from economic growth (Agenda na rzecz zrównoważonego rozwoju, 2023).

The 2030 Agenda for Sustainable Development, adopted in 2015 by 193 United Nations (UN) member states, is a program of unprecedented scope and significance that defines a model for sustainable development at a global level. However, discussions and preparations for the Agenda began much earlier, in the 1980s and 1990s. Initially, discussions on sustainable development focused on emphasizing the issue and the need to reduce the negative impact of economies on the natural environment. Over time, however, the concept of sustainable development has gained a fuller meaning, with a parallel focus on the coexistence and necessity of harmonizing three aspects of development: environmental protection, social progress, and economic growth (Agenda 2030; Błasiak-Nowak, Rajczewska, 2018).

Today, the concept of sustainable development has become a horizontal principle reflected in all national development policies and in all areas of economic, political, and social activity. One of the goals of the 2030 Agenda is to build stable infrastructure, promote sustainable industrialization, and support innovation. This issue will be the focus of the considerations in this article. The authors have concentrated on the activities of a company in the wood production sector. Their goal is to highlight the benefits that can arise from cooperation and the exchange of experiences between companies operating in different countries and market conditions, while simultaneously sharing their own experiences and positive practices in daily operations and activities for environmental protection and sustainable development. An additional aspect of the considerations undertaken was the issue of using the experience of enterprises that have been operating on the market longer and have numerous experiences by enterprises that have shorter experience and lower achievements in their activities. A classic approach to selecting companies was used here, according to the phases of the enterprise life cycle proposed by J. Lichtarski (2007). He assumes that enterprises go through the following stages: establishment, i.e. bringing an enterprise into existence; development, i.e. increasing product sales, increasing market share and increasing territorial expansion; maturity, i.e. a period of stagnation in which there are periods of both growth and decline in sales, with the possibility of re-entering the development phase; and decline, i.e. reduced production and reduced market share.

Therefore, the aim of this article is answer the question: To what extent can less experienced companies benefit from the practices of more developed business partners in implementing sustainable development practices? The article is based on the experiences of the Polish company Northwood (a wooden packaging manufacturer). To achieve this aim, the first part of the article outlines selected aspects of the literature related to sustainable development issues and highlights the role of business cooperation in implementing this concept. Subsequently,

based on Northwood's activities, it presents how the company has used the experiences of its business partners to implement sustainable development concepts. The presented Danish companies are companies that have been operating on the market longer than Northwood, have more experience in the wood industry as well as in the implementation of sustainable development activities and are in the maturity phase. Northwood, inspired by the activities of Danish companies, is a company with a shorter history, less market experience, is in the final stage of development and is looking for new market challenges. The empirical part of the article uses materials provided by Northwood, in the form of internal company documents, covering the period 2009-2022.

2. The Concept of Sustainable Development – Theoretical Considerations

Sustainable development means the socio-economic development of modern societies in a way that meets their needs without reducing the ability of future generations to meet their own needs. Achieving the idea of sustainable development requires global environmental protection, solidarity between different countries—especially between wealthy and poor nations—as well as solidarity with future generations, and the treatment of economic, political, social, and ecological activities as interdependent. The document that sets the conditions for implementing the concept of sustainable development is the 2030 Agenda for Sustainable Development developed by the UN (document: Transforming our world: the 2030 Agenda for Sustainable Development). In September 2015, UN member states, including Poland, adopted this document, which outlines five action areas, 17 goals, and 169 related tasks, corresponding to the three dimensions of sustainable development: economic, social, and environmental (Przekształcamy nasz świat...).

The concept of sustainable development describes a process that enables achieving a high quality of life for residents over a long-term horizon, while respecting natural resources and the environment, and simultaneously allowing for development in social, economic, and spatial domains. This development is achieved through the implementation of a sustainable framework as a model level of development that integrates all dimensions of sustainable development, often defined as economic, social, environmental, and institutional-political frameworks (Przekształcamy nasz świat...).

According to UN documents, sustainable development of the Earth is one that meets basic human needs while preserving, protecting, and restoring health, maintaining the balance of Earth's ecosystems, without threatening future generations' ability to meet their needs. The 17 goals of the 2030 Agenda address the following aspects: ending poverty; zero hunger; good health and well-being; quality education; gender equality; clean water and sanitation; affordable and clean energy; economic growth and decent work; industry, innovation,

and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; partnerships for the goals (The 17 goals...).

It is worth noting that the vision of sustainable development outlined in the 2030 Agenda focuses on five areas known as the 5Ps: People, Planet, Prosperity, Peace, and Partnership (Agenda 2030, Ministerstwo Rozwoju, Pracy i Technologii). From the perspective of this study, the area of partnership deserves special attention, as it emphasizes collaboration between market entities. Within the 2030 Agenda, partnership means actions based on solidarity, cooperation, responsibility, and transparency between governments, local and regional administrations, scientific communities, businesses, and all stakeholders and groups. This indirectly suggests that the concept of sustainable development can be implemented through the exchange of experiences between business partners, as illustrated in the subsequent section of this study.

It is worth pointing out that in scientific studies the concept of sustainable development is indicated as an idea shaping the sustainability of management, on the one hand, on the macroeconomic scale, but also on the micro scale, including in the development of the enterprise. Companies in their strategies have been forced, by the challenges of the 2030 Agenda, to treat economic, ecological and social goals equally, which is also related to the implementation of the concept of corporate social responsibility (Bartkowiak et al., 2016). However, it should be remembered that such changes for many enterprises are of a long-term nature, as they require not only changes in the process or production profile and management method, but also in the awareness of both the management staff and employees (Urbanowska-Sojkin, 2023). In the case of Poland, the concept of sustainable development is developing to varying degrees among entrepreneurs, but in general it is only the initial phase. There is certainly an insufficient level of knowledge on environmental and social issues among Polish entrepreneurs. This requires the implementation of intensive information and promotion activities. The second significant limitation in the implementation of the concept of sustainable development in Poland seems to be the attitude of Polish companies to current affairs and the implementation of short-term strategies aimed at maximizing profit. Meanwhile, in developed countries, the activities of enterprises include not only ensuring and providing appropriate quality products and services, but also engaging in socially important matters related to the protection of the natural environment. Therefore, Polish entrepreneurs and business owners cannot afford to ignore environmental issues, and thus they have been forced to take into account economic goals in their strategies along with ecological and social ones, which in the future will contribute to increasing their competitiveness not only on the domestic market, but also internationally (Jaźwińska, 2016; Klima, 2017). In relation to this perspective of action, it seems important to use the innovative experience of business partners who have already initiated such activities in their operation, which in the case of debuting enterprises creates the opportunity to implement already proven concepts (Bojewska, 2024; Bargieł, 2023).

3. International Cooperation and Using Partners' Experiences in Implementing of Sustainable Development Principles by Northwood¹ – A Case Study

The Polish company Northwood, established in 2009, has focused on the production of wooden pallets intended for markets in Western Europe. Among its foreign partners, Danish companies play a special role. They are not only the main recipients of pallets but also the inspirers and initiators of many production and logistical solutions and standards, primarily due to their international experience. From the beginning, Northwood has emphasized sustainable development and environmental protection. The entire production process was designed to minimize its negative impact on ecosystems. The wood used in the company has always come exclusively from certified, sustainable sources, and the material processing is carried out in a manner that maximizes the conservation of natural resources. The company continues to prioritize energy optimization and reducing carbon dioxide emissions.

Northwood specializes in producing wooden pallets primarily for the transportation and distribution of industrial products, especially for the food, chemical, and metallurgical industries. The production process includes the comprehensive processing of wood—from transforming raw, round logs into pallet components like boards and supports, through their assembly, heat treatment, and storage of finished products. Production is organized to minimize the waiting time for customer pick-up, meaning that finished pallets do not remain in storage for more than three days before being transported to logistics centers in Germany and Denmark. A key element of the technological process is the heat treatment of pallets, which is required for 95% of orders due to the need to meet international phytosanitary standards, including the IPPC (International Plant Protection Convention) standard. This treatment eliminates potential pests and ensures the safety of pallets in international transport.

Northwood produces various types of pallets, adapting them to specific customer requirements, including different load capacities. Key construction elements, such as top and bottom boards and supports, vary in size and parameters depending on the intended use. Approximately 90% of produced pallets undergo both heat treatment and phytosanitary certification, ensuring compliance with international standards. The entire production process at Northwood is geared towards maximizing operational efficiency and ensuring the highest quality products that meet stringent industrial and logistical requirements.

Based on its collaboration with Danish partners, drawing inspiration from their experiences and leveraging advice and suggestions from business partners, Northwood has introduced and expanded numerous initiatives in recent years (2020-2023) that align with the concept of sustainable development. Notable among these efforts are the actions outlined in Table 1.

¹ Information about Northwood is available at www.northwood.pl, 10.10.2024.

Table 1.

Actions Undertaken by Northwood for Sustainable Development as a Result of Cooperation with International Partners (2020-2023)

Agenda Goal 2023	Agenda 2030 Area	Northwood's Actions for Sustainable Development	Initiatives Undertaken
Goal 7 - Clean and Affordable Energy, Goal 9 - Industry Innovation and Infrastructure, Goal 12 - Responsible Consumption and Production	Planet, Prosperity	Implementing the Circular Economy Concept (CEC))	Adopting closed production cycles for pallets and other wooden packaging through optimal use of raw materials. Minimizing production waste and striving for its reuse in the production process.
Goal 7 - Clean and Affordable Energy, Goal 9 - Industry Innovation and Infrastructure, Goal 12 - Responsible Consumption and Production	Planet	Investments in Renewable Energy Sources	Construction of an in-house photovoltaic power plant for production needs.
Goal 9 - Industry Innovation and Infrastructure, Goal 12 - Responsible Consumption and Production Planet Infrastructure Modernization	Planet	Infrastructure Modernization	Modernization and upgrade of the machinery park. Implementation of recovery systems (e.g., energy and raw materials).
Goal 9 - Industry Innovation and Infrastructure, Goal 12 - Responsible Consumption and Production	Planet	Certification of Activities	Certification of raw materials.
Goal 17 - Partnerships for the Goals	Planeta Partnership	R&D Investments	Research on optimizing eco-friendly production, implementing eco-friendly production technologies, and efficient waste management. Establishment of an expert team. Collaboration with academic centers, research institutions, and business partners. Conducting market research. Development of new technologies,

Source: Own elaboration based on data for 2020-2023 provided by Northwood.

Based on the data presented in Table 1, it can be observed that Northwood undertook several actions for sustainable development, primarily driven by leveraging the experiences of its foreign business partners.

In the context of the circular economy (CE) concept, Northwood implemented measures that promoted and continue to promote the circulation of raw materials and products, waste minimization, and thus, increased efficiency of production processes. Through collaboration, the company adopted established procedures from Danish firms, using production models and technologies essential for a comprehensive production transformation. This enabled Northwood to meet global ecological challenges while raising production and environmental standards. Danish partners, known for their advanced circular technologies, contributed to the development of innovative methods for resource optimization, recycling, and energy

management. The transfer of knowledge and technology was crucial in adapting production practices, such as the full utilization of wood resources and transforming production waste like offcuts and sawdust into high-value marketable semi-products. Offcuts and sawdust, once considered waste, are now turned into products like MDF boards, briquettes, pallets, and pallet blocks. Thus, inspired by Danish models, Northwood introduced processes that maximize raw material value through recycling and upcycling, thereby reducing environmental impact and operational costs. Importantly, Northwood also promotes its circular economy efforts among Polish companies collaborating locally within the region.

Another initiative taken by Northwood for sustainable development, based on ideas from Danish companies, was investment in renewable energy sources. These investments have significantly reduced greenhouse gas emissions and decreased dependency on traditional, high-emission energy sources. Northwood built its own photovoltaic power plant, aimed at reducing carbon dioxide emissions and lowering reliance on external energy suppliers. Using renewable energy from photovoltaics has lowered operational costs, and by stabilizing energy costs and reducing exposure to international market price fluctuations, the company has increased its long-term competitiveness. The long-term stability of energy costs thanks to the photovoltaic power plant allows Northwood to better plan its production activities, without the risk of sudden increases in electricity prices. This results in improved financial performance, which in turn enables further development and investment in innovation. The use of the photovoltaic power plant at Northwood not only yields economic benefits but also positively impacts the natural environment and local communities. This power plant enables the company to power its production processes using renewable energy, directly contributing to reducing air pollution. Emission reductions resulting from renewable energy usage support the achievement of global environmental protection goals. Additionally, the use of green energy in production processes enhances the company's appeal to customers, who increasingly seek products from environmentally responsible sources. Such actions build a positive brand image, which directly influences relationships with business partners and customers.

Based on its collaboration with Danish partners, Northwood also modernized its machinery, introducing technologically advanced machines with reduced energy consumption and increased efficiency. A key solution was the use of heat recovery systems, which allow for the recovery of heat generated during production processes and its reuse in other operations. Implementing heat recovery systems and technologies, modeled after Danish solutions, enabled optimal use of thermal energy generated in production processes. Thanks to these technologies, the company reduced energy costs by over 20% and lowered CO₂ emissions by around 15%. As a result, Northwood not only improved the efficiency of its operations but also enhanced its market competitiveness by offering products with environmentally friendly parameters.

Inspired by the Danish approach to sustainable production, Northwood committed to using raw materials sourced from forests managed according to sustainable development principles. FSC (Forest Stewardship Council) and IPPC (International Plant Protection Convention)

certifications confirm that the wood used in production comes from responsible sources. Danish partners have long emphasized such standards, and observing their practices prompted Northwood to adopt similar practices in its own production processes.

Another action taken by Northwood, inspired by its Danish companies collaboration, involves research and development (R&D) initiatives. In an era of increasing ecological awareness and intensified global environmental protection efforts, industrial enterprises are compelled to introduce innovative solutions for sustainable production. Northwood, aware of these challenges, is conducting extensive R&D efforts aimed at implementing advanced technologies supporting the circular economy. The research focuses on optimizing production processes in terms of energy efficiency, waste reduction, and maximizing resource utilization. The adopted CE strategies align with global industrial trends aimed at reducing the environmental impact of economic activities. In this study, the authors merely highlight Northwood's R&D efforts for sustainable development. Given that these actions are highly advanced and innovative, they will be explored in detail in another article.

4. Summary

The implementation of changes at Northwood, inspired by long-term collaboration with Danish companies, has resulted in numerous business and environmental benefits. With support from Danish partners, the company achieved an ambitious plan of operational transformation, which improved production efficiency and reduced its negative impact on the environment. Danish models, combined with investments in renewable energy and modern technologies, enabled Northwood to strengthen its position as a leader in sustainable production in the wood sector within the region. Northwood not only improved its financial results, fully utilized raw materials, reduced waste, and lowered energy costs, which led to increased profitability and stabilized production costs, but also—ecologically—reduced its impact on the environment. The reduction of greenhouse gas emissions, particularly CO₂, and the minimization of production waste are direct outcomes of the implementation of circular technologies and renewable energy sources. The company's strategy includes producing products in line with FSC and IPPC certifications, supporting sustainable forest resource management and contributing to biodiversity conservation. Additionally, by reducing harmful emissions, Northwood has contributed to improved air quality in the region of its operations, which is significant for both local communities and natural ecosystems.

Using the experience of a business partner clearly brings both tangible (financial) and intangible (such as brand building and image creation) benefits to the recipient company. The presented example fully supports this conclusion, positively answering the question posed in the introduction. Another conclusion is that such actions undoubtedly require the consent and

assistance of the other party—the company willing to share its experiences. It is also worth mentioning that the jointly realized idea of sustainable development, if consciously adopted by both collaborating parties, undoubtedly fosters experience sharing. Thus, observations made for the purposes of this article suggest that financial considerations are not the only important aspect of business; long-term awareness, commitment to ongoing collaboration, and focus on a company's strategic objectives are equally critical. A strategy that aims to achieve sustainable development goals and aligns with the 2030 Agenda cannot exist solely in documents or theoretical assumptions; it must translate into practical actions, where partnership for cooperation and environmental protection is crucial.

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IMPACT OF COVID-19 PANDEMIC ON DEVELOPMENT OF EU REGIONS

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Purpose: The main purpose of the study is to find out the impact of the COVID-19 pandemic on the development of EU regions in selected aspects of life: employment, tourism, Internet access and human resources in science and technology.

Design/methodology/approach: To study the impact of the pandemic on regional development, the average rates of change before and after the pandemic in most EU regions were counted. By comparing average rates of change in selected areas of life, it was examined what impact the COVID-19 pandemic had on regional development. The regions were also ordered from the most developed (in terms of selected indicators) to the least developed using the Hellwig linear ordering method.

Findings: The analyses show that the pandemic had an impact on the development of the regions of the EU countries, however, it was mostly a short-term impact. The most severe losses were suffered by the tourism industry, here development was halted and only in 2023 the number of nights spent in tourist accommodations is comparable to 2019. In the case of HRST and household access to the Internet, there was indeed an increase in indicators in 2020, however, there was a correction in subsequent years. In the case of the employment indicator, there was a sharp decline in 2020, which was more than made up for in subsequent years in most regions. The regions were also ranked in terms of the development of the characteristics studied (excluding household Internet access) from the most developed to the least developed in 2012, 2019 and 2023.

Research limitations/implications: Further research should focus on further analyzing similarities in the development of EU regions. Taking into account even more indicators, a more complete picture of the development of EU regions and the impact of the pandemic on this development can be obtained. Unfortunately, there are many data gaps in the Eurostat database, which excludes some regions from analysis.

Social implications: Thanks to the conclusions drawn from the analysis, we can get an idea of how regions in the EU are developing and what impact the COVID-19 pandemic has had on this development. We live in a time of globalization, diseases from one end of the world to the other end of the world move very quickly, the possibility of another pandemic in the near future is high. So it is worth seeing which regions have dealt with the effects of the pandemic the best, and you can then adopt some of the solutions that have been applied in those regions to counter the effects of the pandemic.

Originality/value: While countries are often compared with each other, regions are already much less frequently. The article shows the changes that are taking place precisely in the regions of EU countries. Of course, many decisions are made at the national level, however, also at the

level of regions many important decisions can be made, so that some regions develop better and others less well.

Keywords: regions of EU countries, Hellwig linear ordering method, average rate of change.

Category of the paper: empirical research.

1. Introduction

Thanks to globalization, the world is growing faster and faster. Moving even long distances is no longer a major problem. Thanks to the development of information technology, many things can be accomplished online. Transferring money or technology is also not a problem. Unfortunately, globalization also means dangers. One such threat could be that of diseases. Through the rapid movement of people, diseases move just as quickly. Some of them can cause a pandemic. Such was the case with the COVID-19 pandemic caused by the SARS-Cov-2 coronavirus. It began as an epidemic on November 17, 2019 in Wuhan city, Hubei province, central China, and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (Businessinsider, 2020; WHO, 2020).

The COVID-19 pandemic in Poland lasted from March 2020 to May 2022, causing 6.5 million cases and 119,000 deaths. There were also more than 200,000 excess deaths in Poland during this time compared to the average of recent years (Plonka-Syroka, 2023, p. 27). Also in the rest of Europe, more than 2 million people died from the pandemic (PAP, 2022).

Such a large number of oversized deaths must have affected the economy. In addition, the restrictions that were introduced also affected all spheres of life, especially transportation and tourism.

In the literature we can find a great number of articles on the impact of the COVID 19 pandemic on the global economy (Jedrzejowska, Wróbel, 2021; Shrestha et al., 2020; Khan, Khan, Shafiq, 2021), or on individual countries (Rangachev, Marinov, Mladenov, 2022; Bogos et al., 2021; Parkitny, Parkitna, 2024). Few studies deal with regions, if there are any they deal with selected regions (Smolarski, Suszczewicz, 2021; Kruczek, Borkowski, Mazanek, 2023, Vasilyeva, Lyeonov, Letunovska, 2020). I am yet to see studies that would cover a larger number of regions, as in this case all EU regions for which data are available in the Eurostat database (2024).

The purpose of the article is to show how EU regions have developed over the 2012 -2023 period in terms of employment, tourism, Internet access and the use of human resources in science and technology, and how the COVID-19 pandemic has affected selected areas of life.

The pandemic caused many excess deaths, which certainly affected employment. The employment rate in the 15-64 age group certainly declined during the peak of the pandemic (2020), but the pandemic also forced a change in the attitude of employers, enabling remote work, which in the long run should result in an increase in the employment rate.

The need to work and study remotely should also strongly affect households' access to the Internet. Many institutions have begun to make much greater use of information technology. The pandemic should foster the development of advanced information technology, and thus should affect the increase in education of the population and the growth of employment in science and technology. To this end, the active population in the 15-74 age group, categorized as HRST (i.e., successfully completed third-level education or working in science and technology), was surveyed.

The restrictions during the pandemic undoubtedly also affected tourism. Bans on leaving homes without a valid reason covered many regions of the EU. Tourism is the area that, along with human transport, has suffered the most. However, here, too, we are interested in the longer term, that is, whether three years after the peak of the pandemic people are as eager to leave as they were before the pandemic, or perhaps they are doing so even more eagerly after the experience of lockdowns. To answer this question, nights spent in tourist accommodations were examined.

2. Methodological notes

All data are from the Eurostat website (2024). Regional development was examined using 4 variables:

- employment rate in the 15-64 age group,
- household Internet access measured as the percentage of households in which each household member has the ability to access the Internet from home,
- human resources of science and technology (HRST) as the share of the active population in the 15-74 age group at the NUTS 2 regional level. The data represents the active population in the 15-74 age group included in HRST (i.e., successfully completing third-level education or working in science and technology) as a percentage of the total active population aged 15-74. HRST is mainly measured using the concepts and definitions set forth in the Canberra Manual, OECD, Paris, 1995,
- nights spent in tourist accommodation establishments. A night is defined as any night that a visitor/tourist (resident or non-resident) actually spends (sleeps or stays) or is registered (his/her physical presence in the facility is not necessary) in a tourist accommodation facility.

For all variables, the average rates of change (1) (Ostasiewicz, Rusnak, Siedlecka, 2001) for the years 2012-2019 and 2019-2023 were counted and then compared with each other. On this basis, the question of whether the COVID-19 pandemic changed the development trends of the variables studied was answered.

$$\bar{t}_G = \sqrt[n-1]{i_{n/n-1} \cdot i_{n-1/n-2} \cdot \dots \cdot i_{2/1}} = \sqrt[n-1]{i_{n/1}} \quad (1)$$

In the next step, it was checked in how many regions within the EU countries in terms of the variables studied there was an increase and in how many there was a decrease in the average rate of change of the variables studied.

In the final step, Hellwig's linear ordering method (Hellwig, 1968) was used to arrange the individual regions in order from those in which the variables took on the best values (the highest values because all variables are stimulants) to those that are the worst in terms of the variables under study. Methods of linear ordering, which fall within multivariate comparative analysis and taxonomy more broadly, are largely an output of Polish statistical and econometric thought (Bak, 2016).

3. Employment

The employment rate in the 15-64 age group in the Eurozone (2023) from 2012 to 2023 has been rising steadily except for a slight decline in 2013 and a significant drop in 2020, the pandemic year (Figure 1). Not all EU countries are part of the Eurozone, in addition to the fact that not all regions of each country are developing similarly. The study covered 232 regions for which data was available.

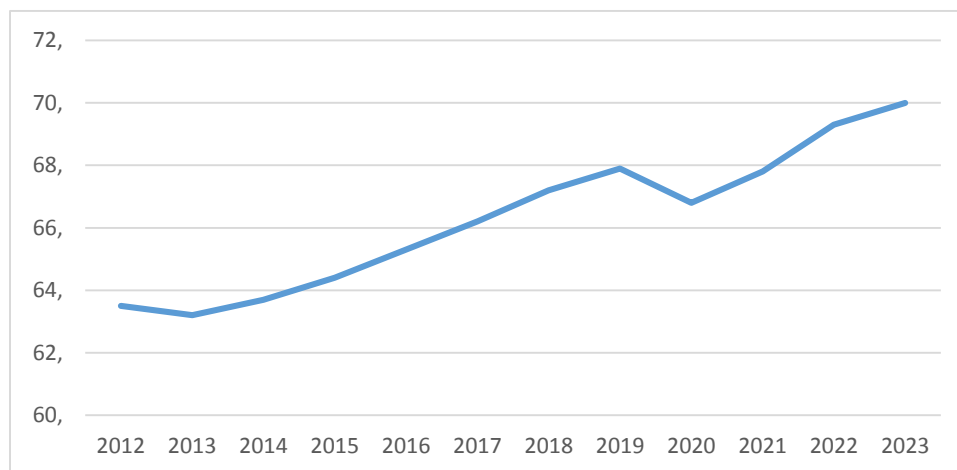


Figure 1. Employment rate in the age group 15-64 in the Euro area (2023) in 2012-2023.

Source: own calculations based on Eurostat data.

Table 1 shows the regions with the highest employment rates in 2012, 2019 and 2023.

Table 1.*Regions with the highest employment rates in 2012, 2019 and 2023*

2012			2019			2023		
Emp. rate	Region	Country	Emp. rate	Region	Country	Emp. rate	Region	Country
80,7	Åland	Finland	81,5	Åland	Finland	84,1	Noord-Brabant	Netherlands
77,8	Freiburg	Germany	81,2	Oberbayern	Germany	84,0	Utrecht	Netherlands
77,8	Utrecht	Netherlands	80,7	Utrecht	Netherlands	83,9	Overijssel	Netherlands
77,6	Oberbayern	Germany	80,1	Niederbayern	Germany	83,3	Zeeland	Netherlands
76,9	Schwaben	Germany	80,1	Noord-Brabant	Netherlands	83,1	Gelderland	Netherlands
76,7	Stockholm	Sweden	79,9	Schwaben	Germany	83,1	Drenthe	Netherlands
76,5	Tübingen	Germany	79,8	Tübingen	Germany	82,7	Friesland	Netherlands
76,4	Mittelfranken	Germany	79,8	Oberfranken	Germany	82,6	Noord-Holland	Netherlands
76,3	Niederbayern	Germany	79,6	Trier	Germany	82,5	Trier	Germany
75,9	Oberfranken	Germany	79,5	Freiburg	Germany	81,6	Niederbayern	Germany

Source: Eurostat.

In both 2012 and 2019, the highest employment rate was in the Åland region in Finland. The top 10 in 2012 included 1 more region from the Netherlands and 1 from Sweden. The remaining positions were held by regions from Germany. In 2019, instead of a region from Sweden, there was another region from the Netherlands. In Table 1, it can be seen that employment rates in 2019 have increased compared to 2012. In 2023, employment rates increased even more, with 8 regions from the Netherlands (there were 12 regions from the Netherlands in all the regions surveyed) and 2 regions from Germany in the top 10. The pandemic appears to have had a significant impact on such a change in ranking. Table 2 shows the 10 regions with the lowest employment rates.

Table 2.*Regions with the lowest employment rates in 2012, 2019 and 2023*

2012			2019			2023		
Emp. rate	Region	Country	Emp. rate	Region	Country	Emp. rate	Region	Country
39,9	Campania	Italy	41,3	Sicilia	Italy	43,8	Guyane	France
41,3	Sicilia	Italy	41,5	Campania	Italy	44,4	Campania	Italy
41,5	Calabria	Italy	42,0	Calabria	Italy	44,6	Calabria	Italy
43,0	Ciudad de Ceuta	Spain	43,3	Guyane	France	44,9	Sicilia	Italy
43,8	La Réunion	France	46,4	Puglia	Italy	47,7	Ciudad de Ceuta	Spain
44,8	Dytiki Makedonia	Greece	46,5	La Réunion	France	48,8	Ciudad de Melilla	Spain
44,9	Puglia	Italy	49,7	Ciudad de Melilla	Spain	50,0	La Réunion	France
45,4	Guyane	France	49,7	Dytiki Elláda	Greece	50,7	Puglia	Italy
45,6	Ciudad de Melilla	Spain	49,8	Guadeloupe	France	51,7	Guadeloupe	France
46,4	Extremadura	Spain	49,9	Ciudad de Ceuta	Spain	54,9	Basilicata	Italy

Source: Eurostat.

Among the regions with the lowest employment rate, regions from Italy, France, Spain and the Dytiki Makedonia region of Greece dominate. Also among the regions with the lowest employment rate, an increase in the rate can be seen, especially in 2023.

Out of 232 regions between 2012 and 2019, as many as 228 regions had an average growth rate of more than 1, meaning that there was an increase in the employment rate. Between 2019 and 2023, growth in the employment rate took place in 195 regions. The region with the largest increase in the employment rate between 2012 and 2023 was the Észak-Magyarország region of Hungary, with a growth rate of 1.032. This means that in the Észak-Magyarország region, employment grew by an average of 3.2% year on year. In contrast, the largest decrease in employment was recorded in Sud-Vest Oltenia in Rumania (an average decrease of 0.6%).

4. Human resources in science and technology (HRST)

The continuous development of technology forces society to educate itself. The growth of employment in human resources in science and technology (HRST) is a natural thing. In the Eurozone, there has been a continuous increase in the population classified as HRST (Figure 2).

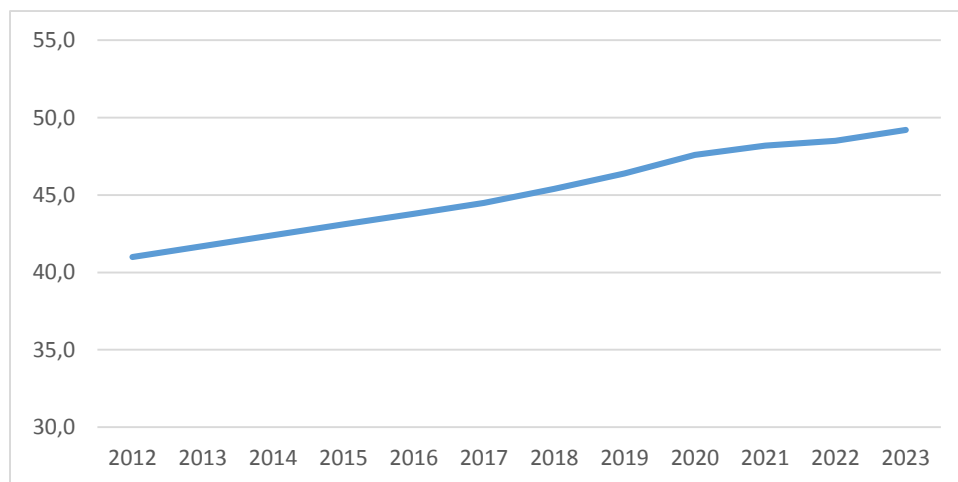


Figure 2. Human resources in science and technology (HRST) in the Euro area (2023) in 2012-2023.

Source: own calculations based on Eurostat data.

There are significant regional differences. It can be expected that there is a larger share of the population counted as HRST in large metropolitan areas, which are academic centers. Table 3 shows the 10 regions with the largest share of the population classified as HRST, and Table 4 shows the regions with the smallest human resources in science and technology.

Table 3.*Regions with the highest HRST index values in 2012, 2019 and 2023*

2012			2019			2023		
HRST	Region	Country	HRST	Region	Country	HRST	Region	Country
62,8	Prov. Brabant wallon	Belgium	68,8	Warszawski stołeczny	Poland	72,9	Warszawski stołeczny	Poland
59,8	Helsinki-Uusimaa	Finland	66,7	Stockholm	Sweden	72,5	Prov. Brabant wallon	Belgium
59,1	Stockholm	Sweden	66,4	Prov. Brabant wallon	Belgium	70,1	Sostinės regionas	Lithuania
58,2	Praha	Czech Republik	64,3	Helsinki-Uusimaa	Finland	69,7	Praha	Czech Republik
58,0	Hovedstaden	Denmark	63,5	Ile de France	France	69,4	Stockholm	Sweden
57,7	Ile de France	France	63,3	Utrecht	Netherlands	68,7	Budapest	Hungary
57,1	Bratislavský kraj	Slovakia	63,0	Hovedstaden	Denmark	67,7	Ile de France	France
57,0	Luxembourg	Luxembourg	61,7	Sostinės regionas	Lithuania	65,9	Utrecht	Netherlands
56,1	Prov. Vlaams-Brabant	Belgium	61,6	Berlin	Germany	65,8	Luxembourg	Luxembourg
55,8	Utrecht	Netherlands	61,5	Luxembourg	Luxembourg	65,0	Hovedstaden	Denmark

Source: Eurostat.

Table 4.*Regions with the lowest HRST index values in 2012, 2019 and 2023*

2012			2019			2023		
HRST	Region	Country	HRST	Region	Country	HRST	Region	Country
17,9	Nord-Est	Romania	15,9	Nord-Est	Romania	21,6	Nord-Est	Romania
18,1	Sud-Muntenia	Romania	19,6	Sud-Muntenia	Romania	21,8	Sud-Muntenia	Romania
18,5	Sud-Vest Oltenia	Romania	22,1	Sud-Vest Oltenia	Romania	23,8	Sud-Est	Romania
19,3	Ionia Nisia	Greece	22,9	Sud-Est	Romania	25,5	Ciudad de Ceuta	Spain
20,5	Sud-Est	Romania	24,2	Região Autónoma dos Açores	Portugal	26,1	Sud-Vest Oltenia	Romania
21,0	Nord-Vest	Romania	24,6	Vest	Romania	26,1	Nord-Vest	Romania
22,5	Peloponnisos	Greece	25,3	Dytiki Elláda	Greece	26,3	Stereia Elláda	Greece
22,9	Região Autónoma da Madeira	Portugal	26,8	Notio Aigaio	Greece	27,1	Ionia Nisia	Greece
23,0	Stereia Elláda	Greece	26,9	Nord-Vest	Romania	28,6	Vest	Romania
23,5	Notio Aigaio	Greece	28,1	Észak-Magyarország	Hungary	28,8	Notio Aigaio	Greece

Source: Eurostat.

In Table 3 it can be seen that only in 2012 there are 2 regions from one country (from Belgium), and in the other years the countries are represented by single regions. This shows that there is a high concentration of the population included in HRST in the surveyed countries. It is noteworthy that as many as 4 regions from Central and Eastern Europe are in the top 10 in 2023.

Among the regions with the smallest HRSTs, there are also regions from different countries, however their diversity is much smaller. Dominant here are regions located in Romania, followed by Greece. Also found here are 2 regions from Portugal and 1 each from Hungary and Spain.

Both tables show an increase in the surveyed share, and it seems that the COVID-19 pandemic did not have a significant impact on the average rate of change of the surveyed phenomenon.

5. Tourist accommodation

Restrictions as a consequence of the COVID-19 pandemic had a very severe impact on tourism. The pandemic caused a 49 percent decrease in the use of tourist accommodation in 2020 compared to 2019 (Szczukowska, 2023). Unfortunately, there are data gaps when it comes to data on nights spent in tourist accommodation establishments, which is why 2013 data was used for Greece instead of 2012 data. The Eurostat database also did not provide data for the Eurozone. To illustrate how the number of nights spent in tourist accommodations evolved, Figure 3 shows the phenomenon studied in the Canarias region (Spain). It was the most visited region in the EU.

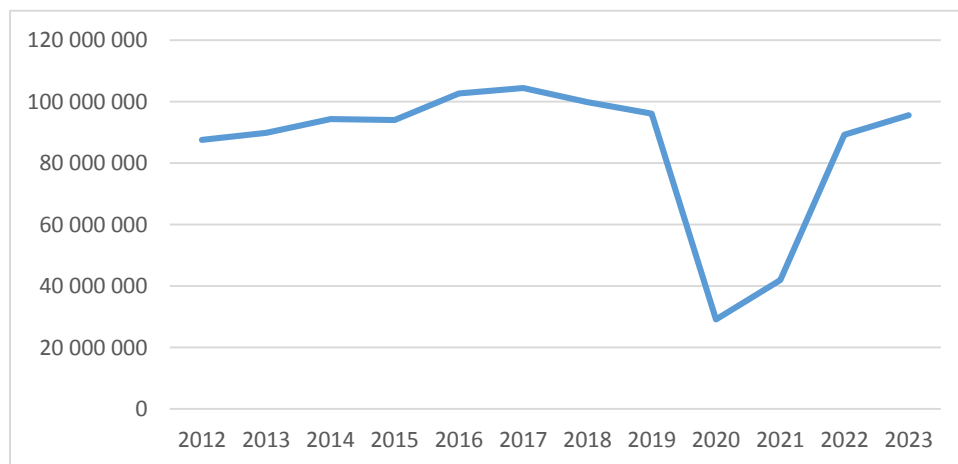


Figure 2. Nights spent in tourist accommodation facilities in the Canarias region in 2012-2023.

Source: own calculations based on Eurostat data.

Figure 2 shows a very large decrease in the number of nights spent in accommodations. This undoubtedly confirms the impact of the COVID-19 pandemic on the tourism industry. After 2020, we see a very rapid increase, but in 2023, it has not yet reached from the level achieved before the pandemic.

Tables 5 and 6 show the regions with the highest and lowest number of nights spent in accommodations.

Table 5.*Regions with the highest number of nights spent in accommodations in 2012, 2019 and 2023.*

2012			2019			2023		
Accommodations	Region	Country	Accommodations	Region	Country	Accommodations	Region	Country
87 549 896	Canarias	Spain	96 113 149	Canarias	Spain	95 574 956	Canarias	Spain
78 104 744	Ile de France	France	86 216 777	Jadranska Hrvatska	Croatia	87 317 514	Jadranska Hrvatska	Croatia
69 692 113	Cataluña	Spain	84 665 344	Ile de France	France	85 635 851	Cataluña	Spain
64 651 179	Illes Balears	Spain	84 140 872	Cataluña	Spain	85 162 673	Ile de France	France
62 352 831	Veneto	Italy	72 044 756	Andalucía	Spain	73 900 351	Andalucía	Spain
59 855 870	Jadranska Hrvatska	Croatia	71 236 630	Veneto	Italy	71 896 863	Veneto	Italy
55 484 758	Provence-Alpes-Côte d'Azur	France	68 376 034	Illes Balears	Spain	68 791 810	Illes Balears	Spain
51 496 216	Andalucía	Spain	54 623 288	Provence-Alpes-Côte d'Azur	France	55 080 043	Provence-Alpes-Côte d'Azur	France
48 709 067	Rhône-Alpes	France	51 484 901	Rhône-Alpes	France	53 752 587	Rhône-Alpes	France
42 651 126	Toscana	Italy	50 063 663	Comunitat Valenciana	Spain	52 449 694	Comunitat Valenciana	Spain

Source: Eurostat.

Table 6.*Regions with the lowest number of nights spent in accommodation facilities in 2012, 2019 and 2023*

2012			2019			2023		
Accommodations	Region	Country	Accommodations	Region	Country	Accommodations	Region	Country
129 259	Ciudad de Melilla	Spain	146 310	Ciudad de Melilla	Spain	132 824	Ciudad de Melilla	Spain
148 704	Ciudad de Ceuta	Spain	167 989	Ciudad de Ceuta	Spain	144 427	Ciudad de Ceuta	Spain
349 483	Guyane	France	354 879	Dytiki Makedonia	Greece	345 477	Dytiki Makedonia	Greece
377 928	Dytiki Makedonia	Greece	396 308	Åland	Finland	420 028	Guyane	France
405 668	Åland	Finland	439 645	Molise	Italy	494 786	Molise	Italy
410 494	Prov. Brabant wallon	Belgium	452 856	Guyane	France	552 952	Prov. Brabant wallon	Belgium
483 858	Severozapaden	Bulgaria	507 424	Prov. Brabant wallon	Belgium	707 654	Opolskie	Poland
540 050	Molise	Italy	566 530	Severozapaden	Bulgaria	741 046	Severozapaden	Bulgaria
613 049	Opolskie	Poland	893 810	Severen tsentralen	Bulgaria	829 531	Severen tsentralen	Bulgaria
671 282	Severen tsentralen	Bulgaria	938 234	Opolskie	Poland	1 232 953	Podlaskie	Poland

Source: Eurostat.

The most visited regions are those of Spain and France. Regions from these countries can also be found among the least visited, but there are also regions from other countries. In 2023, 2 regions each from Spain, Bulgaria and Poland were among the 10 least visited regions.

If we compare, in Tables 5 and 6, the number of nights spent in accommodations in the 2023 and 2019 tats, we find that in many cases the number in 2023 is higher than in 2019. Of all the regions surveyed (231) for which data were available, as many as 136 (58.9%) had more tourists in 2023 than before the pandemic.

6. Household access to the Internet

The effects of the pandemic were far-reaching. People were confined to their homes, students went into remote learning mode. The pandemic also had positive effects. It turns out that some work can be done from home, no need to go to the office. All this has influenced households to equip themselves to contact relatives, teachers, employees, or customers. Internet access has become almost a necessity.

Unfortunately, the availability of complete data on household Internet access, measured as the percentage of households in which each household member has the ability to access the Internet from home, is very limited. The Eurostat database does not have complete data for Germany, France, Greece, Poland Ireland and Lithuania. There is no data at all for Germany and Greece, and partial data for the other countries. The survey therefore covers 134 in 2012, 169 in 2019 and 186 in 2023 EU regions.

Tables 7 and 8 show the regions with the highest and lowest shares of households with Internet access.

Table 7.

Regions with the highest share of households with Internet access in 2012, 2019 and 2023

2012			2019			2023		
Internet	Region	Country	Internet	Region	Country	Internet	Region	Country
97,6	Flevoland	Netherlands	100,0	Mellersta Norrland	Sweden	99,5	Utrecht	Netherlands
96,2	Drenthe	Netherlands	99,2	Flevoland	Netherlands	99,4	Noord-Holland	Netherlands
95,5	Zeeland	Netherlands	99,2	Limburg	Netherlands	99,4	Drenthe	Netherlands
94,8	Stockholm	Sweden	99,2	Gelderland	Netherlands	99,2	Overijssel	Netherlands
94,5	Overijssel	Netherlands	99,0	Noord-Holland	Netherlands	99,1	Zeeland	Netherlands
94,5	Noord-Holland	Netherlands	98,7	Zeeland	Netherlands	99,1	Luxembourg	Luxembourg
94,4	Midtjylland	Denmark	98,7	Noord-Brabant	Netherlands	98,9	Noord-Brabant	Netherlands
94,3	Hovedstaden	Denmark	98,5	Zuid-Holland	Netherlands	98,9	Flevoland	Netherlands
93,9	Friesland	Netherlands	98,3	Småland med öarna	Sweden	98,8	Limburg	Netherlands
93,7	Gelderland	Netherlands	98,29	Utrecht	Netherlands	98,7	Prov. Vlaams-Brabant	Belgium

Source: Eurostat.

Table 8.

Regions with the lowest share of households with Internet access in 2012, 2019 and 2023

2012			2019			2023		
Internet	Region	Country	Internet	Region	Country	Internet	Region	Country
38,2	Severozapaden	Bulgaria	70,00	Severozapaden	Bulgaria	77,1	Guyane	France
45,3	Nord-Est	Romania	73,2	Severen tsentralen	Bulgaria	82,40	Calabria	Italy
46,8	Centru	Romania	73,9	Alentejo	Portugal	82,6	Severozapaden	Bulgaria
47,5	Severen tsentralen	Bulgaria	74,	Severoiztochen	Bulgaria	84,2	Basilicata	Italy
47,9	Severoiztochen	Bulgaria	74,7	Yugoiztochen	Bulgaria	85,4	Severen tsentralen	Bulgaria
48,8	Alentejo	Portugal	75,1	La Réunion	France	85,4	Corse	France
48,9	Sud-Vest Oltenia	Romania	75,3	Yuzhen tsentralen	Bulgaria	85,9	Centro	Portugal

Cont. table 8.

49,6	Sud-Muntenia	Romania	76,7	Centro	Portugal	86,2	Norte	Portugal
49,6	Yugoiztochen	Bulgaria	77,	Calabria	Italy	86,5	Severoiztochen	Bulgaria
50,3	Yuzhen tsentralen	Bulgaria	77,3	Guadeloupe	France	86,6	Alentejo	Portugal

Source: Eurostat

Tables 7 and 8 show what a change there has been in household access to the Internet. While the top 10 in all 3 years was dominated by regions from the Netherlands, there have been big changes in the last 10. It is clear that in 2012 the regions of Bulgaria and Romania had the biggest problem with Internet access. The last 10 in 2019 and 2023 no longer include regions from Romania. The regions of Bulgaria are still among the regions where household access to the Internet is difficult, but they have topped regions from Italy, Portugal and France.

7. Average rate of change of studied phenomena in EU regions

Observing Tables 1-8, we can see that the order of the regions is changing. Let's try to answer the question of which regions grew the fastest and which the slowest, and whether the COVID-19 pandemic changed the average rate of change of the phenomena studied before the pandemic.

Between 2012 and 2019, the employment rate grew on average from year to year for 228 out of 332 regions. The largest average increase was in the Észak-Magyarország region (Hungary) at 1,043, which means that the employment rate grew by an average of 4.3% year on year in this region. In contrast, the decrease in the employment rate during the period under review took place only in the Guyane region (France - 0.993). In the other 3 regions, the average rate of change was 1.

In 2019-2023, the largest average increase in the employment rate was in the Dytiki Elláda region (Greece - 1,046), and the largest decrease was in Nord-Est (Romania). During this period, an increase in the employment rate took place in 195 regions. For 75 regions, the average growth rate of the employment rate was higher in 2019-2023 than in 2012-2019, so it can be concluded that the COVID-19 pandemic caused a decrease in the average rate of change in employment in most regions (68%).

In the case of human resources in science and technology (HRST), out of 232 regions, there was an increase in the average rate of change in 223 regions from 2012-2019, and this was the case for 207 regions from 2019-2023. The largest increases in the share of the population included in HRST took place in Ionia Nisia (Greece - 1,069) and Nord Est (Ruminia), respectively. In contrast, the largest decreases in HRST occurred in Corse (France - 0.977) and Ciudad de Ceuta (Spain - 0.967), respectively. For 58% of the regions, there was a lower rate of change of the studied phenomenon in 2019-2023 than in 2012-2019.

Between 2012 and 2019, tourism in the vast majority of regions (96%) developed very well, with a year-on-year increase in the number of nights provided. In the Iperios region (Greece), the number of nights spent in tourist accommodations increased by an average of 12.7% from year to year, and there were also regions where there was a decline, with the largest in the Mazowieckie Voivodeship region (Poland - 0.822). In 2020, tourism services collapsed, but in the following years the situation began to return to normal. Between 2019 and 2023, 131 regions had a higher number of rented nights than before the pandemic in 2019, with the highest average rate of change in the Flevoland region (Netherlands - 1.089) and the lowest in the Opole province (Poland - 0.932). It can be said that the pandemic has left a big mark on the tourism industry, but the situation is quickly normalizing.

Internet access during the pandemic greatly not only facilitated, but also enabled a relatively normal life. Between 2012 and 2019, 99% of the regions surveyed saw a year-on-year increase in the share of households with Internet access. Between 2019 and 2023, the share was already only 91%. Only 12% of the regions had a higher average rate of change between 2019 and 2023 than between 2012 and 2019. This is due to the fact that in 2012 the Internet was not yet so popular and in some regions (especially Eastern Europe) the share of households with Internet access was below 50%. In 2019, there was no longer a region in the EU where the share was below 70%. In the first period under review, the highest average rate of change was in the Severozapaden region (Bulgaria - 1.092), and the lowest in Bratislava (Slovakia - 0.9996). In the next period, also the largest increase was in Bulgaria's Yugozapaden region (1.092), and the smallest this time in Sweden's Mellersta Norrland region (0.988).

Table 9 shows in how many regions of the studied countries there was an increase in the average rate of change of the studied phenomena in 2019-2023 compared to 2012-2019. The chosen periods were adopted to capture the average rates of change in the studied phenomena before and during the pandemic. If the periods 2012-2019 and 2020-2023 were used, the change that occurred between 2019 and 2020 would be lost, and it can be expected that the most significant changes caused by the COVID-19 pandemic took place during that time. It was in 2020 that the EU experienced the greatest disruptions related to the pandemic. Many countries implemented lockdowns.

Table 9.

Number of regions in which the average rate of change of the phenomenon under study was higher in 2019-2023 than in 2012-2019

	Employment rate		HRST		Internet		Tourist accommodation	
	Increased *	Regions **	Increased *	Regions **	Increased *	Regions **	Increased *	Regions **
Austria	1	9	0	9	2	9	0	9
Belgium	5	11	6	11	1	11	1	11
Bulgaria	0	6	3	6	1	6	2	6
Cyprus	0	1	1	1	0	1	0	1
Czech Republik	0	8	5	8	1	8	0	8

Danmark	1	5	2	5	1	5	4	5
Estonia	0	1	0	1	0	1	0	1
Finland	0	5	0	5	0	4	-	-
France	21	26	14	26	-	-	0	1
Greece	7	13	4	13	-	-	-	-
Spain	0	19	7	19	0	19	2	19
Netherlands	11	12	9	12	3	12	3	12
Croatia	1	1	0	1	0	1	0	1
Ireland	1	3	3	3	-	-	-	-
Luxembourg	1	1	1	1	1	1	1	1
Latvia	0	1	0	1	0	1	0	1
Malta	0	1	0	1	1	1	0	1
Germany	4	38	14	38	-	-	0	38
Poland	4	15	4	15	-	-	0	10
Portugal	0	7	2	7	0	7	0	2
Romania	0	8	4	8	0	8	0	8
Slovakia	0	4	2	4	4	4	0	4
Slovenia	0	2	0	2	-	-	0	2
Sweden	3	8	2	8	1	8	0	8
Hungary	0	6	6	6	0	6	0	6
Italy	15	21	9	21	0	21	7	21

* number of regions in which the average rate of change increased.

** number of regions examined.

Source: own calculations.

In a few countries (France, the Netherlands, Italy), the average rate of employment growth in the 2019-2023 period was higher than in the 2012-2019 period in most regions, but in the vast majority it was lower. For the population counted in HRST, Belgium, the Czech Republic, France, Hungary, the Netherlands, Ireland and Luxembourg saw growth in most regions. For household Internet access, only 3 small countries saw an increase in the average rate of change (Luxembourg, Malta, Slovakia). On the other hand, the average rate of change for the number of nights provided in 2019-2023 was higher than in 2012-2019 only in Luxembourg and Denmark. As you can see, there are a few countries that repeat themselves. The most common is Luxembourg, but it is a small country with only 1 region. Among the larger countries, France and the Netherlands appear most often.

We know which regions are the best and worst in terms of the phenomena studied. Now, using the Hellwig linear ordering method, the regions were ordered from those in which the variables took the best values to those that took the best values. Household access to the Internet was not taken into account due to large data gaps.

Since the variables are given in the form of indices or as real numbers, the first step involved normalization of the variables. In the next step, the best object was created - a pattern (one that takes the best values for all variables - this is a fictitious object). All variables are stimulants, so the higher the value of the indicator the better, so the pattern takes 1 for each normalized variable. In the last step, the Euclidean distance of the regions from the pattern was counted. Tables 10-12 show the top 30 regions in 2012, 2019 and 2023.

Table 10.*Top 30 regions in terms of studied characteristics in 2012*

Position	Region	Country	Position	Region	Country	Position	Region	Country
1	Ile de France	France	11	Darmstadt	Germany	21	Västsverige	Sweden
2	Oberbayern	Germany	12	Schleswig-Holstein	Germany	22	Helsinki-Uusimaa	Finland
3	Cataluña	Spain	13	Comunidad de Madrid	Spain	23	Stuttgart	Germany
4	Berlin	Germany	14	Illes Balears	Spain	24	Freiburg	Germany
5	Noord-Holland	Netherlands	15	Lombardia	Italy	25	Karlsruhe	Germany
6	Tirol	Austria	16	Toscana	Italy	26	Köln	Germany
7	Veneto	Italy	17	Hovedstaden	Denmark	27	Zuid-Holland	Netherlands
8	Praha	Czech Republic	18	Hamburg	Germany	28	Gelderland	Netherlands
9	Emilia-Romagna	Italy	19	Salzburg	Austria	29	Kýpros	Cyprus
10	Stockholm	Sweden	20	Mecklenburg-Vorpommern	Germany	30	Utrecht	Netherlands

Source: own calculations.

Table 11.*Top 30 regions in terms of studied characteristics in 2019*

Position	Region	Country	Position	Region	Country	Position	Region	Country
1	Ile de France	France	11	Veneto	Italy	21	Lombardia	Italy
2	Cataluña	Spain	12	Schleswig-Holstein	Germany	22	Darmstadt	Germany
3	Rhône-Alpes	France	13	Comunidad de Madrid	Spain	23	Salzburg	Austria
4	Oberbayern	Germany	14	Canarias	Spain	24	Toscana	Italy
5	Noord-Holland	Netherlands	15	Comunitat Valenciana	Spain	25	Hamburg	Germany
6	Berlin	Germany	16	Aquitaine	France	26	Hovedstaden	Denmark
7	Provence-Alpes-Côte d'Azur	France	17	Praha	Czech Republic	27	Eastern and Midland	Ireland
8	Illes Balears	Spain	18	Emilia-Romagna	Italy	28	Pays de la Loire	France
9	Tirol	Austria	19	Stockholm	Sweden	29	Languedoc-Roussillon	France
10	Jadrska Hrvatska	Croatia	20	Mecklenburg-Vorpommern	Germany	30	Bretagne	France

Source: own calculations.

Table 12.*Top 30 regions in terms of studied characteristics in 2023*

Position	Region	Country	Position	Region	Country	Position	Region	Country
1	Ile de France	France	11	Illes Balears	Spain	21	Languedoc-Roussillon	France
2	Cataluña	Spain	12	Veneto	Italy	22	Darmstadt	Germany
3	Rhône-Alpes	France	13	Schleswig-Holstein	Germany	23	Zuid-Holland	Netherlands
4	Noord-Holland	Netherlands	14	Comunidad de Madrid	Spain	24	Hamburg	Germany
5	Oberbayern	Germany	15	Praha	Czech Republic	25	Bretagne	France

Cont. table 12.

6	Provence-Alpes-Côte d'Azur	France	16	Comunitat Valenciana	Spain	26	Andalucía	Spain
7	Berlin	Germany	17	Stockholm	Sweden	27	Budapest	Hungary
8	Aquitaine	France	18	Canarias	Spain	28	Lombardia	Italy
9	Tirol	Austria	19	Salzburg	Austria	29	Pays de la Loire	France
10	Jadranska Hrvatska	Croatia	20	Hovedstaden	Denmark	30	Warszawski stołeczny	Poland

Source: own calculations.

In terms of the characteristics studied, the top 30 regions are dominated by regions from the “old” EU countries. Each time, among the countries of Central and Eastern Europe, the highest is Praha (Czech Republic). In 2023, the Warsaw Capital Region was ranked 30th. In each year, the Ile de France (France) region is the best, and Cataluña (Spain) is very high. Regions whose capitals are large cities with academic centers dominate.

8. Summary

Regions of EU countries are constantly developing. The article examines their development as influenced by employment in the 15-64 age group, household access to the Internet, the size of the population classified as HRST, and the number of nights spent in tourist accommodations. Unfortunately, there are data gaps, especially in the case of household access to the Internet.

Examining the average rate of change of individual phenomena, one can conclude that the COVID-19 pandemic had a significant impact on regional development. On more than one occasion, this development was almost halted, as was the case with tourism. Employment also declined in 2020, as did the size of the population counted ho HRST. Unsurprisingly, the pandemic had little effect on the availability of households to the Internet; indeed, in 2020, in most regions the rate grew faster than the average rate of change counted for 2012-2019 would indicate, but then quickly declined. The situation was similar for HRST, with a noticeable increase in 2020, but a correction in subsequent years. In 42% of the regions, the average rate of change in 2019-2023 was higher than in 2012-2019.

For employment, the negative effects of the pandemic have been very short-lived, with a rapid upward rebound after a decline in 2020. In both the top 10 and last 10 regions, the employment rate was higher in 2023 than in 2019.

Much more severe losses were suffered by the tourism industry, here growth was halted and only in 2023 the number of nights spent in tourist accommodations is comparable to 2019.

Among the best-developed regions of the EU countries (in terms of the characteristics studied), the Ile de France (France) region uninterruptedly dominates. The Cataluña region (Spain) also always ranks very high. Most of the best-developed regions are those with large

cities that are academic centers. This is dominated by the regions of the “old” EU, and among the countries of Central and Eastern Europe, only Praha (Czech Republic) (3 times) and the capital Warsaw (Poland) (2023) are in the top 30.

The obtained results suggest that the regions of Central and Eastern Europe are approaching the development level of Western European countries.

Of course, this classification could have looked different if a different linear ordering method had been used, and it certainly would have looked different if other variables had been used. This is where the analysis can be enriched by adding more variables, such an analysis would give an answer to the question of which EU region is the most comprehensively developed. Here, the analysis can be enriched by adding additional variables, making it more reliable. In classification methods, much depends on the choice of indicators used in the study (which is always subjective), so a significant increase in their number would be advisable. A limitation of the analysis is, of course, data availability. The Hellwig linear ordering method can be applied if data is available for all objects, in our case, the EU regions.

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IMPACT OF COVID-19 PANDEMIC ON SELECTED CAUSES OF DEATH IN EU REGIONS

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Purpose: The main objective of the study is to learn about the impact of the COVID-19 pandemic on the trends of selected causes of death in EU regions. The second objective is to learn about the variation in mortality from heart disease and cancer and from accidents in EU regions.

Design/methodology/approach: To examine the impact of the pandemic on mortality, the average rates of change in mortality before and after the pandemic in all EU regions were counted. The linear ordering method was also used to rank EU regions in terms of mortality from ischemic heart disease and cancer and accidents, thus examining the variation in terms of the aforementioned indicators across EU regions.

Findings: The analyses show that 90% of the regions experienced an increase in the total death rate after the pandemic, so it can be argued that indeed the COVID-19 pandemic had a significant impact on mortality in EU regions. The study also shows that there is a high similarity in deaths from heart disease and cancer in regions within EU countries. In the case of deaths due to accidents, there is much greater variation within countries.

Research limitations/implications: Further research should focus on analyzing similarities in the development of EU regions. The research can be expanded to analyze coefficients related to the economic development of the regions.

Social implications: By learning which regions are best able to cope with the effects of a pandemic, regions that are coping less well can draw some patterns to better handle similar situations in the future. In the era of globalization, similar cases may occur more and more frequently, so it is important to have appropriate strategies prepared and to implement them immediately.

Originality/value: While countries are often compared with each other, regions are much less often. The article shows the changes that are taking place precisely in the regions of EU countries. Of course, many decisions are made at the national level, however, also at the level of the regions many important decisions can be made, thanks to which some regions develop better and others less well.

Keywords: EU country regions, Hellwig linear ordering method, average rate of change, mortality.

Category of the paper: empirical research.

1. Introduction

Globalization brings many benefits, but it also brings risks. In December 2019, the first reports of a new disease emerged. A cluster of patients with severe pneumonia was detected in the city of Wuhan, China. The World Health Organization was informed on December 31, 2019, when 44 cases were detected, and on January 9, 2020, information that the disease was caused by a new coronavirus similar to SARS-CoV circulated the world (Duszynski et al., 2020, p. 12). The ease of human travel has caused the coronavirus to spread around the world at a rapid pace.

The COVID-19 pandemic in Poland lasted from March 2020 to May 2022, causing 6.5 million cases and 119,000 deaths. There were also more than 200,000 excess deaths in Poland during this period compared to the average in recent years (Płonka-Syroka, 2023, p. 27). Also in the rest of Europe, more than 2 million people died from the pandemic (PAP, 2022). In the literature, we can find articles on the impact of the COVID-19 pandemic on the global economy (Jędrzejowska, Wróbel, 2021), individual countries (Rangachev, Marinov, Mladenov, 2022; Bogos et al., 2021; Parkitny, Parkitna, 2024) or selected regions (Budner-Iwanicka, Legutko, 2021; Hacıoğlu-Hoke, Känzig, Surico, 2021).

The purpose of this article is to examine the changes that have occurred in the pattern of deaths due to the COVID-19 pandemic in all regions of the EU. The analysis includes the total number of deaths, deaths from accidents, from traffic accidents, from cancer and from ischemic heart disease. Deaths, especially excess deaths, can have serious consequences for the economies of individual EU regions, which is why it is so important to monitor them.

The article examines the changes that have occurred in mortality in the 5 categories adopted by Eurostat in all regions in the NUTS 2 division of the EU. Population deaths were divided according to the 5 categories:

- death due to transport accidents,
- death due to accidents,
- death due to ischaemic heart diseases,
- death due to cancer,
- all causes of death.

The research hypotheses also included:

- mortality in regions of individual EU countries for individual causes is similar to each other,
- in regions from “richer” countries (northwestern Europe) mortality from individual causes is lower than in “poorer” regions (southeastern Europe),
- the authorities of the regions taking care of their residents strive to reduce the listed causes of death, however, the pandemic may have changed the trend of the number of deaths,

- in regions from the countries of Central and Eastern Europe “chasing” the countries of Western Europe, the number of deaths from the listed causes is falling at a faster rate.

2. Methodology

All data are from the Eurostat website (2024). The first step divides the causes of death into 3 categories:

- health-related,
- related to accidents,
- all causes of death.

For the first two categories, Hellwig's linear ordering method (Hellwig, 1968) was used to order each region from those with the lowest mortality rates to those with the highest. To do this, the variables were normalized, and then the pattern of development was counted, i.e. the region (often fictitious) where all rates were best (in this study, rates were lowest) with which all regions were compared.

The use of Hellwig's linear ordering method involves the fact that we must have complete data, variables for which we do not have complete data must be removed from the analysis. In this method, we can include weights for individual variables, this gives the opportunity to take into account the hierarchy of importance of individual criteria, but it also affects the results of the analysis and can lead to manipulation of the study. For this reason, the study did not assign weights to individual variables, so all variables were assumed to be equally important. Another limitation of Hellwig's linear ordering method is that it does not take into account the relationships between variables, which can also affect the results of the analysis, and finally, the most important thing is the choice of variables themselves, which is always a subjective choice.

By organizing the regions, it is possible to answer the question of whether mortality in the regions of each EU country for particular causes is similar to each other, and whether mortality for particular causes is lower in regions from “richer” countries than in “poorer” regions.

In the next step, the average rate of change of total deaths was counted (Ostasiewicz, Rusnak, Siedlecka, 2001) in 2013-19 and in 2019-21. Comparison of these indicators will help answer the last 2 research hypotheses.

3. Deaths in EU regions due to ischemic heart disease or cancer

Heart disease and cancer are common causes of death that all EU countries are trying to combat, among other things, through prevention. To see which regions have the highest mortality rates for the aforementioned diseases, they were ranked using Hellwig's linear ordering method. All EU regions were ranked from those for which death rates from heart disease and cancer are lowest to those for which they are highest. Such an analysis was performed for 2013, 2019 and 2021, so we can see whether there were changes in the order of EU regions. Table 1 shows the 15 regions in which Hellwig's measure of development took the largest values (mortality rates were the smallest), and Table 2 shows the smallest. Table 2 arranges the regions in order from the smallest value of the Hellwig development measure to the largest value.

Table 1.

Regions with the highest values of Hellwig's measure of development (ischemic heart disease and cancer)

2013			2019			2021		
Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development
Martinique	France	1,000	Provincia Autonoma di Trento	Italy	1,000	Sardegna	Italy	0,995
Guyane	France	0,995	Calabria	Italy	0,883	Centre — Val de Loire	France	0,944
Kýpros	Cyprus	0,869	Sardegna	Italy	0,876	Calabria	Italy	0,936
La Réunion	France	0,866	Centre — Val de Loire	France	0,832	Provincia Autonoma di Bolzano/Bozen	Italy	0,913
Voreio Aigaio	Greece	0,859	Sicilia	Italy	0,825	Aquitaine	France	0,900
Midi-Pyrénées	France	0,852	Provincia Autonoma di Bolzano/Bozen	Italy	0,824	Sicilia	Italy	0,896
Comunidad de Madrid	Spain	0,845	Friesland	Netherlands	0,799	Pest	Hungary	0,883
Molise	Italy	0,836	Pest	Hungary	0,795	Sostinės regionas	Lithuania	0,872
Calabria	Italy	0,835	Basilicata	Italy	0,795	Prov. Limburg	Belgium	0,871
Basilicata	Italy	0,828	Aragón	Spain	0,795	Haute-Normandie	France	0,866
Abruzzo	Italy	0,814	Vidurio ir vakarų Lietuvos regionas	Lithuania	0,789	Flevoland	Netherlands	0,865
Notio Aigaio	Greece	0,814	Sostinės regionas	Lithuania	0,783	Campania	Italy	0,864
Centro	Portugal	0,807	Tübingen	Germany	0,779	Picardie	France	0,862
Rhône-Alpes	France	0,806	Prov. Limburg	Belgium	0,779	Friesland	Netherlands	0,860
Región de Murcia	Spain	0,800	Aquitaine	France	0,778	Prov. Brabant wallon	Belgium	0,859

Source: own calculations.

Table 2.

Regions with the highest Hellwig development index values (ischemic heart disease and cancer)

2013			2019			2021		
Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development
Észak-Magyarország	Hungary	0,124	Limburg	Netherlands	0,112	Limburg	Netherlands	0,130
Közép-Dunántúl	Hungary	0,151	Burgenland	Austria	0,152	Burgenland	Austria	0,148
Észak-Alföld	Hungary	0,152	Gelderland	Netherlands	0,175	Noord-Brabant	Netherlands	0,168
Pest	Hungary	0,159	Noord-Brabant	Netherlands	0,177	Gelderland	Netherlands	0,185
Dél-Dunántúl	Hungary	0,171	Zuid-Holland	Netherlands	0,204	Zuid-Holland	Netherlands	0,231
Vidurio ir vakarų Lietuvos regionas	Lithuania	0,200	Noord-Holland	Netherlands	0,205	Niederösterreich	Austria	0,233
Dél-Alföld	Hungary	0,213	Niederösterreich	Austria	0,211	Noord-Holland	Netherlands	0,237
Nyugat-Dunántúl	Hungary	0,234	Zeeland	Netherlands	0,269	Zeeland	Netherlands	0,286
Západné Slovensko	Slovakia	0,248	Norra Mellansverige	Sweden	0,291	Norra Mellansverige	Sweden	0,286
Budapest	Hungary	0,273	Vest	Romania	0,304	Drenthe	Netherlands	0,332
Severozápad	Czech Republic	0,274	Utrecht	Netherlands	0,314	Utrecht	Netherlands	0,337
Stredné Slovensko	Slovakia	0,283	Severozápad	Czech Republic	0,318	Sydsverige	Sweden	0,346
Východné Slovensko	Slovakia	0,285	Mellersta Norrland	Sweden	0,327	Severozápad	Czech Republic	0,349
Nord-Vest	Romania	0,294	Drenthe	Netherlands	0,327	Vest	Romania	0,355
Latvija	Latvia	0,294	Overijssel	Netherlands	0,343	Overijssel	Netherlands	0,364

Source: own calculations.

From Tables 1 and 2, we can learn that the regions with the highest and lowest surveyed death rates have changed over the nine years. Of particular note is the Hungarian region of Pest. In 2013 it was ranked 4th in terms of the highest surveyed death rates (the lowest measures of Hellwig development), while in 2019 and 2021 it was ranked 8th and 7th, respectively, among the countries with the highest measure of Hellwig development.

We can also see that among the highest-rated countries in 2013 were the Mediterranean countries and Portugal, while the lowest-rated were the countries of Central and Eastern Europe. In 2019 and 2021, the situation is quite different. Among the worst countries, the Netherlands is by far the leader, with as many as 9 regions from this country in both years (out of 12 regions in total). Among the best regions, there are 6 and 5 regions from Italy and 2 and 4 regions from France, respectively. It can be seen that regions from these countries maintain very high positions throughout the period under review.

Lithuania's regions recorded the largest growth. Lithuania has 2 regions according to the NUTS 2 classification. In 2013, both were among the 20 weakest regions, in 2019 and 2021 they are among the best regions.

Table 3 shows the average positions of the regions for each EU country in 2021.

Table 3.

Average regional positions for each EU country (ischemic heart disease and cancer)

	Mean	Standard deviation
Hungary	46,5	23,74
Italy	50,1	44,09
Belgium	58,2	46,85
France	61,3	39,26
Spain	72,7	30,38
Portugal	102	49,87
Germany	116,1	38,16
Poland	126,7	13,71
Finland	138,6	45,13
Greece	147,3	8,90
Bulgaria	152,7	34,51
Slovakia	154	7,73
Sweden	156,6	39,36
Austria	162,3	40,65
Netherlands	166	76,42
Denmark	170,6	12,53
Czech Republic	186,3	9,81
Romania	191,8	4,85

Source: own calculations.

Table 3 shows countries with at least 3 regions. The average can give us an idea of what the situation is in terms of mortality from heart disease and cancer in each EU country. The standard deviation, as a measure of variability, tells us how different the individual positions of the regions are from the average for the country. It can be seen that in 2021 Hungary, Italy and Belgium were ranked No. 1, with Denmark, the Czech Republic and Romania in last place. It can be seen that the largest variation of individual regions is in the Netherlands, while for many countries the variation is small, indicating the significant influence of the state and the systemic solutions adopted in each country to counter the studied mortality in each region. The worst situation is in the last 3 countries because the averages indicate very high mortality rates compared to EU countries, and the low value of the standard deviation shows that this bad situation applies to all regions in these countries. In the Netherlands, the situation is also bad, but the high value of the standard deviation shows that some regions are doing much better than others. There are 2 regions from the Netherlands in the top 15, and as many as 9 in the last 15.

4. Deaths in EU regions due to accidents

In addition to mortality due to ischemic heart disease and cancer, this study examined mortality due to accidents. Deaths from traffic accidents and deaths from accidents in general were taken into account. As in the case of mortality from diseases, the regions were also ranked

by counting the Hellwig measure of development. Tables 4 and 5 show the regions for which the development measure took the largest and smallest values.

Table 4.

Regions with the highest values of Hellwig's measure of development (accidents)

2013			2019			2021		
Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development
Comunidad de Madrid	Spain	0,9772	Centre — Val de Loire	France	0,949	Centre — Val de Loire	France	0,944
Ciudad de Ceuta	Spain	0,9505	Lorraine	France	0,931	Región de Murcia	Spain	0,891
Bremen	Germany	0,9494	Notio Aigaio	Greece	0,922	Hannover	Germany	0,888
Düsseldorf	Germany	0,9106	Pays de la Loire	France	0,905	Wien	Austria	0,872
Arnsberg	Germany	0,9088	Bretagne	France	0,902	Nord-Pas de Calais	France	0,867
Canarias	Spain	0,8924	Bremen	Germany	0,895	Notio Aigaio	Greece	0,867
Köln	Germany	0,8913	Región de Murcia	Spain	0,875	Champagne-Ardenne	France	0,863
Berlin	Germany	0,8911	Warmińsko-mazurskie	Poland	0,869	Attiki	Greece	0,861
Schleswig-Holstein	Germany	0,8838	Attiki	Greece	0,868	Pays de la Loire	France	0,859
Comunitat Valenciana	Spain	0,8822	Düsseldorf	Germany	0,868	Bretagne	France	0,854
País Vasco	Spain	0,8802	Alsace	France	0,861	Basse-Normandie	France	0,854
Saarland	Germany	0,8740	Wien	Austria	0,860	Alsace	France	0,853
Detmold	Germany	0,8666	Nord-Pas de Calais	France	0,860	Warmińsko-mazurskie	Poland	0,852
Andalucía	Spain	0,8654	Voreio Aigaio	Greece	0,859	Ile de France	France	0,850
Münster	Germany	0,8630	Hovedstaden	Denmark	0,857	Münster	Germany	0,846

Source: own calculations.

Table 5.

Regions with the lowest values of Hellwig's measure of development (accidents)

2013			2019			2021		
Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development	Region	Country	Hellwig's measure of development
Prov. Namur	Belgium	0,187	Prov. Luxembourg	Belgium	0,217	Övre Norrland	Sweden	0,109
Sostinės regionas	Lithuania	0,194	Overijssel	Netherlands	0,225	Stredné Slovensko	Slovakia	0,226
Guyane	France	0,214	Övre Norrland	Sweden	0,225	Západné Slovensko	Slovakia	0,230
Prov. Luxembourg (BE)	Belgium	0,227	Západné Slovensko	Slovakia	0,257	Etelä-Suomi	finlandia	0,336
Vidurio ir vakarų Lietuvos regionas	Lithuania	0,261	Sardegna	Italy	0,263	Calabria	Italy	0,347
Vest	Romania	0,262	Veneto	Italy	0,292	Overijssel	Netherlands	0,363
Nord-Est	Romania	0,387	Etelä-Suomi	Finland	0,308	Prov. Luxembourg (BE)	Belgium	0,366
Sud-Est	Romania	0,397	Stredné Slovensko	Slovakia	0,323	Länsi-Suomi	Finland	0,367
Latvija	Latvia	0,401	Limburg	Netherlands	0,328	Veneto	Italy	0,400

Cont. table 5.

Sud-Vest Oltenia	Romania	0,416	Prov. Namur	Belgium	0,357	Sardegna	Italy	0,408
Lubuskie	Poland	0,419	Länsi-Suomi	Finland	0,362	Gelderland	Nether-lands	0,419
Kujawsko-pomorskie	Poland	0,432	Drenthe	Nether-lands	0,380	Drenthe	Nether-lands	0,419
Prov. Hainaut	Belgium	0,437	Gelderland	Nether-lands	0,385	Mellersta Norrland	Sweden	0,420
Prov. Liège	Belgium	0,443	Calabria	Italy	0,418	Nord-Vest	Romania	0,461
Wielkopolskie	Poland	0,447	Zuid-Holland	Nether-lands	0,420	Prov. Namur	Belgium	0,464

Source: own calculations.

If we look at Table 4, in 2013 the highest values of Hellwig's measure of development were in regions of 2 countries, Spain and Germany. In subsequent years, the ranking changed and there were more and more regions from France and Greece. The top 15 also included 1 region from Poland - the Warmian-Masurian Voivodeship.

In contrast, the regions with the most accidents in 2013 were Belgium, Romania and Poland. It also included both regions from Lithuania and Latvia. The final places of the classification also saw changes in subsequent years. Several regions from the Netherlands, Italy, Slovakia and Finland appeared. Country averages and standard deviations in 2021 are shown in Table 6.

Table 6.

Average regional positions for each EU country (accidents)

	Mean	Standard deviation
Greece	37,8	38,82
Denmark	39,8	12,06
Hungary	68,8	19,10
Germany	74,1	39,37
France	74,6	61,04
Spain	83,7	50,43
Bulgaria	102	43,88
Portugal	106,3	42,11
Italy	126,3	56,30
Poland	132,1	54,77
Belgium	135,3	53,99
Sweden	144,1	70,29
Austria	145,1	53,44
Czech Republik	149,9	37,06
Netherlands	151,1	56,25
Finland	164,8	47,10
Romania	183,4	14,57
Slovakia	192	25,52

Source: own calculations.

In 2021, 2 countries by far lead the way in terms of the lowest death rates from accidents, both traffic and overall. Greece ranked first, followed by Denmark. If we look at the standard deviations, they are much higher than for deaths from heart disease and cancer. Only in three countries is the standard deviation value below 20. This shows that in the case of death from accidents, the regions in each country are much more diverse than in the case of death from heart disease and cancer. It seems that in this case the geographic location of the region is more important.

5. Deaths in EU regions, and the COVID-19 pandemic

If we look at the average rate of change of total deaths of residents of EU regions (Table 7) from 2019 to 2021, and the average rate of change of total deaths from 2013 to 2019, we find that out of 239 districts, as many as 219 were higher in the later period. Undoubtedly, this was influenced by the outbreak of the COVID-19 pandemic. However, in 20 regions there was a decrease in the average rate of deaths.

It should be noted that the number of deaths decreased (on average) from year to year in most regions between 2013 and 2019. Only in 7 regions it increased: in 4 regions in France, 2 in Portugal and 1 in Greece. Between 2019 and 2021, the number of deaths has already increased (on average) in 182 regions. The regions where the average death rate decreased are in 7 countries: Denmark 3, Germany 8, Greece 2, Spain 2, France 1, Portugal 3, Finland 1. Denmark is particularly noteworthy, it is here in 3 out of 5 counties that the average rate of deaths further decreased during the pandemic period, and in all counties the number of deaths steadily decreased throughout the period studied. This was still the case in Ireland, Luxembourg and Finland. In these 4 countries, the average rate of change in both 2013-2019 and 2019-2021 was below 1, so on average, the number of total deaths declined from year to year.

Table 7.

Increase/decrease in average rate of change of total deaths in EU regions

Region	Number of regions	Number of regions in which the average rate of change was above 1 in years		Number of regions where the average rate of change in 2019-21 was higher than in 2013-19
		2013-2019	2019-2021	
Belgium	10	0	10	10
Bulgaria	6	0	6	6
Czech Republic	8	0	8	8
Denmark	5	0	0	2
Germany	38	0	19	30
Estonia	1	0	1	1
Ireland	3	0	0	3
Greece	13	1	11	11
Spain	19	0	15	17
France	27	4	22	26
Croatia	1	0	1	1
Italy	21	0	21	21
Cyprus	1	0	1	1
Latvia	1	0	1	1
Lithuania	2	0	2	2
Luxembourg	1	0	0	1
Hungary	8	0	8	8
Malta	1	0	1	1
Netherlands	12	0	10	12
Austria	9	0	9	9
Poland	17	0	17	17
Portugal	7	2	4	4
Romania	8	0	8	8
Slovenia	2	0	2	2

Cont. table 7.

Slovakia	4	0	4	4
Finland	5	0	0	1
Sweden	8	0	1	8

Source: own calculations.

Table 8 shows that 215 regions out of 239 (90%) saw an increase in the average rate of change of deaths in the surveyed regions in 2019-2021 compared to 2013-2019. On this basis, it can be argued that indeed the COVID-19 pandemic caused an increase in excess deaths, which undoubtedly translates into economic growth in the EU.

6. Conclusions

Referring to the research hypotheses, we can conclude that in the case of mortality due to ischemic heart disease and cancer in many countries, we can see little variation within a country. However, this does not apply to all countries. In the Netherlands, the variation is very large. For deaths due to traffic accidents and accidents in general, we see much greater variation. Only in the case of 3 countries, Denmark, Hungary and Romania, the standard deviation of the places of each region in the ranking is less than 20.

When we look at the regional rankings we can see that in 2013 the highest mortality from heart disease or cancer was in the regions of Central and Eastern Europe, however, the top countries were not from Northern Europe, but rather from the Mediterranean basin, which may suggest that diet has a huge impact on the above statistics. In the following years, the situation improved dramatically in the countries of Central and Eastern Europe, to the point that in 2021 mortality from heart disease or cancer was lowest in regions from Hungary. Regions from France, Belgium and Italy also ranked very high. On the other hand, if we compare mortality due to accidents, here the regions of Central and Eastern European countries fare even worse. It should be noted that looking through the prism of countries, in both rankings in 2021, regions from Romania ranked last, while Hungary ranked 1st and 3rd, respectively. In summary, while back in 2013 we could indeed see a division between the “old EU” countries and the new EU members, over the years this division is blurring.

Answering the question of whether the COVID-19 pandemic has changed the trends of the overall number of deaths in each region, the answer is definitely yes. In most regions of the EU countries in 2013-2019 the trend was downward, while in 2019-2021 it was already upward. However, there are countries in which total mortality declined in all regions in both periods studied. Such a situation provides an opportunity for the authorities of regions where the situation is worse to look at the decisions and actions taken in recent years by the authorities of regions where the situation is best. The different cities and region of the EU countries are cooperating with each other, knowledge of which of them are dealing with particular problems

best can be used to cooperate even more closely to solve problems that are influenced by the lower level authorities and to prepare an appropriate action strategy for similar situations like the COVID-19 pandemic.

The analysis could be extended to regions outside Europe. Such a comparison would also provide an answer to the question of how European regions coped with the effects of Pandemic COVID-19 compared to regions from other continents.

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BUILDING SUPPLY CHAIN RESILIENCE: HOW BLOCKCHAIN TECHNOLOGY ADDRESSES VULNERABILITIES AND STRENGTHENS CAPABILITIES

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Purpose: This study explores the potential of blockchain technology to mitigate supply chain vulnerabilities and enhance resilience-building capabilities. Using the SCRAM framework as a foundation, it examines how blockchain features align with specific vulnerabilities and capabilities to strengthen supply chain resilience.

Design/methodology/approach: The research employs a conceptual analysis based on the SCRAM framework and blockchain technology features. By reviewing academic literature and industry case studies, the study systematically maps blockchain functionalities to the vulnerabilities and capabilities defined in SCRAM. A diagram is developed to visually illustrate these interactions.

Findings: The study identifies how blockchain features—such as transparency, decentralization, smart contracts, and immutability—address specific vulnerabilities, including process disruptions and resource constraints, while enhancing capabilities like visibility, adaptability, and collaboration. The proposed mapping highlights blockchain's dual impact on reducing risks and strengthening resilience.

Research limitations/implications: The findings are primarily theoretical, based on literature review and conceptual mapping. Empirical validation in real-world supply chains is needed to confirm the suggested relationships and measure blockchain's practical impact on supply chain resilience.

Practical implications: The study provides a framework for businesses to strategically adopt blockchain technology to address supply chain risks and enhance resilience. The mapping and accompanying diagram can serve as a decision-making tool for practitioners in designing robust supply chain strategies.

Originality/value: This research contributes to the growing literature on blockchain in supply chain management by integrating it with the SCRAM framework. The unique mapping of blockchain features to vulnerabilities and capabilities offers both theoretical insights and practical applications, paving the way for further empirical exploration and innovation.

Keywords: blockchain technology, supply chain resilience, supply chain vulnerability.

Category of the paper: Research paper.

1. Introduction

In an increasingly interconnected and volatile global economy, supply chains face unprecedented challenges, ranging from environmental turbulence and resource constraints to deliberate threats and dependency on critical partners. Addressing these vulnerabilities requires a comprehensive framework that not only identifies potential weaknesses but also outlines strategies to build resilience. Petit's Supply Chain Resilience Assessment and Management (SCRAM) framework provides a robust foundation for such an analysis, categorizing supply chain risks into 7 key vulnerabilities and offering 14 capabilities essential for resilience (Petit, 2008). Simultaneously, the emergence of blockchain technology has introduced transformative solutions to enhance transparency, security, and efficiency across supply chains. Features such as decentralization, traceability, immutability, and smart contracts have shown immense potential in mitigating risks and strengthening operational capabilities.

This article explores the intersection of these two domains, leveraging the SCRAM framework to systematically evaluate how blockchain technology can address specific vulnerabilities while bolstering resilience-building capabilities. By analyzing literature and real-world applications, it offers a conceptual mapping that connects blockchain features with elements of the SCRAM framework. The resulting diagram, "Blockchain impact on SCRAM Vulnerability factors and resilience building capabilities" illustrates the dual impact of blockchain, serving as both a theoretical model and a practical guide for businesses aiming to fortify their supply chains in an era of uncertainty.

2. Methods

The methodology adopted in this article is grounded in the integration of SCRAM framework developed by Petit with the core features and applications of blockchain technology. The following steps outline the structured approach used in the study:

- 1) Framework selection: The SCRAM framework was chosen as the foundational model due to its comprehensive categorization of supply chain vulnerabilities and resilience-building capabilities. It provides a robust theoretical base for analyzing the challenges and strengths inherent in supply chains.
- 2) Blockchain features analysis: Key features of blockchain technology, including transparency, decentralization, smart contracts, process automation, security and trust, traceability, immutability of records, and process standardization, were examined in detail. These features were identified through an extensive review of relevant literature and practical applications across various industries.

- 3) Mapping Blockchain to SCRAM: A systematic process was undertaken to align blockchain features with the 7 vulnerability factors and 14 capabilities defined in SCRAM. This involved:
 - Identifying how specific features of blockchain mitigate or address each vulnerability.
 - Exploring how these features simultaneously enhance resilience capabilities, such as adaptability, collaboration, and recoverability.
- 4) Literature Review: The analysis was supported by a thorough review of academic publications, industry case studies, and reports that provided evidence of blockchain's practical applications and its impact on supply chain management. This ensured that the proposed alignments were grounded in empirical and theoretical research.
- 5) Visual Representation: As a primary outcome of the study, a comprehensive diagram was developed: "Blockchain impact on SCRAM vulnerability factors and resilience building capabilities". This diagram visually encapsulates the dual impact of blockchain features, showing their role in mitigating vulnerabilities and enhancing capabilities.

This methodology provides a structured approach to integrating blockchain technology into the SCRAM framework, offering both theoretical insights and practical implications for enhancing supply chain resilience. The combination of literature-based analysis and conceptual mapping ensures that the findings are both academically rigorous and actionable in real-world contexts.

3. The SCRAM framework and blockchain core features

The SCRAM framework

In 2008, T. Petit presented a tool for analyzing the resilience of supply chains. This tool was called the "Supply Chain Resilience Assessment and Management" (SCRAM) and consisted of using a survey form consisting of statements' series regarding the vulnerability and resilience of the supply chain, with which the respondents assessed compliance on a five-point Likert scale (Petit, 2008).

The statements regarding the vulnerability and resilience of the supply chain were arranged in the framework of 7 "vulnerability factors" of the considered supply chains and 14 supply chain capabilities (Petit et al., 2010). The vulnerability factors of the supply chain are defined in Table 1. In the area of each of the seven vulnerability factors, it is possible to assess more detailed elements influencing the assessment of the analyzed supply chain in terms of its vulnerability.

Table 1.
SCRAM's vulnerabilities description

ID	Vulnerability factors	Description
V1	Turbulence	The environment is exposed to frequent changes in external factors beyond the company's control
V2	Deliberate threats	There are intentional attacks aimed at disrupting operations or causing human, material and financial damage
V3	External pressures	There are external tensions causing business disruptions
V4	Resource limits	There are limitations due to the lack of availability of resources for production and distribution
V5	Sensitivity	The importance of strictly controlling the conditions of the processes and materials used
V6	Connectivity	The degree of dependence on external partners
V7	Supplier/Customer disruptions	The vulnerability of suppliers and buyers to external disruptions

Source: own elaboration based on Pettit, Fiksel, Croxton, 2010, pp. 1-21.

The second part of the SCRAM tool refers to the ability of the supply chain to build and strengthen resilience. Its author indicated 14 such capabilities. Each of them could be called a strategy for building resilience, as it emphasizes a certain set of actions that can influence the supply chain resilience strengthening. The individual capabilities are presented in Table 2.

Table 2.
Supply chain's resilience building capabilities

ID	SC resilience building capabilities	Description
C1	Flexibility in Sourcing	Ability to quickly change supply sources
C2	Flexibility in Order Fulfilment	The ability to quickly change means of transport or other factors related to order fulfillment
C3	Capacity	Availability of resources to ensure a certain level of production
C4	Efficiency	The ability to produce with minimal resource requirements
C5	Visibility	Knowledge of the condition of operational assets and the environment
C6	Adaptability	Ability to modify operations in response to threats and opportunities
C7	Anticipation	The ability to perceive potential future events or situations
C8	Recovery	The ability to quickly return to normal after a disruption
C9	Dispersion	Wide distribution or decentralization of assets
C10	Collaboration	Ability to work effectively with external entities for mutual benefit
C11	Organization	Human resource structures, policies, skills and culture
C12	Market position	Company status on the market
C13	Security	The ability to protect against external attacks and other threats
C14	Financial strength	Ability to absorb fluctuations in cash flow

Source: own elaboration based on Pettit, Fiksel, Croxton, 2010, pp. 1-21.

Within each of the 14 capabilities, it is possible to assess more detailed elements influencing the assessment of the analyzed supply chain in terms of its resilience. In the following sections of this article, SCRAM's elements are paired with key features of blockchain technology to highlight its potential for creating and strengthening the resilience of modern supply chains (Zaczek, 2019).

Blockchain core features

Blockchain technology has emerged as a transformative solution in various industries, including supply chain management, due to its unique set of features that directly address operational inefficiencies, vulnerabilities, and the need for resilience (Dutta et al., 2020). This section explores the key features of blockchain technology and their applications, focusing on transparency, decentralization, smart contracts, process automation, security and trust, traceability, immutability of records, and process standardization.

Blockchain's transparency stems from its distributed ledger system, where all participants in the network have access to the same, verified data (Sedlmeir et al., 2022). This feature reduces information asymmetry, enabling stakeholders to make informed decisions. In supply chains, transparency ensures real-time visibility into inventory levels, shipment status, and supplier compliance (Sunny et al., 2020). For example, food manufacturers use blockchain to provide consumers with detailed information about product origins, ensuring accountability and fostering trust. Unlike centralized systems, blockchain operates on a decentralized network where no single entity has control (Zarrin et al., 2021). This eliminates the risks associated with single points of failure and enhances resilience. In supply chain contexts, decentralization allows diverse stakeholders - such as manufacturers, logistics providers, and retailers - to interact on equal terms, improving collaboration and reducing dependency on intermediaries (Naef et al., 2024).

Smart contracts are self-executing agreements encoded on the blockchain that automatically trigger actions when predefined conditions are met (Turner, 2021). This feature streamlines complex processes, such as payment settlements, order fulfillment, and regulatory compliance (Sigalov et al., 2021). For instance, in trade finance, smart contracts can automate payments upon the successful delivery of goods, minimizing delays and disputes (Aránguiz et al., 2021). Blockchain enables process automation by integrating smart contracts with other digital systems (Eggers et al., 2021). This reduces manual intervention, improves efficiency, and eliminates human errors. Applications include automated inventory replenishment and route optimization in logistics, where blockchain ensures seamless coordination across multiple stakeholders (Ran et al., 2024). Blockchain's cryptographic protocols and consensus mechanisms ensure the security and authenticity of transactions (Lashkari, Musilek, 2021). Data stored on the blockchain is highly resistant to tampering, fostering trust among participants. In the pharmaceutical industry, for example, blockchain prevents counterfeit drugs from entering the supply chain by securely tracking each product's lifecycle (Musamih et al., 2021).

Once data is recorded on a blockchain, it cannot be altered or deleted without consensus from the network (Kairaldeem et al., 2021). This immutability guarantees data integrity and provides an auditable trail of transactions. For example, in logistics, immutable records ensure that shipment details cannot be fraudulently modified, enhancing accountability and reducing disputes (Selvaprabhu, 2023). Blockchain facilitates the standardization of processes by providing a common framework for data exchange and workflow management (Papadakis, Kopanaki, 2022). This is particularly useful in global supply chains, where diverse participants must adhere to varying regulations and practices. Blockchain ensures consistency, as seen in the automotive industry, where it standardizes the tracking of parts and components across international suppliers (Habibullah et al., 2024).

By leveraging these features, blockchain technology addresses long-standing challenges in supply chain management while unlocking new opportunities for efficiency, collaboration, and resilience. Its applications continue to expand, demonstrating its potential to reshape the future of supply chains and other interconnected systems.

4. Blockchain impact on SCRAM vulnerability factors and resilience building capabilities

Blockchain technology offers a unique set of features that directly address the vulnerability factors identified in the SCRAM framework, as summarized in Table 3.

Table 3.

Blockchain technology features affecting the supply chain's vulnerability factors

Vulnerability factors	Blockchain features	Examples
Turbulence	- Transparency - Traceability	Food industry: Tracking the source of contamination in the food supply chain
Deliberate threats	- Immutability of records - Security and trust	Pharmaceuticals: verification of medicine authenticity, elimination of counterfeits
External pressures	- Smart contracts utilization	International trade: automation of customs documents
Resource limits	- Transparency - Process automation	Logistics: optimizing storage and inventory management
Sensitivity	- Process standardization - Automatic data logging	Manufacturing: automation of component orders via smart contracts
Connectivity	- Transparency - Shared data ledgers	Automotive: collaboration platforms for sharing supplier and order data
Supplier/Customer disruptions	- Traceability - Trust and security	Apparel industry: real-time tracking of raw materials across supply chains

Source: own elaboration.

Environmental turbulence, characterized by unpredictable changes in supply chain conditions, can be mitigated through blockchain's real-time traceability and data immutability, ensuring accurate and up-to-date information flow across stakeholders (Horrigan, 2023). For instance, in the food industry, blockchain-enabled traceability systems allow rapid identification of affected batches during recalls, minimizing disruptions. Deliberate threats, such as fraud or cyber-attacks, are countered by the security and trust inherent in blockchain's cryptographic protocols and decentralized nature (Ahmad, David, 2024). This creates a tamper-proof ledger, exemplified in the pharmaceutical sector, where counterfeit prevention mechanisms ensure the authenticity of products. External pressures, like regulatory requirements, are addressed through smart contracts, which automate compliance checks and reduce administrative burdens (Gucciardi, 2023). A notable example is the integration of blockchain in customs clearance processes, enabling faster and error-free documentation verification.

Resource constraints, such as limited capacity or raw material shortages, benefit from blockchain's ability to improve efficiency and adaptability through precise resource tracking and predictive analytics (Nagariya et al., 2024). Supply chain partners can optimize inventory management and reduce waste, as demonstrated in manufacturing sectors employing blockchain for just-in-time systems. For process vulnerabilities, blockchain ensures visibility and transparency, reducing errors and delays by providing a unified view of the supply chain (Madhani, 2021). In automotive logistics, blockchain platforms enhance process reliability by tracking parts' provenance and ensuring compliance with quality standards.

Dependency on partners is mitigated through blockchain's decentralization, which reduces reliance on single points of failure (Lohmer et al., 2020). In multi-tiered supply chains, decentralized systems distribute authority and increase resilience, especially in scenarios where suppliers face disruptions. Finally, disruptions from suppliers or customers are alleviated by blockchain's real-time visibility and immutability, allowing swift identification and resolution of bottlenecks (Etemadi et al., 2021). For example, blockchain-powered platforms in retail enable dynamic re-routing of deliveries during unforeseen events, ensuring continuity in service levels. By aligning blockchain features with specific vulnerabilities, organizations can strategically leverage this technology to fortify their supply chains against diverse risks and uncertainties.

Blockchain technology and SCRAM resilience building capabilities

Blockchain technology, on the other hand, aligns with the capabilities defined in the SCRAM framework by enhancing key supply chain functions and supporting resilience-building measures, as outlined in Table 4.

Table 4.*Blockchain technology features strengthening resilience building capabilities*

Capability	Blockchain features
Flexibility in sourcing	- Traceability - Transparency
Flexibility in Order Fulfilment	- Process automation - Smart contracts
Capacity	- Transparency - Immutability of records
Efficiency	- Process automation - Smart contracts
Visibility	- Transparency - Immutability of records
Adaptability	- Scalability - Traceability
Anticipation	- Immutability of records - Process automation
Recovery	- Immutability of records - Decentralization
Dispersion	- Decentralization
Collaboration	- Security and trust - Transparency
Market position	- Process standardization - Immutability of records
Security	- Traceability - Security and trust
Financial strength	- Decentralization - Transparency

Source: own elaboration.

Supply flexibility, the ability to adapt sourcing strategies, is bolstered by blockchain's traceability and visibility, enabling dynamic adjustments based on real-time data. In the agricultural sector, for example, blockchain platforms allow buyers to source products from alternative suppliers during disruptions without compromising quality standards (Pattanayak et al., 2024). Order fulfillment flexibility, which ensures responsiveness to changing customer demands, is enhanced through smart contracts that automate order processing and payment workflows. Retailers leveraging blockchain can seamlessly adjust fulfillment priorities and payment terms during peak demand periods (Nadime et al., 2023).

Production asset availability, a critical component of operational continuity, benefits from blockchain's immutability and transparency, which facilitate predictive maintenance and precise asset management. For instance, in manufacturing, blockchain is used to monitor equipment health, reducing downtime and ensuring operational efficiency (Leng et al., 2020). Efficiency, a cornerstone of supply chain performance, is significantly improved through blockchain-enabled automation and decentralized data sharing, which reduce redundancies and streamline operations. Logistics companies, for instance, use blockchain to optimize route planning and minimize fuel consumption (Ran et al., 2024). Visibility, the ability to monitor the entire supply chain, is inherently supported by blockchain's transparent and real-time data-sharing capabilities. This feature is particularly impactful in industries like pharmaceuticals,

where end-to-end visibility ensures compliance with regulatory standards and enhances trust among stakeholders (Uddin et al., 2021).

Adaptability, or the capacity to respond to unexpected changes, is strengthened by blockchain's flexible and decentralized structure, enabling organizations to reconfigure their networks in response to disruptions. Blockchain's role in facilitating adaptive supplier networks has been demonstrated in sectors like electronics, where supply chains must frequently adjust to component shortages. Anticipation, the ability to forecast risks and opportunities, is improved by blockchain's ability to consolidate and analyze historical data. This predictive capability allows businesses in sectors such as energy to anticipate demand fluctuations and plan resource allocation proactively (Vionis, Kotsilieris, 2023).

Recoverability, which focuses on restoring operations after disruptions, is enhanced by blockchain's secure and reliable data management, enabling accurate damage assessments and streamlined recovery efforts. For example, after natural disasters, blockchain systems in supply chains have expedited insurance claims and resource deployment. Dispersion, the ability to distribute resources and operations, benefits from blockchain's decentralization, which supports geographically diverse supply chain configurations. Organizations in global trade use blockchain to coordinate distributed warehouses and ensure operational continuity (Helo, Shamsuzzoha, 2020). Collaboration across supply chain partners is facilitated by blockchain's shared ledger system, which promotes trust and reduces friction in information exchange. The automotive industry, for instance, uses blockchain to synchronize production schedules and parts availability among suppliers (Ada et al., 2021).

Organization, or the alignment of internal processes, is supported by blockchain's ability to enforce standardized workflows through smart contracts. Market position is strengthened by blockchain's ability to enhance brand credibility through traceability and authenticity verification, particularly in industries like luxury goods and organic food production (de Boissieu et al., 2021). Finally, financial position benefits from blockchain's ability to streamline payment processes and reduce transaction costs. Organizations using blockchain-based payment systems can shorten cash conversion cycles, improving liquidity and financial resilience (Purwaningsih et al., 2024).

Mapping blockchain features to SCRAM elements

By mapping blockchain features to these capabilities and - on the other hand - to vulnerability points, businesses can strategically adopt the technology to not only enhance specific supply chain functions but also build a robust foundation for resilience and long-term competitiveness. The Figure 1 illustrates the dual role of blockchain technology in enhancing supply chain resilience.

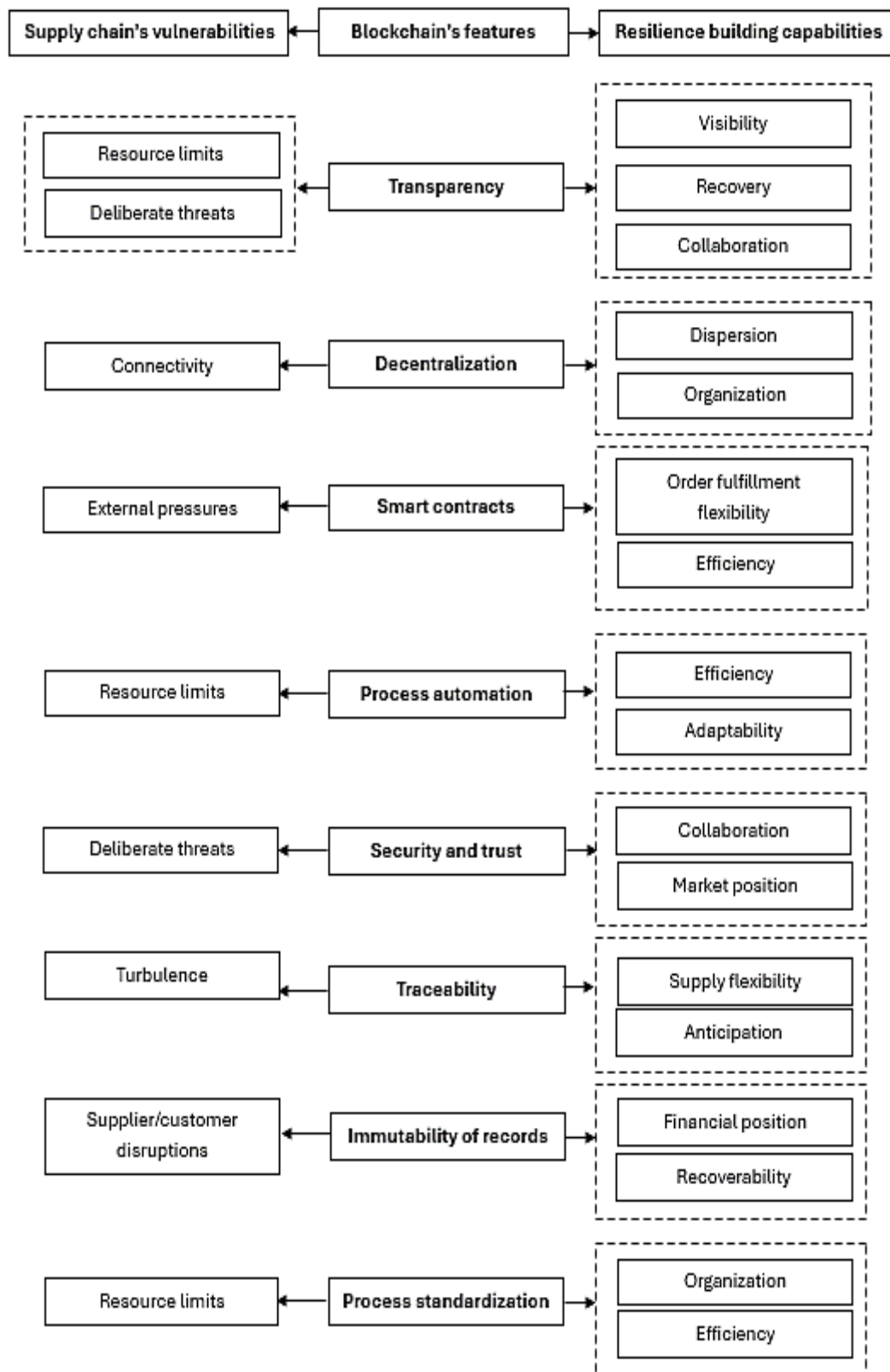


Figure 1. Blockchain impact on SCRAM Vulnerability factors and resilience building capabilities.

Source: own elaboration.

On one side, the Figure 1 highlights how specific features of blockchain—such as transparency, decentralization, immutability of records, traceability, security and trust, process automation, and smart contracts—mitigate the vulnerability factors identified in the SCRAM framework. These vulnerabilities include supplier/customer disruptions, environmental turbulence, deliberate threats, resource constraints, external pressures, dependency on partners, and process vulnerabilities. On the other side, the Figure 1 demonstrates how these blockchain features simultaneously strengthen key resilience-building capabilities within the supply chain. These capabilities include supply flexibility, order fulfillment flexibility, efficiency, collaboration, recoverability, visibility, adaptability, financial position, anticipation, and organization. The visual representation emphasizes the interconnected nature of blockchain's impact, showcasing its ability to both reduce weaknesses and enhance strengths, creating a robust and adaptive supply chain system. This dual effect underscores blockchain's critical role in transforming supply chain management for greater resilience.

5. Conclusion

This article demonstrates the potential of blockchain technology to address supply chain vulnerabilities and enhance resilience-building capabilities through the lens of the SCRAM framework. By systematically mapping blockchain features—such as transparency, decentralization, smart contracts, and immutability—to the seven vulnerabilities and fourteen capabilities outlined in SCRAM, the study highlights blockchain's dual role in mitigating risks and reinforcing operational strengths. The conceptual diagram developed as the key outcome of this research provides a practical and theoretical tool for understanding these interactions and applying them in real-world supply chains. However, while the analysis offers strong theoretical support and insights from literature and case studies, the findings raise an important question: how effectively do these theoretical linkages translate into tangible results in specific supply chain contexts? To address this, future research should focus on empirical validation of the proposed framework. Studies could investigate selected supply chains across industries to measure the real-world impact of blockchain on vulnerabilities and resilience capabilities. Such research could involve qualitative case studies, quantitative assessments, or longitudinal analyses to determine the degree to which blockchain influences supply chain performance.

Furthermore, future studies could explore how other emerging technologies—such as artificial intelligence or Internet of Things (IoT)—might interact with blockchain to create synergies in addressing supply chain vulnerabilities. By expanding the scope of research and integrating empirical evidence, scholars and practitioners can further refine the theoretical foundations and practical applications of blockchain in supply chain resilience. Ultimately, this article contributes to a growing body of knowledge on blockchain's role in supply chain

management, offering a framework for both academic inquiry and business innovation. As organizations continue to navigate the complexities of global supply chains, the insights provided here can guide strategic decisions to build more robust and adaptive systems.

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THE IMPACT OF THE YOUTUBE PLATFORM ON CONSUMER PURCHASING ATTITUDES AND BEHAVIORS IN THE CONTEXT OF VIDEO MARKETING CONTENT

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Purpose: The study aimed to determine, inter alia, the extent to which the video marketing content posted on the YouTube platform influences consumers' awareness and perception of companies and their offers. An attempt was made to solve the research problem, including examining whether and how video content influences consumers' purchasing decisions, and what elements draw the most attention during viewing video marketing content on YouTube.

Design/methodology/approach: A diagnostic survey method was used in the study, with an online survey as the research technique and a survey questionnaire as the tool. The survey covered a sample of 100 persons, 50% of whom were females and 60% were males, with the largest group of respondents (54%) residing in cities of an over 150 000 population.

Findings: The survey showed that 94% of the respondents confirmed using YouTube, stressing the relevance of the platform as a key video marketing and communication tool. YouTube has become an integral part of corporate promotional strategies, and messages tailored to specific audiences have rendered video content essential in the building of brand awareness and the shaping of consumer perception of companies.

Originality/value: Owing to its unique features and global reach, the YouTube platform has become a cornerstone of modern marketing strategies, combining the power of image with emotional impact on consumers. Video marketing visibly affects the perception of companies, emphasizes its role in creating positive brand images among audiences. For this reason, YouTube serves as an invaluable tool companies should utilize for effective promotion and to build lasting relationships with consumers.

Keywords: YouTube platform, video marketing, marketing strategies.

Category of the paper: case study.

1. Introduction

The contemporary role of information as one of the key resources is the reason why social media has reached unprecedented prominence. Social media are communication platforms operating primarily via the Internet and on mobile devices enabling the free flow of information among users (Dąbrowska, 2019). They serve as communication, thought exchange and experience sharing platforms, but also as tools in the shaping of public opinion (Grębosz et al., 2016). In the era of digital content dominance, video marketing has become one of the most effective promotional tools, allowing brands to effectively reach their audiences. In this context, YouTube, as the world's largest video platform, plays a key role, offering companies unparalleled image-building and user engagement opportunities.

Within the rapidly changing media environment, it is the YouTube platform which holds a particular place as one of the key tools for video content sharing. Since its debut in 2005, the site has undergone a transformation from a simple portal for short video clip publishing to a global platform used by creators, brands and corporations to compete for the attention of billions of users around the world (Dutko, 2021).

The original version of YouTube, although full of potential, differed significantly from the current, elaborate media platform. The platform gained popularity as a site where amateurs could share their videos completely free of charge (Dąbrowska, 2019). One milestone in the service's evolution was the acquisition by Google in 2006, for a sum of \$1.65 billion (Frontczak, 2023). This provided YouTube with access to the advanced technologies and resources of one of the world's largest technology companies, further contributing to the platform's growth and global expansion. The emergence of YouTube has not only fueled the online video content market, but has also affected popular culture, education, politics and many other areas of life. Its simple interface enables even new users to easily navigate YouTube (Maciejak, 2018). With many universities and professionals publishing educational content, e.g.: Wrocław University of Technology [Politechnika Wrocławska] (PW, <https://www.youtube.com>, 2023), University of Warsaw [Uniwersytet Warszawski] (UW, <https://www.youtube.com>, 2023) or Jagiellonian University [Uniwersytet Jagielloński] (UJ, <https://www.youtube.com>, 2023), the platform has become a source of knowledge at both basic and advanced levels. Marketing communication strategies are shaped around educational content, indicating the platform's growing educational value. YouTube has also greatly influenced popular culture, becoming a key tool in the promotion of artists, musicians and filmmakers. It has become a major component of content marketing.

According to the official information provided by YouTube, the site operates as an online service allowing users to upload, share, comment on and watch videos. In short, it is a platform for video content sharing among users across the world.

Platforms such as YouTube have transformed from purely entertainment tools into sophisticated marketing mediums and substantial sources of income for numerous creators. Increasingly highlighted is the strategic importance of YouTube in companies' marketing efforts, with indications of its potential in image building, audience outreach and consumer engagement.

One key business model element, especially in the digital environment, is monetization, with services and content often offered to users for free, generating revenue via alternative means, such as advertisers.

Through an innovative approach, YouTube has transformed not only into a space for content creators, but more importantly into a platform providing businesses with unique opportunities for promotion and effective communication with consumers. Promotion is an element of communication involving messages conveyed by companies in order to increase awareness of their products, generate interest in those products and encourage the purchase thereof (Kotler, 2004). Contemporary marketing cannot function in isolation from technology, and platforms such as YouTube play a key role in the process.

Video marketing, essentially based on long-term use of videos for promotional or brand-building purposes, has been one of the most rapidly growing areas of marketing in recent years (Daniłoś, 2016).

Digitization, social media, artificial intelligence and YouTube as a video marketing tool are just some of the channels used by companies in their promotional strategies. In the era of globalization and widespread access to the Internet, marketing efforts must be precisely targeted, innovative and tailored to the specifics of the market and consumer expectations. YouTube has been one of the most powerful tools in achieving these objectives.

YouTube's advantage as a business communication tool lies primarily in its ability to reach wide audiences. Video content enables development of unique emotional ties with consumers, which fosters formation of lasting relationships and increases brand loyalty.

2. The role of social media in consumer trend formation

Social media, as a key tool of modern marketing, offer companies the opportunity to build lasting and authentic relationships with consumers. They enable engagement and activation of audiences, as well as provide valuable feedback to better tailor products and strategies to market needs. Consumer decisions, however, are not only shaped by the information available and interactions on social media, but also by individual beliefs, both explicit and implicit. Explicit beliefs, reflecting consumers' conscious views, and implicit beliefs, resulting from unconscious wants and needs, represent an important element affecting purchasing processes. Exploration of these beliefs, especially the of the implicit nature, poses a challenge for

marketers, which calls for comprehensive research. An effective marketing strategy must take both the dynamics of social media and the deeper psychological mechanisms of consumption into account (Rosa, Perenc, 2016). Existing research confirms that social media play an important role in life of the younger generation, becoming not only a space for communication, but also the most relevant source of information supporting decision making, including purchasing. As many as 98% of the respondents admit to using social networks, with 87% doing so at least once daily. More than 75% of the respondents indicated that negative reviews posted on these platforms drove them to abandon a planned purchase (Parzonko, 2015). For this reason, companies must work to avoid negative reviews both on their profiles as well as within the spheres they have no control of, such as groups or reviewer profiles. One of the key concepts of modern marketing is real-time marketing, involving dynamic marketing activities responsive to current media events or pop culture trends. This strategy is based on monitoring popular events, especially those of a viral nature, and responding to those events through the use of humorous elements, comments or creation of engaging content, such as memes, as exemplified by Ryanair airline's profile (Loh, 2024).

One phenomenon effectively addressing the aforementioned needs of companies and utilizing a real-time marketing strategy is the growing popularity of social media influencer marketing. According to estimates, 56% of social media users have been persuaded to purchase at least one product through influencer marketing (Geyser, 2023). Influencers are active on a variety of social media platforms, from traditional ones, such as Facebook and Instagram, to such video sites as YouTube and TikTok. The key goal companies pursue is to establish cooperation with an influencer. Influencers serve as a key indirect-marketing tool in the building of an impression of authenticity and trust among consumers. By specializing in their niches, and with knowledge of social media, they deliver credible, engaging messages, in the form of storytelling, for instance, which is far more persuasive than traditional advertising. They activate the audience by encouraging discussion in the comments, which serve as a valuable source of feedback for companies, aiding a better tailoring of products to customers' needs (Jaska, Werenowska, 2019). Research indicates that influencer marketing takes the methods known from marketing to the next level. Influencers discuss products with their audiences 22 times more often than regular consumers. Eighty-two percent of influencers' regular audiences are highly likely to give heed to the influencer's purchase recommendation (Berger, 2019). Social media offers companies a wide range of tools to build lasting relationships with consumers. Marketing strategies utilizing these platforms create an impression of authenticity, which promotes long-term customer engagement with brands. Moreover, they enable efficient implementation of further marketing instruments, strengthening loyalty and increasing the effectiveness of promotional activities.

3. Research Methodology

The subject of the study is the mechanism of the influence exerted by video marketing content distributed via the YouTube platform on, *inter alia*, consumers. The study aimed to determine, among other things, the extent to which the video marketing content posted on the YouTube platform influences consumers' awareness and perception of companies and their offers. The study attempted to address the research problem, including investigating whether and how video content influences consumers' purchasing decisions, as well as what elements draw the most attention when viewing video marketing content on YouTube. The research hypothesis assumed that the use of the YouTube platform as a tool for video marketing content publication significantly affects the recognizability and positive consumer perception of companies and their offers.

4. Survey results

A total of 100 respondents participated in the online survey questionnaire, 50% of whom were females and 60% were males, with the largest group of respondents (54%) residing in cities of an over 150 000 population. The majority of the respondents (56%) were aged between 18 and 25, whereas education-wise, the dominant groups were persons with secondary (48%) and higher education (47%). An overwhelming majority of the respondents (94%) confirmed using the YouTube website, indicating the platform's immense popularity regardless of gender, place of residence, age or education.

In analyzing the frequency of service use, it was found that 39% of the respondents use it very often, 36% often, and 20% moderately often, which attests to the high popularity of this service among the surveyed group. Only a small percentage of the surveyed (4%) use the platform rarely, and only 1% indicated a very rare use. The majority of the respondents perceive the form of advertising presented via the platform as highly persuasive, compared to other forms of advertising. The survey clearly shows that single-presenter YouTube content is perceived as an effective form of advertising, compared to other forms. While not all of the respondents find it highly persuasive, most do recognize its value in terms of product and service promotion. Thirty-three percent of the respondents rated this form of advertising highly, 17% found it highly persuasive, assigning the highest possible rating, and 31% rated it sufficient, indicating a neutral attitude toward this type of content presented in such form. Ultimately, a minority of the respondents rated this form of advertising as not very convincing, with 1% assigning the lowest and 16% a low rating.

Considering the type of videos the respondents watch on the YouTube platform, a variation in preferences can be noted. Of greatest interest are videos of an entertainment nature, attracting as much as 50% of the respondents, which highlights the widespread tendency to use YouTube for entertainment purposes. Second is educational content (45%). In this case, of particular note in the context of the young age group, from 18-25 years old, is that educational content ranked as significant. The survey also showed the variety of YouTube's usability, not only as an entertainment but also as an informational and educational tool. Travel received 43% of interest, and business content 37%. Considering the survey participants' level of education, educational and business content have been found to be more popular among persons with higher education, as evidenced by the high percentage of the respondents (47%). Moreover, given the young-age group of the respondents, categories such as fashion and beauty, sports and automotive received similar scores of 30%, 30% and 32%, respectively, which indicates a wide spectrum of interests among the younger population.

Sixty-seven percent of the surveyed confirmed they had discovered new brands through YouTube, which proves the platform's effectiveness as a tool to promote companies and increase the visibility thereof to potential customers. YouTube videos allow companies not only to reach wide audiences, but also to effectively build brand awareness and develop consumer trust. Through interactive features, such as comments and subscriptions, YouTube provides unique opportunities to engage audiences in a long-term relationship.

In considering the influence of product or service YouTube reviews on consumer purchasing decisions, it can be noted that 23.2% of the respondents answered 'Definitely yes,' which indicates a clear bearing of reviews on this group's purchasing decisions. Another 22.2% of the respondents indicated a 'Yes' answer, which likewise suggests a positive, though less intense, impact of reviews. A total of 24.2% of the surveyed selected the answer 'moderately,' which also can be interpreted as a neutral impact of reviews. The answer 'no' was indicated by 19.2% of the respondents, suggesting that reviews only marginally influence their purchasing decisions. Lastly, 11.1% of the respondents answered 'Definitely not,' which indicates that reviews have no bearing on their consumption choices.

The respondents' opinion on companies' investment in the production of YouTube video content is rather neutral, as 39.4% of the surveyed consider the issue neutral. A significant minority of 11.1% is against greater investment in such content, while a substantial number of the respondents, 25.3% and 24.2%, believe that companies should invest, or even 'definitely' invest, in video content production. Both women (39.4%) and men (60.6%) perceive a similar need for greater investment in YouTube video content, which may suggest the platform's universality as a marketing tool independent of gender.

YouTube channel recognizability varied among the respondents. Most popular channels proved to be the 'Sports Channel [Polish: Kanał Sportowy]' and 'Lidl's Kitchen [Polish: Kuchnia Lidla],' indicated by 72% and 63%, respectively. Less popular were such channels as 'Entrepreneur Adventures [Polish: Przygody Przedsiębiorców]' (58%) and 'x-kom' (59%).

In assessing the quality of expert videos on YouTube, the respondents rated the quality of available content. As many as 47% of the surveyed assessed most of the expert videos watched at a good level, indicating an overall high quality of these videos. Moreover, 12% of the respondents found the quality of these videos to be very high, assigning a rating of very good. By contrast, only 9% of the surveyees rated the quality of the videos at a low level, suggesting some dissatisfaction, though the trend is not dominant. Noteworthy is that none of the respondents rated the quality of expert videos as very low.

Analysis of the factors affecting viewers' attention while watching videos on the YouTube platform pinpoints several key aspects. The first and most salient element noted by 80% of the surveyed is the video presenter. Such a result suggests that the person presenting the content is instrumental in the reception of the material presented, while his/her charisma and manner of content presentation are significant factors in attracting viewers' attention. Another important aspect indicated by 68% of the respondents is the substantive content and message presented, which highlights the relevance of the content conveyed in the video, possibly outweighing other elements involved. The visual quality and duration of videos also affect the reception of content, as evidenced by 67% and 59% of indications, respectively. These results suggest that the technical aspects of a video exert significant influence on the viewers' experience. The sound design, color scheme and message story, although less important than the above-mentioned elements, are of appeal to 54%, 50% and 50% of the respondents, respectively, as evidenced by the relevance of these, albeit to a lesser extent.

The results in this area, therefore, indicate that the most relevant factors driving viewers' attention are the video presenter and the content, while technical aspects, such as image quality and sound design, are likewise important, although to a slightly lesser degree. Accordingly, in order to attract and maintain viewers' attention, crucial for the content creators on YouTube is attention to the presenters' competence and high quality of the messages.

Based on the survey responses, it can be concluded that video marketing significantly influences consumers' perception of companies. As many as 60% of the respondents confirmed that such videos influenced their perception of a given company. In contrast, 25% of the surveyed declared that video marketing had little impact on their opinions. Interestingly, 15% of the respondents are not sure whether such materials have influenced their perception of brands. Noteworthy is that the high percentage of positive responses indicates the growing role of video marketing as an effective tool in corporate image building and consumer opinion shaping.

Conclusion

With its unique features and global reach, the YouTube platform has become a cornerstone of modern marketing strategies, combining the power of image with emotional impact on consumers. The survey found that 94% of the respondents confirmed using YouTube, which highlights the platform's prominence as a key video marketing and communication tool. YouTube has become an integral part of companies' promotional strategies, with messages tailored to specific audiences rendering video content essential in the building of brand awareness and the shaping of consumer perception of companies. The vast majority of the respondents treat YouTube as a major source of information and a tool for discovering new brands and products (75%). Moreover, video marketing clearly impacts the perception of companies, which highlights its role in the creation of positive brand images among audiences. YouTube therefore serves as an invaluable tool that should be utilized by companies for effective promotion and to build lasting relationships with consumers.

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THE ROLE OF SUPPLIER EVALUATION IN ENHANCING SUPPLY CHAIN EFFICIENCY AND COLLABORATION

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Purpose: This paper aims to evaluate the significance of the supplier assessment process in supply chain management, with a focus on its role in improving supplier relationships and ensuring overall supply chain efficiency. The research investigates key performance criteria and their impact on collaboration with suppliers.

Design/methodology/approach: The study uses a diagnostic survey method, employing an electronic questionnaire completed by 150 internal customers from six countries. The evaluation focused on 186 key suppliers representing 15% of the total supplier base. The analysis incorporated predefined scoring criteria, including price, quality, delivery timeliness, flexibility, and service quality. Results were categorized to inform subsequent supplier management actions.

Findings: The majority of suppliers (74%) fell into the average performance group, while only 1% exceeded expectations. However, 25% of key suppliers performed below expectations, highlighting areas requiring corrective action. The findings underscore the importance of supplier assessment as a critical auxiliary process that influences supplier collaboration and the effectiveness of the supply chain.

Research limitations/implications: The research focuses on a single company within the TSL (Transport-Forwarding-Logistics) sector and a limited regional supplier base. Future studies could explore cross-industry supplier assessments and develop frameworks for broader application.

Practical implications: The research provides actionable insights for supply chain managers, emphasizing the need for regular supplier evaluations. It recommends strategies for improving relationships with underperforming suppliers and reducing reliance on those with consistently low scores. These practices can enhance supply chain reliability and operational efficiency.

Social implications: The study indirectly promotes sustainable supply chain practices by encouraging accountability and collaboration among suppliers. Improved supplier performance can contribute to better resource utilization and adherence to quality and environmental standards.

Originality/value: This paper highlights the supplier assessment process as a strategic tool for supply chain optimization. It offers a practical framework for evaluating and managing suppliers, providing value to academics, supply chain professionals, and policymakers aiming to improve supply chain performance and resilience.

Keywords: Supply chain, Management, Supplier evaluation.

Category of the paper: Research paper.

1. Introduction

Supply chains play a crucial role in the economy by ensuring the continuous flow of goods. Every product available on the market has interacted with some form of supply chain, making it evident that society is deeply interconnected with them. The key to an efficient supply chain lies in its links, which, through collaboration and strong relationships, enable the smooth movement of goods from their point of origin to the end customers. These links are commonly referred to as suppliers, as each link in the chain supplies goods to the next. Therefore, maintaining strong relationships with suppliers is an equally important aspect of supply chain management.

Efficient supply chains are essential to the economy. In the age of globalization, companies strive to lead their industries, and achieving this is only possible through effective supply chain management and associated processes. One such process is supplier evaluation, which directly impacts relationships and collaboration between the downstream tiers of the supply chain. Furthermore, this process is repeated at various stages within any supply chain, making it critically important for companies.

The main objective of this study is to analyze and evaluate the significance of the supplier evaluation process within the supply chain. Additionally, the paper seeks to achieve the following specific objectives:

1. Outline the nature of the supply chain.
2. Analyze the supplier evaluation process using a selected company as an example.
3. Present the results of supplier assessments and their importance in supply chain management.

The research focuses on a single company within the TSL (Transport-Forwarding-Logistics) sector and a limited regional supplier base. The study uses a diagnostic survey method, employing an electronic questionnaire completed by 150 internal customers from six countries.

2. The Essence of the Supply Chain

The concept of a supply chain has been defined in various ways throughout the literature. These definitions often differ significantly, reflecting the diverse perspectives of their authors. Such differences arise from the reference to distinct industries, issues, and the scope that each definition covers. Additionally, discrepancies may result from inaccurate translations of the term or from conflating the concepts of "supply chain" and "supply chain management".

To properly define the supply chain, it is essential first to consider its context and environment (Kos, 2013). According to Gołemska (1999), a supply chain is "the activity associated with the flow of products and services—from their original source, through all intermediate forms, to the state in which they are consumed by the final customer". In this definition, the customer is not merely a passive recipient but an integral part of the supply chain.

Fertsch (2008) takes a similar view, describing a supply chain as "a group of companies performing activities necessary to meet the demand for specific products across the entire flow chain—from the acquisition of raw materials to delivery to the final customer. These activities include development, production, sales, service, procurement, distribution, resource management, and various supporting processes". This definition is particularly comprehensive, as it explicitly incorporates after-sales services.

La Londe and Masters (1994) define the supply chain as "a collection of companies that transmit materials and products to the market. It includes a large number of independent companies involved in producing products and delivering them to the end buyers. Members of the supply chain include all raw material and component producers, product assemblers, wholesalers, retailers, and transport companies".

Lambert, Stock, and Ellram, (1998) on the other hand, emphasize collaboration, describing the supply chain as "the collaboration of firms to deliver products or services to the market".

The most general definition, however, is provided by Mentzer (2001), who defines a supply chain as "three or more firms directly connected by one or more flows of goods, services, finance, and information from source to customer". Figure 1 illustrates an example of an extended supply chain, providing a visual representation of these interconnected activities.

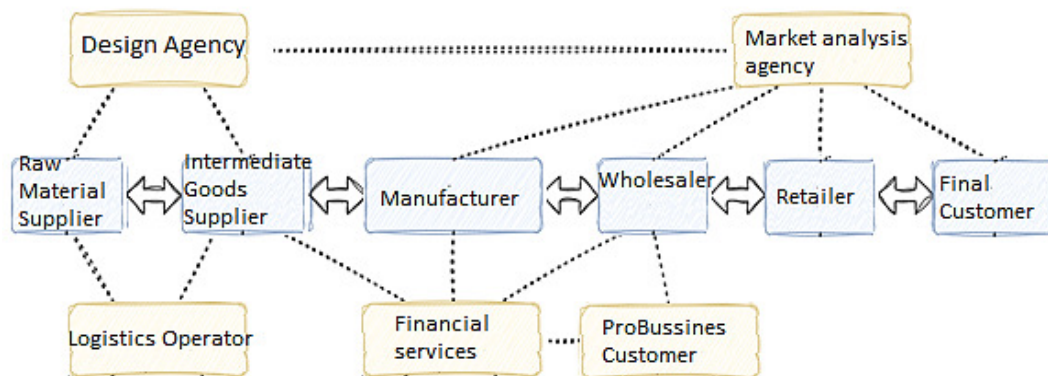


Figure 1. Example of an extended supply chain.

Source: own elaboration based on Mentzer, 2001.

An example of a supply chain includes links such as the supplier of raw materials, the supplier of intermediate goods, the manufacturer, the wholesaler, the retailer, and the final customer. These links play a crucial role in the overall efficiency of the supply chain. Service providers, such as design agencies, logistics operators, financial service providers, business customers, and market analysis agencies, are also integral parts of the chain. These service providers, often marked in yellow in illustrative diagrams, form essential links in the flow of goods. It is also important to note that neighboring links in the supply chain always maintain a supplier-customer relationship. Rutkowski (2002) describes this as a defining feature of supply chains, where each recipient acts as a supplier to the next link, continuing up to the final customer. In an extended supply chain, numerous dependencies and relationships exist between the links.

Definitions of a supply chain may vary depending on the author's perspective. To better understand supply chains, it is helpful to outline some basic classifications. Frankowska (2014) identifies three primary types of supply chains based on the range of functions performed by participants:

- Direct supply chain.
- Extended supply chain.
- Comprehensive supply chain.

Supply chains can also be categorized by the organizational and spatial relationships between their links:

- Internal supply chains: Operate within a single organization, such as the flow between a supply warehouse, manufacturing plant, machining plant, finished goods warehouse, and distribution warehouse (Pimor, Fender, 2008).
- Intra-organizational supply chains: Comprise links from different plants operating in various markets but under the same company.
- Inter-organizational supply chains: Consist of two or more independent companies, each managing their own internal flows while collectively forming a single supply chain (Stadtler, Kilger, 2005).
- International supply chains: Include companies managing the flow of goods, services, information, or finances across different countries (Eksogliu, 2001).

The described examples are shown in Figure 2.

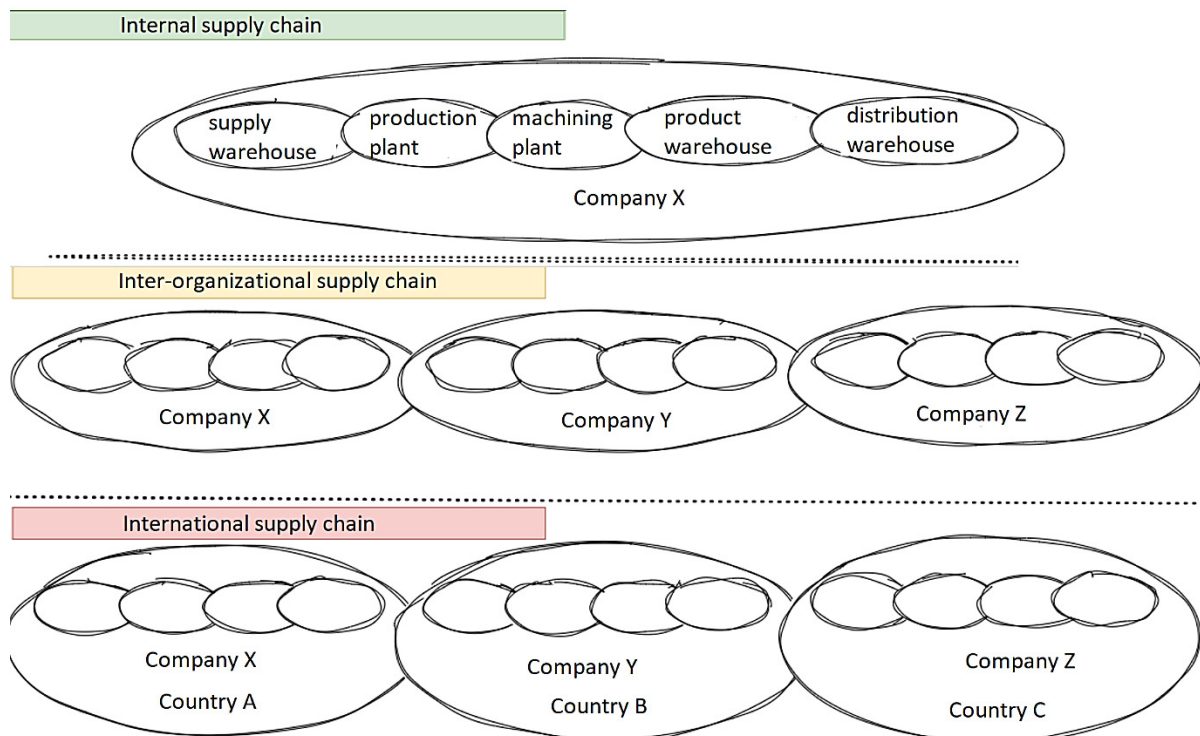


Figure 2. Example of classification due to organisational-spatial relationships.

Source: own elaboration base on Pimor, Fender, 2008; Stadtler, Kilger, 2005; Eksioglu, 2001.

3. Supply Chain Management

Supply chain management involves overseeing the entire process of delivering a product, requiring collaboration among suppliers, manufacturers, distributors, and customers. The goal of supply chain management is to maximize market competitiveness, optimize costs, and increase profits. Rutkowski (2002) emphasizes that the objective of cooperation between supply chain links is to maximize the efficiency of both individual companies and the entire network. This can be achieved through integration, coordination, and optimizing the added value contributed by each link in delivering the final product to the customer (Rutkowski, 2002).

Several methods and tools support comprehensive supply chain management, including:

Lean Management (LM): Lean Management focuses on eliminating waste and improving efficiency by reducing unnecessary resources. This concept emphasizes producing only what is needed at a given time while using minimal manpower (Ohno, 1988). Piasecka-Głuszak (2014) notes that this approach aims to eliminate activities that do not add value to the customer, treating the gains and losses of each link as integral to the entire supply chain. Any changes made must affect the entire chain to ensure the supply chain functions as a cohesive unit.

Quick Response (QR or QRM): Quick Response Manufacturing focuses on reducing lead times, particularly in low-volume or custom-designed production. Pyrek notes that the full benefits of QRM can only be realized when both suppliers and customers participate. Suppliers must deliver smaller batches quickly, improve product quality, and reduce costs, while customers need to accept smaller batch deliveries at acceptable prices (Pyrek, 2006).

Agile Management (AM): Agile Management, as the name suggests, emphasizes flexibility and responsiveness. In manufacturing, it involves the ability to produce low-cost, high-quality products with short delivery times, offering customization to increase customer value (Frankováa, Drahošová, Balcoa, 2016). Kowalska and Sikora (2016) explain that an Agile supply chain is entirely customer-focused, emphasizing adaptability to current demand rather than relying on demand forecasts or increased inventories. The Agile approach prioritizes quick responses to market changes and evolving consumer needs, especially under uncertain conditions.

Supplier Evaluation Process

The supplier evaluation process is one of the most critical processes within companies. While it is classified as an auxiliary process in the supply chain, meaning it does not directly affect the company's core operations, its significance cannot be overstated. The requirement for systematic supplier evaluation arises from EN ISO 9001:2015, an international standard referring to a "Quality Management System" in organizations. Furthermore, supplier assessment is closely linked to enterprise risk management, which is vital for the overall functioning of the supply chain. Suppliers are a fundamental link in the supply chain. If a supplier fails to perform its role correctly, the entire chain is at risk. For this reason, companies should conduct periodic supplier evaluation to maintain ongoing control over contractors. Another critical aspect of supplier evaluation is fostering relationships with suppliers. The primary output of the process is the evaluation result, which provides the foundation for future cooperation. By assessing suppliers, companies clarify their expectations, verify whether those expectations are being met, and provide feedback to suppliers.

Evaluating suppliers for sustainability is a critical process for businesses aiming to minimize environmental impact, uphold ethical practices, and ensure long-term resilience. This guide outlines key criteria, methodologies, and best practices for sustainable supplier evaluation (Amri et al., 2021; Chang et al., 2021; Ghosh, Mandal, Ray, 2023).

To begin the process, companies must acquire input data, starting with a database of current suppliers to be evaluated. According to the authors (Szűcs, Pató, Kiss, 2019), the next step involves defining the evaluation criteria for the supplier evaluation form. These criteria can vary between companies but typically include the following, as outlined by Zamostny:

- Price: While often considered the most obvious criterion, it is not always the most important.
- Quality of goods: Assesses whether the goods meet technical specifications.

- Timeliness of delivery: Measures the supplier's ability to meet agreed deadlines, which is crucial for Just-In-Time (JIT) delivery.
- Flexibility of delivery: Evaluates the supplier's ability to adjust to changes in orders, meet special requests, and respond to dynamic market changes.
- Completeness of deliveries: Assesses the proportion of correctly executed orders relative to the total customer orders.
- Certified Quality Management System: Considers whether the supplier holds a recognized certification.
- Product certification: Evaluates required documents, such as approvals, certificates, and labels.
- Purchase conditions: Examines the terms of the contract.
- Payment terms: Longer payment periods are typically more favorable for the company.
- Quality of service: Encompasses aspects like responsiveness and support.

Once the evaluation criteria are defined, a supplier evaluation form is created and distributed to internal customers for completion. After collecting the completed evaluations, the results are analyzed, and suppliers are scored based on predefined ranges. The scoring system should be tailored to the company's industry and operations. Wolniak and Skotniciej-Zasadzień (2008) provide an example scoring system:

- 90% and above: Category I - Qualified suppliers.
- 80%-89%: Category II - Qualified suppliers.
- 70%-79%: Category III - Reserve suppliers.
- 60%-69%: Category IV - Reserve suppliers.
- Below 60%: Category V - Does not meet customer requirements; cooperation is discontinued.

Once suppliers are classified into categories, the company must follow through with actions based on the assessment results. Suppliers should be informed of their scores and classifications, followed by debriefing discussions. For suppliers scoring low, corrective action plans should be implemented unless they provide rare or irreplaceable products/services. In most cases, cooperation with underperforming suppliers is terminated.

4. Supplier Evaluation Results and Relevance to Supply Chain Management

Company X, a Polish subsidiary of a global corporation, is part of a larger supply chain group operating within the TSL (Transport-Forwarding-Logistics) industry. The parent company manages end-to-end supply chain solutions and operates in more than 160 countries with over 58,000 employees.

The supplier evaluation process for Company X was conducted using a diagnostic survey method, with an electronic questionnaire as the primary tool. The survey involved 150 employees of the company. While specific contractor names are not disclosed, the process itself is described in detail.

Table 1 summarizes the activities involved in the supplier evaluation process, including the duration of each activity, responsible individuals, and their respective departments. All information regarding suppliers and internal procedures was obtained from confidential company records and databases, which are not shared in this paper.

Table 1.
Steps in the Supplier Evaluation process

No.	Stage of the Supplier Evaluation process	Duration [working days]	Responsibility	Department
1.	Data preparation	10 days	Tools and Systems Specialist + Purchasing Category Managers	Purchasing Department
2.	Preparation of assessment forms	5 days	Tools and Systems Specialist	Purchasing Department
3.	Preparation of contact list and content of e-mail message	1 day	Tools and Systems Specialist	Purchasing Department
4.	Preparation of presentations for information meetings	1 day	Tools and Systems Specialist	Purchasing Department
5.	Distribution of the message to Warehouse Managers and Supplier Evaluation	10 days	Tools and Systems Specialist	Purchasing Department
6.	Distribution of the message to operational teams	1 day (during point 5)	Warehouse managers	Operations Department
7.	Information meetings	3 days (during point 5)	Tools and Systems Specialist + Operations Teams	Purchasing Department + Operations Department
8.	Collection of survey results	2 days	Tools and Systems Specialist	Purchasing Department
9.	Compilation of results and preparation of the form for Category Supervisors	5 days	Tools and Systems Specialist	Purchasing Department
10.	Final Supplier Evaluation	5 days	Category Supervisors	Purchasing Department
11.	Analysis of results	5 days	Tools and Systems Specialist	Purchasing Department
12.	Preparation of the report	5 days	Tools and Systems Specialist	Purchasing Department
13.	Publication of the report	1 day	Tools and Systems Specialist	Purchasing Department

Source: Own compilation based on company documents.

The company's Supplier Evaluation process is conducted according to the procedure outlined in the table. Subsequent actions with suppliers are closely tied to the results of the evaluation. The process operates under the following assumptions:

- <50%: Cooperation with the supplier is reviewed, leading to one of the following outcomes:
 - Termination of the partnership.
 - Reduction of cooperation and identification of an alternative supplier.
 - Implementation of corrective actions with the supplier.
- 50-75%: No immediate action is taken, following an individual supplier approach.
- >75%: Further development of the relationship with the supplier, potentially designating them as a preferred supplier.

The implementation of these actions is overseen by the Purchasing Category Supervisors. Once the evaluation report is published, suppliers are contacted and the results are shared with them. Meetings are arranged with suppliers who have achieved above-average results and those with very poor results. However, meetings are not conducted with average-performing suppliers due to the high volume of suppliers.

During the meetings, the Supplier Evaluation results and the prospects for continued cooperation or termination are discussed. Suppliers with poor results often express a willingness to improve. In such cases, a remediation plan is introduced, typically lasting 1 to 3 months. During this period, the supplier's performance is monitored by specific operational departments. After the remediation period, the supplier is reassessed.

The referenced Supplier Evaluation process involved 150 of the company's internal customers from six countries, all of whom acted as respondents. The assessment focused exclusively on suppliers with whom the respondents had worked during the year. A total of 186 suppliers were evaluated. This represents a significant number of suppliers, given the company's operations across multiple markets, though it accounts for only 15% of the total suppliers in these countries. Only key suppliers, those critical to the company and representing the highest expenditure, were assessed. Table 2 presents the evaluation results by country and evaluation range.

Table 2
Results of Supplier Evaluation

Country/Outcome	>75%	50-75%	<50%	TOTAL
Poland	2	66	35	103
Czech Republic	0	16	7	23
Slovakia	0	9	1	10
Austria	0	8	1	9
Hungary	0	17	2	19
Romania	0	21	1	22
TOTAL	2	137	47	186

Source: Own compilation based on company data.

Only two Polish suppliers scored above respondents' expectations. The majority of assessed contractors were in the average group, comprising 137 suppliers (74% of assessed suppliers). The lowest-scoring group included 47 suppliers (25%). This group consists of key suppliers whose performance is unsatisfactory despite the company's significant turnover with them.

The company plans to focus its attention on these suppliers by initiating discussions to identify the reasons for their low ratings. Corrective actions may also be implemented. Notably, only 1% of the evaluated suppliers scored above average.

5. Summary

Supply chains are the backbone of today's economy. Virtually every business is part of a smaller or larger supply chain. Increasingly, supply networks—more complex systems with multiple links and connections—are also emerging.

Supply chains involve numerous processes, some of which occur within companies while others take place between the links in the chain. The literature classifies these processes into three main categories: main processes, auxiliary processes, and general processes. Each of these processes, regardless of its classification, plays an essential role in the efficiency of the supply chain. This paper, however, focuses specifically on the supplier evaluation process.

The supplier evaluation process can be understood in two ways:

- Pre-contract evaluation: Assessing suppliers before contracting them to determine if they meet the organization's expectations.
- Annual evaluation: Reviewing the performance of current contractors.

This thesis frames the supplier evaluation process in the context of annual evaluations. Despite being classified as an auxiliary process, it has proven to be a critical process for both the company and the entire supply chain. This is due to the significant impact that supplier assessment outcomes have on supplier collaboration and overall supply chain performance.

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