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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 48 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about: Corporate Social Responsibility; innovation management; the impact of COVID-19 pandemic on management; public management; e-commerce; logistics; productivity; decision making; information management; human resource management; consumption; knowledge management; the AI implementation in business; Management 3.0; smart cities; motivation; environmental management; economics; sport management and leadership.

Bożena Skotnicka-Zasadzień

Radosław Wolniak

COMPARISON OF EVALUATIONS OF EMPLOYEE-ORIENTED CSR PRACTICES BY POLISH AND GERMAN REPRESENTATIVES OF GENERATION Z

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Purpose: The aim of this article is to compare the evaluations, by Polish and German representatives of generation Z, of selected CSR activities of companies aimed at employees.

Design/methodology/approach: The article is theoretical and empirical in nature. The theoretical part presents a review of the literature on the subject in the context of employee benefits proposed by companies as part of the implementation of the CSR concept and their impact on employee attitudes and behaviour in the organisation. The empirical part presents the results of primary research carried out in face-to-face interviews using a questionnaire conducted in 2023-2024 on a group of students from Poland and Germany.

Findings: The comparative analysis showed convergence in ratings towards most of the most preferred examples of activities by Generation Z respondents from Poland and Germany. These included: initial training in the organisation, support from experienced employees, flexible working hours, medical care package for the employee and his/her family, organisation and/or funding of on-site training, online training, employee satisfaction survey, provision of work from home. The analysis also made it possible to identify activities with different evaluations.

Research limitations/implications: Among the limitations of this research procedure, the limited set of practices included in the prepared questionnaire, created on the basis of an analysis of the social reports of Polish companies only, should be pointed out.

Practical implications: The article provides useful lessons for employers who employ or plan to employ Generation Z people. They address the basic recommendation of the need to constantly monitor the needs and expectations of employees and adapt a set of relevant practices.

Social implications: The article highlights the importance of the issue of corporate social responsibility and its employee context. It draws attention to the needs and expectations of employees.

Originality/value: The article presents the current results of primary research.

Keywords: Corporate social responsibility, CSR practices for employees, generation Z.

Category of the paper: Research paper.

1. Introduction

It is becoming a progressive trend in modern organisations to take into account the principles of the concept of Corporate Social Responsibility (CSR) when carrying out their core activities. These principals include, among other things, ethical and social issues in relation to the primordial internal stakeholder group of employees. In this respect, they are present both at the stage of formulating, delineating and implementing strategies, policies, procedures and shaping systemic solutions in organisations, as well as in the implementation of specific practices, actions, initiatives, including the set of various types of employee benefits offered. There is no doubt that drawing the attention of employers to the broadly understood well-being of employees and offering them a set of specific benefits may generate additional benefits for both the employees themselves and the employer. It is worth noting, however, that this will be more effective if the choice of practices is responsive to the needs and expectations of the employees.

Given the growing presence of representatives of generation Z among potential job candidates, it is first of all justified to identify to what extent the current set of employee benefits meets their expectations. Furthermore, it is worth analysing whether differences in these preferences of young people can be discerned with respect to, for example, the criterion of their country of origin (nationality). Therefore, the aim of this article is a comparative analysis of the assessments, currently applied to employers, of CSR practices made by representatives of two nationalities representing the youngest generation entering the labour market more and more intensively.

2. Literature review

A review of the literature on the subject shows, first of all, a great deal of interest in the issue of the concept of corporate social responsibility - CSR (Dahlsrud, 2008; Homer, Gill, 2022), which is constantly evolving (Latapi Agudelo, Jóhannsdóttir, Davídsdóttir 2019; Yevdokimova et al., 2019), but in its basic assumptions is based on an organisation taking broad responsibility in its activities. At its core is the organisation's awareness of its impact on different stakeholder groups and consideration of the impact of other actors on itself.

In the application dimension, it is associated with the need for constant improvement in terms of creating positive relations (Kwarcińska, 2023) with the closer and further environment, and thus constant adjustment of the tools of influence, so that they are adequate to the expectations of individual stakeholder groups. According to the literature, aspects of researchers' interest in the concept of corporate social responsibility also include the issue of

the relationship of organisations, including companies, with employees, which has been analysed in various contexts (Arzenšek, Franca, Laporšek, 2018; Badura-Mojza, 2016; Adu-Gyamfi et al., 2021; Bhatti et al., 2022). This is probably due to the importance of this particular stakeholder group for any organisation.

The importance of this area in the CSR concept is highlighted in each case by international normative guidelines such as the OECD Guidelines for Multinational Enterprises (<http://dx.doi.org/10.1787/9789264115415-en>), the Global Compact Principles (<https://ungc.org.pl/o-nas/obszary-dzialan>), the ISO 26000 Standard (Norma ISO 26000), the SA 8000 Standard (Norma SA 8000), as well as the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (Trójstronna deklaracja zasad...) adopted by the Administrative Council of the International Labour Office. In their provisions one can find the context of employment and labour relations and, among others, the following declarations (Kwarcieńska, 2021a, 2023):

- respecting the right of workers to form and join trade unions,
- contributing to the effective abolition of child labour and the elimination of forced or coerced forms of labour,
- combating discrimination in employment,
- employment stability,
- attention to working conditions and social protection,
- health and safety at work,
- provision of development and training in the workplace,
- social security,
- consultation,
- access to remedies and complaint handling,
- resolution of industrial disputes.

The fulfilment of the postulates mentioned above is reflected in business practice in the form of specific CSR practices implemented by organisations, which can generate specific benefits (Grzesiuk, 2023; Kwarcieńska, 2021) both for the responsible entity and for the employees themselves.

Interest in the issue of employee benefits themselves and their impact on employee attitudes and behaviour in organisations is a recurring and unabated trend (Harris, Fink, 1994; Hong et al., 1995; Dulebohn et al., 2009). Previous research indicates that the presence of employee benefits influences both employee productivity (Kang, Gun, Lee, 2016), employee job satisfaction (Tessema, Ready, Embaye, 2013), engagement (Žnidaršič, Bernik, 2021), motivation (Kim, Scullion, 2013) and even company competitiveness (Werner, Balkin, 2021).

The range of recent studies with this theme includes research on the comprehensive impact of employee benefits on various variables, such as, for example, identity and reputation, as well as employee attitudes and behaviour, related to retention and attraction, employee wellbeing,

organisational citizenship behaviour and task performance (Werner, Balkin, 2021), as well as inquiries considering only specific types of benefits, for example, support for work-life balance (Žnidaršič, Bernik, 2021).

It is worth mentioning that previous studies have also highlighted the differentiating variables of selected relationships, among which the following can be pointed out in particular: gender, age, education level, position, marital status (Hong et al., 1995), as well as national culture (Wang, Xu, Wang, 2020). This also applies to perceptions of the broad benefits of CSR practices applied by companies to employees (Kwarcińska, 2024). It may differ, if only because of the age of the employees. This is probably due to the different expectations and needs of, on the one hand, relatively older people, who have probably already achieved a certain professional status, formed a level of experience and expect a kind of stability and certainty at work, and, on the other hand, relatively younger people, who in their preferences will often pay attention to practices related to good preparation for their work, receiving support from experienced employees, opportunities to maintain a balance between work and private life and opportunities for individual development (Kwarcińska, 2024).

In addition, it is worth noting that the results presented in the literature of studies of spillovers between specific CSR practices and their impact on specific variables usually refer to analyses carried out in different countries. Thus, the country of origin of the beneficiaries of CSR activities may also be a differentiating criterion for the perception of benefits from employee benefits.

In conclusion, the literature review has shown the topicality of the topic and highlighted the importance of employee benefits as effective tools for managing employee relations, which are part of generating benefits for the employees themselves and for the organisation. Therefore, it seems all the more justified to adequately select the benefits offered to employees and to pay attention to the necessity of taking into account the differences in their perception, which may result both from the generational diversity of the employed persons, as well as their nationality - also related, by the way, to a specific work culture, standard of living, sense of security, etc. In this respect, this article fills the research gap and extends the analysis with an assessment of preferences, currently addressed to employees by enterprises, of CSR practices by representatives of generation Z from Poland and Germany.

3. Research methodology

The basis for the present research and the choice of the research method were the conclusions formulated during the literature study on the subject concerning three basic aspects in the creation of CSR practices applied by enterprises towards employees. Firstly, to draw attention to the need to take into account the adequacy of practices in relation to the expectations

of employees. Secondly, the possible specificity of the perception of the value of practices currently offered to employees by representatives of the youngest generation present on the labour market, also representing potential job candidates. Thirdly, to consider the influence - on this different perception of CSR practices by people of generation Z - of their country of origin, as one of the variables that may also determine this. Thus, a research hypothesis was adopted stating that evaluations of CSR activities currently offered to employees by companies may be different for potential job candidates representing representatives of generation Z coming from different countries, in this case Poland and Germany.

In order to test the research hypothesis, a set of CSR practices applied by enterprises towards their employees was first drawn up on the basis of an analysis of a dozen or so enterprise social reports available at www.rapotyzyr.pl submitted as part of the 12th edition of the Social Reports competition by various organisations (Kwarcieńska, 2024). Subsequently, a paper questionnaire was prepared containing examples of enterprises' activities, including respondents' assessment of each activity on a five-point scale in terms of its importance, relevance, value, benefits for respondents. Representatives of generation Z in the form of 94 students from Poland (Kwarcieńska, 2024) and 75 students from Germany were asked to rate the initiatives in 2023 and 2024. A survey of the preferences of young people from Poland and Germany towards the listed practices formed the basis for conducting a comparative analysis of their evaluations. Arithmetic averages of evaluations were calculated for the individual initiatives and, according to these, the enterprise practices were ordered from those considered by respondents from the two countries to be relatively most important, beneficial to them, to those they considered relatively least important. In the presentation of the results of this comparison, the 10 initiatives with the relatively highest averages from the evaluations made by people from both countries were included.

4. Results of primary research

It is worth noting at the outset that the results of surveys conducted among potential Generation Z employees from both Poland and Germany showed, above all, a relatively high importance for them, of all activities directed at employees. The spread between the highest and lowest average for the examples of practices in both cases, i.e. in the survey of Polish and German Generation Z representatives, was approximately 2.1.

Figure 1 shows a set of 10 CSR practices structured according to their average rating taking into account their relevance to potential Generation Z employees from Poland, and Figure 2 shows, according to the same gradation, a set of activities according to their average rating of relevance to potential Generation Z employees from Germany.

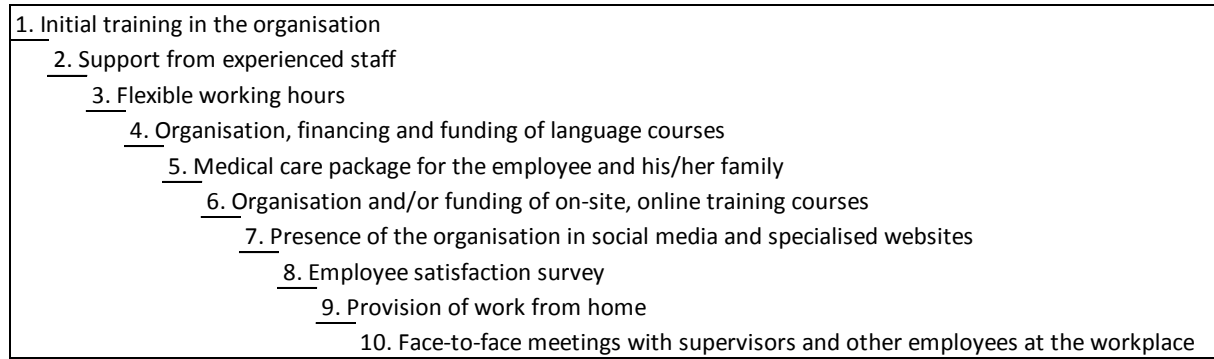


Figure 1. The most important CSR activities of enterprises aimed at employees according to their average assessment of importance for potential employees of generation Z from Poland.

Source: Kwarcińska, 2024, pp. 195-206.

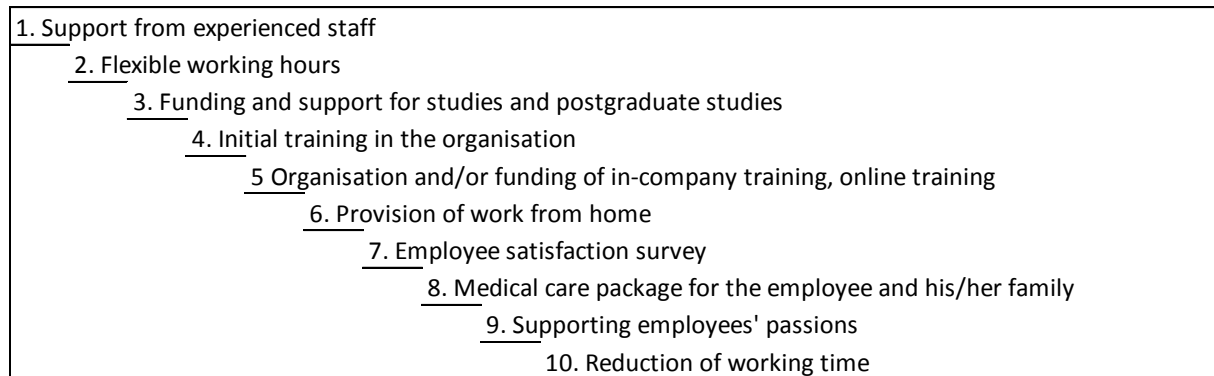


Figure 2. The most relevant CSR activities of companies aimed at employees according to their average rating of importance to potential employees from the German Z generation.

Source: own compilation based on the results of primary research.

A comparative analysis of the data presented in Figures 1 and 2 makes it possible, first and foremost, to single out the CSR practices applied to employees, which in the set of the most relevant 10 activities occurred in both the Polish and German student survey. These initiatives include:

- Initial training in the organisation, which according to the average rating according to the survey of Polish students is in 1st place and according to the survey of German students is in 4th place. It can therefore be concluded that this type of training is less important for young people from Germany. Perhaps they feel better prepared professionally?
- Support from experienced employees, which according to the average rating of the survey of Polish students is in 2nd place and according to the survey of German students is in 1st place. This means that both Polish and German students similarly evaluate the importance for them of support by experienced employees. This is therefore an extremely important issue considering the young age of the respondents and often the beginning of their career path.

- Flexible working time, which according to the survey of Polish students is in 3rd place and according to the survey of German students is in 2nd place. In the case of this type of practice, it can therefore be seen that it is almost equally important and valuable for young people from Poland and Germany. At the same time, it seems to be valued comparably for good reason, as it indirectly illustrates the modern desire of employees to have more time freedom in their work tasks.
- Medical care package for the employee and his/her family, which according to the survey of Polish students is in 5th place and according to the survey of German students is in 8th place. It therefore appears that the medical care package is more important to Polish students. One wonders whether this may be influenced by their feeling of inferior general medical care? Referring to the importance of national determinants, it can be concluded that the level of medical care provided in a given country may determine the importance to respondents of such additional measures offered by companies.
- The organisation's organisation and/or funding of in-company training, online training, which according to the average rating of the survey of Polish students is in 6th place and according to the survey of German students is in 5th place. In the case of offering training, therefore, a significant convergence can be observed in the ratings of Polish and German students. This is otherwise a very positive sign of young people's awareness of the importance of continuing professional development.
- Employee satisfaction survey, which according to the average score of the survey of Polish students is in 8th place and according to the survey of German students is in 7th place. This indicates an equal importance of this type of survey for all respondents.
- Work-from-home provision, which according to the average score of the survey of Polish students is in 9th place and according to the survey of German students is in 6th place. This means that work-from-home provision is more important to German students. It can therefore be concluded that it is they who value more freedom in working time, which also indirectly influences better time availability in private life (e.g. having to spend time getting to and from work).

In addition, based on a comparison of the assessment results in the survey carried out, it is possible to identify those practices which, in terms of their average score, were relatively more important to Polish students and ranked relatively higher in terms of average score, and those which, in terms of average score, ranked in the top 10 most important in the assessment of German students. In the first set of practices that are relatively more relevant to Polish students than German students, the following three types of activities can be singled out:

- Organising, financing and subsidising language learning courses, which, according to the ranking due to the average score by potential employees of generation Z from Poland, was ranked 4th, while in the ranking of average scores by German students it is only ranked 14th. This may indicate both that for Polish students it is important to create opportunities for language learning in the workplace and that they would be willing to use such solutions, but it may also indicate the inadequacy of education in this area at the educational stage.
- The organisation's presence in social media and specialised web portals, which according to the average rating according to the survey of Polish students is in 7th place, and according to the survey of German students is only in 13th place. In view of this, it can be concluded that people from generation Z from Poland value the use of such practices by companies more. This is puzzling, as it seems that nowadays for all relatively young people the issue of social media presence is an integral part of their activity. Perhaps clarifying the question to what extent this could be a company presence (for example, in terms of searching for job candidates or informing about company products or unique company actions) would yield more similar results.
- Face-to-face meetings with superiors and other employees at the workplace, which, according to the average score according to the survey of Polish students, is ranked 10th and according to the survey of German students is ranked 15th. This suggests that Polish respondents, who value the presence of companies on social media, nevertheless perceive additional value from face-to-face contacts in the workplace.

On the other hand, in the second group of measures, i.e. those that were on average rated higher by German students than Polish students and included in the 10 highest rated initiatives, were:

- Funding and financing of studies and postgraduate studies, which, according to the average rating according to the survey of German students, is in 3rd place and according to the survey of Polish students is in 11th place. This means that such a practice is more favoured by potential employees of generation Z from Germany. Arguably, there may be many reasons for this, but it is worth noting the cost of additional education and thus the desire for such funding from the employer.
- Supporting the passions of employees, which according to the average rating according to the survey of German students is in 9th place and according to the survey of Polish students is in 15th place. It can therefore be seen that by far the practice of employers paying attention to the passions of their employees is more important to potential Generation Z employees from Germany. This otherwise underlines the importance for them of having passions.

- Reducing working time, which, according to the average rating according to the survey of German students, is ranked 10th and according to the survey of Polish students is ranked 12th. This underlines the importance of leisure time for Generation Z people from Germany, although it is also worth noting at this point that such practices were also quite important to potential Generation Z employees from Poland. It can therefore be assumed that these types of activities are simply valued by Generation Z people.

5. Discussion

The research process carried out in this article has first of all recognised that the issue of corporate social responsibility and the conduct of organisations in accordance with its principles are persistent research themes in the literature of many researchers worldwide (Dahlsrud, 2008; Homer, Gill, 2022; Latapí Agudelo, Jóhannsdóttir, Davídsdóttir, 2019; Yevdokimova et al., 2019). This also applies to an extremely important issue, highlighted each time in all CSR guidelines and standards, involving the formation of responsible relationships between employers and employees (Arzenšek, Franca, Laporšek, 2018; Badura-Mojza, 2016; Adu-Gyamfi et al., 2021; Bhatti et al., 2022). In this area, it appears that a responsible employer image, also sometimes created by offering employees various types of employee benefits, can generate specific benefits in the form of both positive employee attitudes and behaviour, as well as positive effects at the organisational level, measurable and not financially measurable (Grzesiuk, 2023; Kang, Gun, Lee, 2016; Tessema, Ready, Embaye, 2013; Žnidaršič, Bernik, 2021; Kim, Scullion, 2013; Werner, Balkin, 2021).

It was pointed out, however, that in order for specific CSR practices directed at employees to be a source of expected benefits, it is important that they are properly selected, i.e. appropriate to employees' needs and expectations. Here, the possible existence of multi-criteria differentiation in employees' perceptions of the value to them of specific activities proposed by employers was recognised. Among the main variables differentiating appraisals of practices, the age of the employees was considered, taking into account in the study only people from generation Z, who may also constitute a group of potential job candidates, and nationality, while assuming that even among people from one generation, in this case Generation Z, there may be differences in appraisals, given precisely their country of origin. A study verifying differences in evaluations of CSR practices currently aimed at employees was conducted among students from Poland and Germany.

6. Conclusions

As the comparative analysis of the results of the conducted research showed, the following CSR practices currently addressed to employees were relatively most important for both groups of respondents representing potential employees from generation Z from both Poland and Germany: initial training in the organisation, support from experienced employees, flexible working hours, medical care package for the employee and his/her family, organisation and/or financing of stationary training by the organisation, online training, employee satisfaction survey, provision of work from home. Thus, due to the relatively large number of listed activities with a convergent evaluation of students from Poland and Germany, it can be concluded that these are activities that should absolutely be included in the set of practices offered to young employees. Their selection is not surprising, as it seems to be directly linked to the young age of people from generation Z and thus: the awareness of insufficient professional preparation in the first place and the expectation of support in this respect from experienced employees, the feeling of the importance of the value of medical care, as well as the desire for a kind of freedom to shape the time allocated to work and, finally, the emphasis on the possibility of further development in the workplace.

On the other hand, in view of the analysis of dissimilar CSR activities indicated, according to the results of the research, as more preferred by Polish students, it is possible to consider that the proposals of employers employing young people from Poland should include internships that will include opportunities to learn foreign languages, remembering also to ensure the presence of the organisation in social media and specialised Internet portals and not to give up on direct meetings in the workplace. On the other hand, the dissimilarity of indications of activities that are more relevant to German students leads to a reflection recommending that employers employing them consider introducing opportunities for financing and subsidising their studies and postgraduate studies, supporting their passions and shortening their working hours.

In conclusion, this article is a contribution to the discussion on employees' perceptions of the value of CSR practices directed at them. Differences in evaluations of individual activities may be due to a variety of reasons, of which the focus was on the age and nationality of employees. According to a comparative analysis of the structured preferences of exemplary practices of potential job candidates from generation Z from Poland and Germany, similarities and differences in their perception were perceived. The basic observation and, at the same time, recommendation for organisations that care about the image of a responsible employer and obtaining specific benefits from such perception, therefore, remains the constant monitoring of the needs and expectations of employees and adjusting the set of adequate practices.

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EXPLORING THE DRIVERS OF PATENTING ACTIVITY IN POLISH REGIONS

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Purpose: The main aim of this article is to explore the drivers of patenting activity of Polish regions. We hypothesise that R&D expenditures, as well as internationalization measures or regional economy indicators have statistically significant impact on patenting at the regional level.

Design/methodology/approach: In the following article, an ordinary least squares (OLS) regression is utilized. Specifically, patents granted by Polish Patenting Office are regressed on various standard, as well as non-orthodox measures of innovative activity. To account for unobserved, time-invariant region characteristics, a fixed effects (FE) model was chosen, supported by highly significant outcome of the Hausman test.

Findings: The results indicated that the determinants of innovative activity utilized in country-level studies are effective in explaining patenting activity on the regional level. Statistically significant relationship between dependent variable and various independent variables was demonstrated. First of all, region's economy's size, measured by GDP per capita and number of firms show positive impact on the number of patents granted, similarly to utilized internationalization measures (firms with foreign capital, foreign students). On the contrary, the number of university graduates is negatively related to the number of patents granted, which remains slightly less intuitive. At the same time, the impact of R&D and expenditures on patenting appears to be more complex and non-linear.

Research limitations/implications: The following article contains several limitations. The patenting activities should be preferably conducted on the firm or industry level data. Second, a comparison between determinants of patenting activity in developed and non-developed economies would benefit the field, however, given the choice of independent variables, was subject to data availability. Finally, given ambiguous results of the impact of R&D expenditures on patenting in both, absolute and relative terms, different types of R&D expenditures should be compared, once available.

Originality/value: To authors knowledge is the first study that employs panel data framework in the field of patenting at the regional level in Poland – modestly innovative and non-high-income country.

Keywords: innovations, patents, regions, panel data.

Category of the paper: Research paper.

1. Introduction

Inventive and innovative activities of entities leading towards enhancing stocks of knowledge are the discussed in the literature devoted to economic growth and technology change, usually at the country/economy level. However, over the last few decades, increasingly important role has been paid to regions. The starting point of analysis often refers to the theory of industrial districts by Marshall (1920), who identified the factors of industry concentration in a specific place, focusing on access to a specialized workforce, development of the production of intermediate goods, and the processes of spilling knowledge between enterprises within a region. The first two factors are easily measurable, while the latter is relatively difficult to capture due to intangible nature of flows of knowledge (Krugman, 1991). The majority of empirical studies undertake this challenge following the seminal papers by Griliches (1979) who put emphasis on the concept of knowledge production function (KPF). The KPF considers patenting activity as an effect of generating knowledge, resulting from investments by companies and institutions in the U.S. The authors stated that commercial patents are a function of investment in R&D-related activities by given sectors, universities, and federal agencies, while the knowledge diffuses between them, constrained by time and space.

The vast majority of the studies on spatial aspects of patenting activity is fully devoted to developed economies over short periods (Paci, 1999). It is not surprising that the propensity to patent is higher in knowledge-based economies with long-term innovation policies, which enhance the spillovers. At the same time, little attention has been paid to the spillovers in non-developed countries, where both – innovative patterns and their determinants may significantly differ from economies at the world technological frontier (Acemoglu et al., 2006). This knowledge gap is addressed in the present paper which analyses the factors determining patenting activity measured by patents granted in Poland – a modest innovating country, by Polish Patenting Office. The study covers patenting activities at the regional level, and according to authors knowledge is the first to employ panel data framework in the case of Poland.

The structure of the paper is as follows. The first chapter presents a literature review on regional determinants of R&D and patenting activity from theoretical and empirical perspective. Second chapter describes data, methodology and leads to hypotheses development. Third section shows the results and the fourth chapter is devoted to discussion on the results and conclusions.

2. Literature Review

In line with the new growth theory (Romer, 1986; Lucas, 1988) the spillovers between firms contribute to generating increasing returns and economic growth. These effects are the consequence of various phenomena such as networking, mobility of employees, exchange of knowledge, or industrial intelligence and espionage (Mausserth, Verspagen, 2002). At the same time, it is generally agreed that knowledge transfer or technology diffusion is limited by the distance between economic agents, or, more generally, geographical barriers (Marshall, 1920; Krugman, 1991). This, in turn, leads to the spatial concentration of economic activity, especially firms from the same industries, and, to some extent, explains the regional core-periphery setting, widely investigated by the new economic geography (Moreno et al., 2005). There is also a consensus in the literature that this behavior additionally rewards innovators, who tend to cluster, enhancing each other's innovative efforts, which has been confirmed by numerous empirical studies (for example Audreths, Feldman, 1996 or Jaffe et al., 1993).

Complementary to geographical proximity, Jaffe (1986) suggests that the spillovers occur additionally in so-called technological proximity. In other words, the nature of R&D activity may significantly affect the strength of knowledge spillovers, as it tends to be industry-specific. In line with several empirical studies (Jaffe et al., 1993; Jaffe, Trajtenberg, 1998) the spillovers are a function of both, technological and spatial proximity. At the same time, both types of proximity tend to reinforce each other – sectors, where knowledge externalities are more important, tend to cluster to a larger extent (Audreths, Feldman, 1996).

The negative impact of geographical distance on innovations and technology flow can be leveled by different channels of diffusion, such as trade or foreign direct investments, both extensively discussed in the recent economic literature (Kwiatkowski, 2021). For example, Coe and Helpman (1995) indicate that R&D spillovers and international trade are strictly related. Similarly, Bayoumi et al. (1999) consider trade as the main channel of knowledge transfer and argue that trade with economies with a large stock of knowledge promotes productivity and contributes to economic growth. This aspect of a trade is also analyzed in Grossman and Helpman's (1991) growth model which assumes that the stock of a country's knowledge depends on domestic R&D and foreign knowledge absorption. In the model, trade allows for accessing foreign knowledge and innovations, while the extent of foreign knowledge absorption is a function of trade intensity.

From the empirical perspective, the conceptual relation between R&D activity and patented innovation output was established in the seminal paper by Griliches (1979) within the Knowledge Production Function (KPF). In the initial setting, the linkage between innovation inputs and outputs was describing the process of technological progress at the country or industry level rather than the firm level (Moreno et al., 2005). The spatial context of the KPF was established by Jaffe (1989) who investigated the existence of spillovers between

universities and firms in the US using patent and R&D expenditures data. The results show statistically significant impact of university research, especially in high-tech industries, such as pharmaceuticals/medicine, electronics, optics, or nuclear technology. Moreover, Jaffe (1989) shows that it induces industrial R&D spendings locally. These effects seem to occur only one-way as business R&D expenditures do not impact university research according to the results. In a similar manner, Anselin et al. (1997) investigate spillovers between universities and high-tech innovations at the state and metropolitan statistical areas in the US and suggest that university research positively impacts the local innovative activity of companies directly and indirectly through private R&D expenditures.

At the micro level, the intensity of spillovers may depend on the size of an entity. For example Acs et al. (1994) show that the spillover effects differ between small and large companies. Namely, small companies exploit spillovers from universities to a larger extent than large companies, while large companies' R&D expenditures play a key role in the innovativeness of the latter. The study shows that the total number of innovations at the firm level is positively related to the R&D expenditures of both universities and large corporations. Other studies show that large firm productivity growth can be intensified by geographic and technological proximity between firms (Aldieri, 2009).

In recent years the classical KPF was often modified or extended. For example, Ó hUallacháin and Leslie (2007) verified the regionalization of the production function for the U.S., proving that human capital, flows of specialized knowledge, the degree of urbanization, and the presence of high technology sectors significantly increase the number of patents in the region. Co (2002) takes into account income per capita as a proxy of the quality of human capital in the region. In the European context, Bilbao-Osorio and Rodriguez-Pose (2004) recognize the socio-economic characteristics of European regions as a filter for the relationship between R&D and generating patents. However, when analyzing the regional production function, one should remember the possibility of numerous interactions existing between the characteristics of a given region (Charlot et al., 2015).

From the European perspective, Maurseth, Verspagen (2002) investigate patterns of patent citations across Europe based on patenting data at the regional level. The study shows that knowledge flows between regions in Europe are subject to significant barriers. The spillover is likely to occur primarily between regions in the same country, especially in geographic proximity and within the same or connected industries. Similarly, Bottazzi (2003) that R&D spillovers can be observed within 300 km only. Additionally, Moreno et al. (2005) investigated spillovers at the regional level in developed countries in Europe at the industry level and argue that spillover effect was observed – the innovative activity of a given region was affected by other regions' innovativeness, however the effect was constrained by the borders of a country.

Fritsch and Franke (2003) investigate cross-regional knowledge spillovers in Germany. The study suggests that the efficiency (productivity) of R&D activity differs significantly between regions which can be attributed to intra-regional spillovers from other R&D active

entities within the region – both private companies and public institutions. Gumbau-Albert and Maudos (2009) who investigates differences in patenting activity among Spanish regions. First of all, the study finds a positive impact of human capital and R&D expenditures on regional patenting activity. Moreover, the spillover effects have been confirmed – the impact of innovative activity of neighbouring regions on particular region is stronger than more distant ones. From an intra-regional trade perspective, trade spillovers seem to occur.

Theoretical postulates of trade as a crucial element of a local stock of knowledge was confirmed by Xu and Chiang (2005) who analyze the differences between technology diffusion in countries at different stages of development. The study shows that the source of technology transfer in high-income countries are primarily domestic R&D and imports of foreign capital goods. In the case of middle-income economies, foreign patents and imported goods play a crucial role, while for the low-income countries, the most important source of technology are foreign patents.

As noted above, the empirical studies for non-developed countries are rather scarce, yet the spillovers may be expected also in economies at the lower level of development. For example Chen and Yang (2005) utilized R&D expenditures and patent data to estimate the impact of technology and spillovers on productivity of Taiwanese manufacturing companies. The results suggest that both technological progress measured by R&D and patents as a measure of knowledge stock, as well as spillover effects within industry play key roles in firm-level productivity growth.

From Emerging European perspective, Ćudić (2021) finds that small and medium firms domiciled in West Balkans have low propensity to patent due to perceived level of costs and complexity related to the patenting process.

Given limited studies of non-developed countries and subject to available data, three hypotheses were formulated based on the above literature:

- H1: The R&D expenditures have statistically significant impact on the patenting propensity in Polish regions.
- H2: Internationalization measures are positively associated with the patenting propensity in a specific region.
- H3: Regional economy characteristic measures are positively associated with the patenting propensity in a specific region.

3. Data and Methodology

In the following study, the primary source of data utilized was the Local Data Bank, collected by Statistics Poland. It enables the analysis of regional trends in patenting activity in 16 Polish voivodeships (NUTS-2 regions) from 2009 to 2022. It should be noted that some

series were available over the longer horizon, however, for transparency reasons, balanced panel data were chosen over unbalanced one. We follow Feldman and Florida (1994) assuming that the distribution of innovation can depend on various factors, such as R&D expenditure, but also size of the region, or the presence of international firms within the region. At the same time, it should be highlighted that the economic literature finds patents as a measure of innovative activity output to be suboptimal proxy. Among several arguments, the most important is the fact that not all inventions are patented (software for example). Additionally, patents differ in terms of their quality and may take the form of defensive patenting behaviour, aiming rather in blocking competition rather than reflecting innovation (Cincera, 1997; Griliches, 1991). Despite this critique, we follow Acs et al. (2002) who finds that given similar drawbacks of alternative measures of innovative activities' output, patents remain the most sound measure. Therefore, the dependent variable representing the number of inventions in the region are patents granted by Polish Patenting Office per 100 thousand inhabitants.

The independent variables can be divided into two groups. The first covers inputs of innovative activity. Specifically, we include internal R&D expenditures and internal R&D expenditures per capita as well as number of employees in R&D per 1000 professionally active inhabitants.

The second group represents regional structure conditions associated with knowledge externality effects. First of all, the number of enterprises per thousand of working age inhabitants to reflect the level of regional entrepreneurship. Second, to account for international knowledge transfer, which is specifically important in the case of non-developed countries (Xu, Chiang, 2005), the number of entities with foreign capital participation per 10 thousand inhabitants was considered. Finally, the number of university graduates per 10 thousand inhabitants as a measure of human capital as well as percentage of foreign students reflecting internationalization/academic networking within a region were taken into account.

Therefore, the final data sample consists of 14 yearly observations for 16 Polish NUTS-2 regions implying 224 observations per each variable. To verify the above stated hypotheses, the ordinary least squares (OLS) regression is utilized in the following study. To account for unobserved, time-invariant region characteristics, a fixed effects (FE) model was chosen over other frameworks, which was supported by highly significant outcome of the Hausman test (1978).

4. Results

The results of estimated coefficients are presented in Table 1 below. All of the obtained coefficients are statistically significant at the 0.1 level. The overall model fit can be considered satisfactory, explaining nearly half of the variation in the count of patents granted per

100 thousand inhabitants, which is acceptable for panel data. Surprisingly, the impact of R&D expenditures is statistically significant, but negative, which is counterintuitive. There are two possible explanations of such outcome. First, per capita relativisation may not properly reflect the relationship between the variables. To account for this, the second specification of the model was estimated (the right column of the table) where relative R&D expenditures were replaced with absolute R&D expenditures. Given no change of the coefficient's sign, another possible explanation is a non-linear relationship between variables, which seems to be confirmed by the plot (fig. 1). Finally, it is reasonable to assume that the relationship between both variables is more complex in nature¹.

The potential of the regional entrepreneurship, measured by enterprises per thousand of working age inhabitants impacts positively patenting activity in a given region, which is in line with Feldman and Florida (1994), and general economic intuition. Similarly, the coefficient related to number of entities with foreign capital participation per 10 thousand inhabitants is statistically significant and positive, which supports the concept of internationalization as a channel of technology transfer (Xu, Chiang, 2005; Kwiatkowski, 2021; Keller, 2021).

Additionally, the measure of academic networking (share of foreign students) is statistically significant and positive, which is generally in line with knowledge spillover literature. On the other hand, the results did not find support for the positive impact of human capital on innovative activity, opposite to numerous studies (Maudos, 2009; Ó hUallacháin, Leslie, 2007).

Finally, GDP changes, a proxy for productivity/technological changes, are positively and statistically significantly affecting patenting in regions, which supports the postulates of new growth theory. It should be noted that the effect can be to some extent endogenous – changes in productivity can impact innovative activity in a region or result in increase of patents per se, but on the other hand, innovative activity results in productivity growth and technological progress.

Table 1.
The results of estimated model

	R&D expenditures (relative)			R&D expenditures (absolute)		
	Estimate	SE	p-value	Estimate	SE	p-value
Independent Variable: patents granted per 100 th inhabitants						
rd_exp	-0.003	0.001	0.000	-0.000	0.000	0.000
Entn	0.044	0.014	0.002	0.028	0.012	0.020
for_ent	1.003	0.156	0.000	0.982	0.156	0.000
Grad	-0.0217	0.009	0.019	-0.024	0.009	0.011
for_stud	0.157	0.077	0.042	0.152	0.077	0.050
Gdp	0.158	0.036	0.000	0.156	0.036	0.000
Adj R2	0.45			0.44		

Source: Own elaboration.

¹ Due to high correlation between R&D expenditures and employees in R&D per 1000 professionally active inhabitants, the second variable was introduced in a separate specification of the model, replacing R&D expenditures. The coefficient related to employment remained negative and therefore, given lower model fit, not presented in the body of the article, yet available upon request.

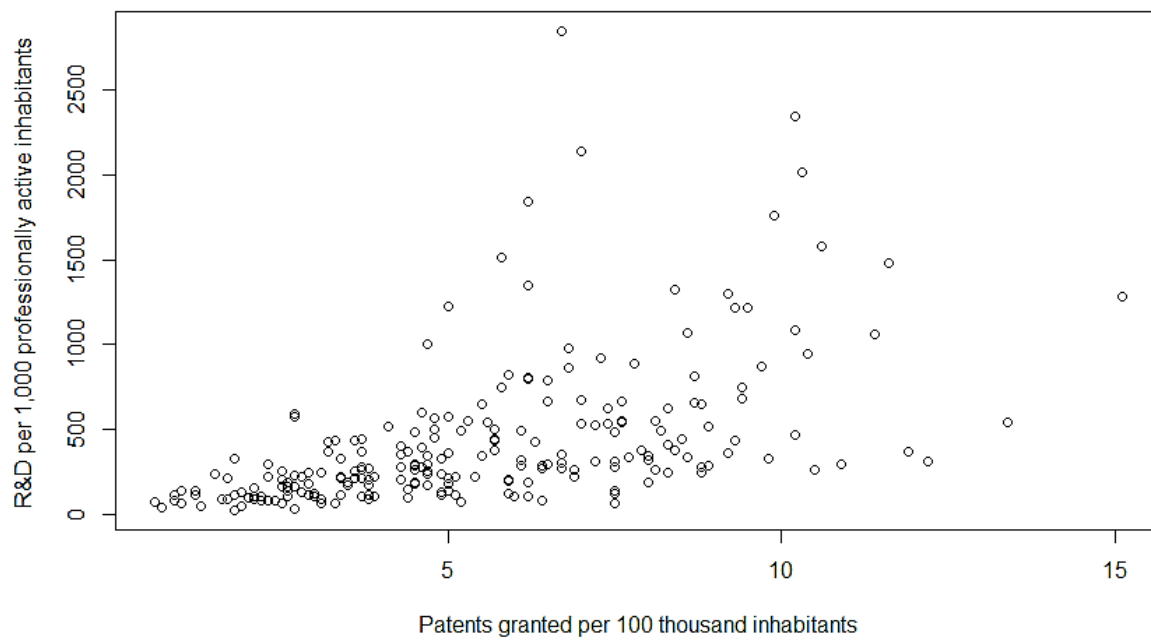


Figure 1. Scatterplot of patents and R&D expenditures.

Source: Own elaboration.

5. Discussion and conclusions

The main aim of this article was to explore the drivers of patenting activity of Polish regions, where patents granted were regressed on various standard, as well as non-orthodox measures of innovative activity. We conclude that determinants of innovative activity utilized in country-level studies are effective in explaining patenting activity on the regional (NUTS-2) level in the case of non-developed country (Poland) with nearly 50% variation explained. Specifically, we demonstrated statistically significant relationship between dependent variable (patents granted per 100 thousand inhabitants) and various independent variables. First of all, region's economy's size, measured by GDP per capita and number of firms show positive impact on the number of patents granted by the Polish Patenting Office, similarly to utilized internationalization measures (firms with foreign capital, foreign students). On the other hand, the number of university graduates is negatively related to the number of patents granted, which remains slightly less intuitive. At the same time, the impact of R&D and expenditures on patenting appears to be more complex and non-linear.

The obtained results in general can be considered robust, as changes to independent variables, as in the case of R&D expenditures, do not impact to a large extent model's performance. Furthermore, the obtained results support the postulates of the new growth theory and knowledge spillover-related literature. The role of knowledge spillovers is likely to remain key at the regional level regardless of the level of regions/country development. However,

the character of its impact could in fact be more nuanced than in classical, country level studies, as in the discussed case of R&D expenditures and patents granted relationship.

At the same time, the presented study has certain limitations. First of all, the patenting activities should be preferably conducted on the firm or industry level data. Second, a comparison between determinants of patenting activity in developed and non-developed economies would benefit the field, however, given the choice of independent variables, was subject to data availability. Finally, given ambiguous results of the impact of R&D expenditures on patenting in both, absolute and relative terms, different types of R&D expenditures should be compared, once available. All limitations mentioned above should be considered as potential areas for further studies. Specifically, a multi-country analysis of developing and developed countries (i.e. EU, OECD) should be modelled using international patent data at the industry and regional level to verify underlying relationships between patenting activity of firms.

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BUSINESS EMAIL COMPROMISE (BEC) AS A THREAT TO ORGANIZATIONS: A CASE STUDY

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Purpose: This analysis investigates Business Email Compromise (BEC) as a significant threat to corporate financial stability. Utilizing a paradigmatic case study of a multinational industrial enterprise, the research identifies critical organizational shortcomings and proposes risk mitigation strategies. Furthermore, the study highlights existing gaps within legal frameworks that impede effective cross-border fraud prevention and asset recovery.

Design: The research methodology employs a qualitative case study approach, integrating both legal and managerial perspectives to examine BEC intricacies. Data collection involved a detailed examination of publicly available judicial and banking records, situating the case within the broader phenomenon of cyber-enabled financial fraud.

Findings: Findings identify weaknesses in corporate payment protocols facilitating BEC: predictable workflows and limited authentication. Additionally, significant legal and organizational factors, particularly jurisdictional fragmentation, hinder timely asset recovery, notably by delaying necessary cross-border cooperation.

Research limitations/implications: Because the analysis focuses on a single case study, the generalizability of the results is inherently constrained. Future investigations should include comparative and quantitative approaches, spanning multiple jurisdictions, to evaluate the efficacy of preventive legal frameworks on a broader scale.

Practical implications: Findings support the tightening of internal security protocols, particularly through dual-channel verification and the adoption of anomaly detection tools. Continuous staff training in secure email practices and social engineering awareness is likewise essential to thwart increasingly sophisticated cyber threats. Implementing these measures can substantially reduce financial exposure and enhance overall organizational resilience.

Social implications: Although the primary focus is on corporate risk management, this research has broader societal relevance by raising awareness of digital threats and reinforcing public trust in electronic payment systems.

Originality/value: This article contributes to scholarly discourse by providing a comprehensive analysis that integrates the legal dimensions of BEC with a detailed examination of organizational vulnerabilities. The paper is therefore particularly relevant to legal scholars, management researchers, cybersecurity experts, and practitioners involved in fraud prevention.

Keywords: Business Email Compromise; Digital Fraud; Social Engineering; Cybercrime; Organizational Security.

Category of the paper: Research paper; Case study.

1. Introduction

This article is the result of an empirical analysis of a specific case of Business Email Compromise (BEC) fraud that took place in Poland; BEC fraud is a phenomenon that represents one of the most insidious threats to business management in the field of cybercrime (Cross, Gillett, 2020). The scam takes the form of a sophisticated social engineering attack that has the potential to affect all types of companies, from very small to multinational; generally speaking, the *modus operandi* is as follows: a group of fraudsters uses email to trick an individual or company into transferring money or revealing confidential information, often by appropriating their digital identity (Simpson, Moore, 2019).

The very nature of this type of fraud is by no means new: the tendency to manipulate and deceive others for illegal gain dates to antiquity. It is no surprise that the Latin saying ‘*nihil novi sub sole*’ (nothing new under the sun) perfectly describes this phenomenon. While in the past, attempts at fraud relied on convincing eloquence or forged documents – such as the classic example of a con artist trying to sell the Colosseum to unwary tourists – today, digital technologies have transformed and amplified these methods, making them more insidious and difficult to detect. However, the basic principle remains the same: the weak point of any security system is the human factor.

In the case in question, the fraudster managed to infiltrate the electronic correspondence between buyer and seller by adopting a sophisticated *modus operandi*. In a manner that can be compared to a real comedy of deception, the fraudster alternately assumed the identity of the seller and the buyer, manipulating the communication to achieve the desired result. The fraudster then tricked the buyer into making a payment to a new, apparently legitimate bank account that belonged to the cybercriminal himself.

By analysing this episode, it is possible to highlight the typical *modus operandi* of BEC fraud and to outline the most common vulnerabilities in the corporate sector. The aim of this article is not only to understand the mechanisms of such attacks, but also to propose concrete strategies for risk prevention and management to protect companies in an increasingly digitised and interconnected business environment.

From a legal point of view, current regulations do not always guarantee effective protection against such fraud, especially in the case of cross-border transactions. The lack of uniform international standards for freezing and returning misappropriated funds further complicates the fight against this phenomenon.

The aim of this study is to analyse the susceptibility of corporate and banking systems to BEC fraud and to propose preventive strategies and risk mitigation measures. Only through increased awareness and improved cybersecurity practices can companies effectively defend themselves against this increasingly common type of threat (Federal Bureau of Investigation, 2019).

2. Theoretical framework: Digital frauds and Business Email Compromise

Digital fraud encompasses a broad spectrum of malicious activities designed to exploit technological systems, human vulnerabilities, and organizational processes for financial or informational gain. Among these, Business Email Compromise (BEC) has emerged as one of the most sophisticated forms of attack, characterized by the impersonation of high-level executives or trusted parties in an organization's email communications to manipulate employees into transferring funds or divulging confidential information. Other prevalent types of digital fraud include phishing—where attackers deceive victims into revealing credentials or financial data through counterfeit emails or websites—and vishing, which relies on telephone-based strategies to elicit sensitive information under false pretenses. These various forms of cyber-enabled fraud often share an essential mechanism: social engineering, which leverages human psychology to bypass technical security measures by tricking individuals into performing actions or sharing information.

Recent global statistics underscore the scope and severity of BEC (Europol, 2024). According to the Federal Bureau of Investigation (FBI), BEC scams were responsible for a significant portion of total reported cybercrime losses in 2022, with annual damages reaching several billion dollars worldwide (Federal Bureau of Investigation, 2023). Europol's Internet Organised Crime Threat Assessment has likewise highlighted BEC as an especially insidious threat due to its reliance on interpersonal trust and organizational knowledge, which can significantly complicate detection and response efforts (Europol, 2024). In Italy, the Clusit report has documented a similar upward trend in cybercrime, noting a steady increase in fraud attempts that target business communication channels (Clusit – Associazione Italiana per la Sicurezza Informatica, 2025). Similar concerns are echoed in the literature, with scholars stressing the operational sophistication of these attacks (Al-Musib et al., 2023; Goenka et al., 2024). These findings emphasize that BEC is not merely a localized or industry-specific threat; rather, it is an evolving global phenomenon that demands attention from both private entities and governmental bodies.

The economic and legal repercussions of BEC and other digital frauds extend well beyond immediate financial losses. Organizations victimized by BEC often suffer secondary effects such as reputational damage, reduced shareholder confidence, and disrupted business processes. On the legal front, the cross-border nature of these scams raises substantial jurisdictional challenges, as funds are frequently channeled through multiple international accounts before reaching the perpetrators. This complexity can result in delays and obstacles in asset tracing and recovery, while also complicating the pursuit of legal remedies. Data protection laws, consumer protection regulations, and contractual obligations further intertwine with the investigation and prosecution of such offenses, highlighting the need for a multi-faceted approach that spans forensic accounting, legal expertise, and cyber incident response.

Central to the concept of BEC is “communicative infiltration”, the notion that attackers skillfully infiltrate the normal flow of organizational communication to manipulate recipients who may not suspect any irregularity. This infiltration is typically achieved through deceptive emails that closely mirror legitimate corporate styles and formats, thus lowering the recipient’s guard. Coupled with social engineering, wherein adversaries exploit psychological triggers such as urgency, authority, or empathy, this tactic can lead well-intentioned employees to inadvertently participate in fraudulent transactions. The dual strategy of communication infiltration and social engineering not only undermines the trust-dependent nature of business processes but also exposes inherent vulnerabilities in corporate cultures that prioritize rapid responses to executive directives. As the threat landscape continues to evolve, companies and legal authorities alike face the challenge of implementing more robust authentication protocols, awareness training, and international legislative cooperation to curtail the increasingly pernicious impacts of BEC and related digital fraud schemes.

3. Operational Mechanics of BEC Scams

BEC frauds rely on the ability of fraudsters to infiltrate corporate communication systems and manipulate information to their advantage. The attack mechanism unfolds in several stages, characterised by a sophisticated combination of social engineering techniques and advanced technological tools. The attack starts with unauthorised access to a company email account. The criminals can obtain the credentials through phishing techniques, malware or brute force attacks. Once access has been gained, the fraudster carefully analyses the correspondence between the parties involved in financial transactions to understand the operational dynamics and internal communication patterns (Cross, Gillett, 2020).

In some cases, it is not necessary to compromise the target's account directly: it may be enough to spoof email addresses to make the sender's identity appear credible. This allows fraudsters to join the communication flow without arousing suspicion. Once they have gained access to the communication, the criminal carefully monitors the emails exchanged between administrative departments or between the company and its suppliers/customers. The aim is to identify the key moments when payments are authorised and to determine how payment instructions are issued. Fraudsters may wait weeks or even months before taking action to gather enough information to organise the fraud as effectively as possible. During this observation period, the criminal may also send test emails to gauge the recipients' reactions and find out if there are any verification procedures in the payment processes.

When the criminal sees a suitable moment, they modify existing communication or create fake communication, assuming the identity of one of the parties involved. Usually, the fraudster pretends to be a company supplier and sends an email containing new payment instructions,

indicating a different bank account than the original one. To make the request appear more legitimate, the language is often adapted to the victim's language, and the style and tone of the authentic e-mail are reproduced. In addition, the fraudsters may attach forged company signatures or forged documents to strengthen the credibility of the request.

If the victim does not recognise the scam and follows the new instructions, the payment will be made and the funds will be transferred to a bank account controlled by the fraudster. These accounts are often located in countries with less strict money laundering regulations, making it difficult to recover the misappropriated funds. After receiving the money, fraudsters quickly move it between different bank accounts, using layering techniques to hide its origin. In many cases, the funds are converted into cryptocurrencies or withdrawn in cash, making it almost impossible to trace and return them to the victim (Bakarich, Baranek, 2020). The fraud is usually detected when the actual beneficiary of the payment – the original supplier – demands the agreed payment, indicating that they have not received the money. At this point, the defrauded company realises their mistake and tries to stop the payment or recover the funds through banking and judicial authorities. However, time works in the criminal's favour: once the money has been transferred and settled through a network of accounts and transactions, it is extremely difficult for financial authorities to intervene effectively. This highlights the importance of implementing effective security systems and strict verification procedures to prevent the risk of BEC fraud (Susanti et al., 2023).

4. Case Study Analysis: Infiltration and Money Laundering Techniques

The case analysed here is a paradigmatic example of Business Email Compromise (BEC) fraud, which highlights certain weaknesses in corporate payment processes and critical regulatory issues in the recovery of misappropriated funds. The case involved a European multinational industrial company that, as a result of fraudulent manipulation of its electronic communications, made payments of several hundred thousand euros to a bank account in the name of a Polish front company set up for money laundering purposes.

The attack used a repetitive and well-established transaction, which facilitated the fraud. Company A, operating in the high-tech industry, periodically purchased spare parts for high-value machinery from its regular supplier, company B. The continuous use of these machines required regular purchases. The continuous use of these machines required regular replacement of components, with large payments every six months. This predictability in financial flows was exploited by fraudsters who analysed the communication between the two companies, identifying the purchase cycle in order to infiltrate the transactions. By manipulating the exchange of emails between the parties, they were able to change the payment instructions, causing the funds to flow into a fraudulent account.

The scam consisted of several stages. After determining the exact time when Company A was to make the transfer, the fraudsters sent a seemingly authentic email with the new bank details. Convinced of the legitimacy of the request, the financial directors of company A authorised the transfer by paying the amount into an account controlled by the fraudsters and held in the name of a fictitious Polish company. The money was immediately transferred through a network of intermediary accounts, using offshore banks and institutions with less stringent control regulations, which made it much more difficult to recover the embezzled amounts.

Analysis of this episode shows how the predictability of financial transactions and the lack of cross-checking of payment details can become critical weaknesses. This case highlights the importance of stronger security protocols, including independent verification of bank details changes, multi-factor authentication and tools to detect anomalies in financial flows. Only a preventive and integrated approach can reduce the risk of BEC fraud, preventing companies with established payment processes from becoming the main targets of cybercriminals.

An investigation by the Polish Regional Prosecutor's Office revealed a complex financial structure involving several legal entities, resulting in the embezzlement of a total of more than 2.1 million euros. The fraud was based on a multi-layered money laundering model with three main stages: (1) setting up front companies through letterbox companies, (2) layering and transferring funds (layering), and (3) transforming into assets that are difficult to trace. The fraudsters took over inactive companies and changed their ownership structure using fictitious letters of credit, which allowed them to open company bank accounts without immediately attracting the attention of financial regulators. After receiving the money, the criminals set up multiple transactions between different bank accounts, splitting the amounts in order to avoid the banks' automatic monitoring systems (smurfing technique). Within 48 hours, funds were transferred between different jurisdictions, taking advantage of less strict banking regulations, while some amounts were converted into cryptocurrencies or withdrawn in cash via anonymous credit cards issued by foreign financial institutions.

From a legal point of view, the preventive seizure of funds triggered interpretative doubts regarding their distribution, and several victims filed competing claims. An international industrial company contested the claim of another defrauded company, which demanded a full refund of the seized funds, arguing that they originated exclusively from its own transaction and should not be distributed among several injured parties. The dispute became complicated due to the transnational nature of the fraud and differences in banking and criminal law, in particular with regard to the legal qualification of frozen funds and their return in accordance with the principle of priority of the original creditor (Wawrzyniak, 2024; Gwoździewicz, Tomaszewski, 2017).

The investigation was initiated by a Polish banking institution that received a SWIFT warning about a fraudulent transfer. The bank cooperated with the authorities, repeatedly providing information on the accounts involved in the fraud. Among the identified accounts, the most significant was the alpha account, in the name of a front company, to which an international industrial company made a payment. This account was blocked by BNP Paribas and then by the public prosecutor's office, freezing the final balance of several million euros.

An analysis of the transactions revealed that the money was quickly redirected through multiple transactions before it was frozen, in order to make it more difficult to trace the money and facilitate money laundering. The account received funds from another company and was then emptied through foreign transfers to accounts in the name of unknown entities. However, a few days later, another transfer from an international industrial company restored the positive balance, which was then completely frozen by the bank and the prosecutor's office.

From a legal point of view, the main dispute concerned the claim made by the second defrauded company, which demanded the entire frozen amount. This company claimed that the accounts involved were managed by a single criminal organisation and that the seized funds should be used primarily for its own compensation. However, thanks to timely bank-based freezing, the funds of the multinational industrial company did not mix with the funds of other defrauded companies, thus preventing them from being categorised as separate criminal assets.

This circumstance allowed the international corporation to more forcefully demand full reimbursement of the seized amounts, without having to compete with other victims in the process of recovering the illegally embezzled funds.

5. Legal framework of BEC fraud in Polish criminal law

From the perspective of Polish law, BEC (Business Email Compromise) fraud generally involves a number of related crimes, including fraud, document forgery, money laundering and, in some cases, unauthorised access to computer systems. Their legal configuration is based on several provisions of the Polish Penal Code, which regulate criminal behaviour typical of these fraudulent schemes.

The main offence is fraud (Article 286 of the Polish Penal Code), which punishes anyone who, for the purpose of financial gain, misleads a person or exploits their weakness to induce them to take actions resulting in economic loss. The penalty is between six months and eight years imprisonment, depending on the severity of the damage caused.

In addition to fraud, the BEC structure often involves document forgery (Section 270), which punishes anyone who alters or uses forged documents with the intention of passing them off as genuine with up to five years' imprisonment. In cases where the forgery also involves public officials or specialists authorised to certify documents, the offence of false certification

(Article 271) may be committed, punishable by imprisonment for a period of three months to eight years in the event of financial gain resulting from the offence. This offence is punishable by imprisonment for a period of six months to ten years, with the penalties being more severe if the person in question acts in cooperation with others or obtains a particularly significant advantage. In the case of money laundering involving financial entities such as banks or credit institutions, the regulations provide for an aggravating circumstance for those who facilitate the transfer or conversion of suspicious amounts.

BEC fraud can also involve the offence of unauthorised access to computer systems (Article 267), which applies to anyone who unlawfully obtains confidential information by breaching computer security measures. The penalties for this offence range from an administrative fine to two years' imprisonment, depending on the severity of the violation. This offence is particularly relevant when fraudsters infiltrate company mailboxes using phishing techniques or exploiting computer vulnerabilities.

Another important legal aspect is the possibility for Polish judicial authorities to order the confiscation of criminal assets (art. 299, §7), ordering the return of misappropriated funds to the victims if these funds can be clearly identified. However, in situations where the illegal amounts have been 'mixed' with other financial resources, these funds can be considered part of the criminal assets, which complicates their recovery.

Finally, the Polish Penal Code contains provisions on the concurrence of offences (Articles 11 and 12), according to which several frauds committed within a short period of time and for the same purpose may be treated as a single offence with enhanced severity, for which more severe penalties may be imposed. In particular, if a criminal group organises several fraudulent transfers, Polish case law tends to treat these activities as a single offence, aggravated by the continuity of the transactions.

6. Conclusions

From a corporate management perspective, preventing BEC fraud and other cyber threats relies on one key element: continuous employee training and the implementation of clear and strict security protocols. Experience shows that the human factor is the most vulnerable link in the corporate security chain, as employees, subjected to a high pace of work and intense cognitive load, are more prone to making mistakes that can be exploited by fraudsters. To limit this risk, companies must adopt structured prevention strategies, including both raising employee awareness through regular training programmes and introducing a rigorous internal vademecum for handling financial communications and sensitive information (Birla, Parwani, 2024; Ogwo-Ude, 2023).

Companies should establish strict rules of 'communication hygiene' by enforcing a two-factor confirmation system whenever a change of bank details is required for paying suppliers or sending confidential data. This mechanism, in combination with direct verification through independent channels, drastically reduces the risk of fraudulent manipulation. The creation of standardised procedures, supported by advanced technological tools, not only ensures a higher level of security, but also constitutes an effective barrier against vulnerabilities resulting from human error, thus protecting the company's financial and operational integrity (Caldarola et al., 2023).

Finally, this case suggests the need for a stricter regulatory approach, with the introduction of more stringent payment traceability standards and the harmonisation of procedures for blocking and returning illegally transferred funds, in order to mitigate the risks arising from a financial system that is increasingly vulnerable to digital fraud. Furthermore, there is a need to strengthen the control of procedures for opening corporate bank accounts, imposing stricter checks on the real ownership of companies and directors to prevent the use of fictitious entities as money laundering tools. Adopting a more proactive approach to preventing these frauds, based on cooperation between regulators, banks and businesses, is a key step towards reducing the vulnerability of the financial system to these increasingly sophisticated types of attacks (Susanti et al., 2023; Lazarus, 2025).

This research presents some inherent limitations. First, it is based on a single case study, which limits the generalizability of the findings. Furthermore, the analysis was constrained by partial access to banking and judicial data due to confidentiality and procedural limitations.

For future research, it would be valuable to conduct quantitative studies involving multiple cases of BEC fraud in diverse industries and legal contexts. Comparative legal analysis across jurisdictions would also shed light on regulatory inconsistencies and best practices. Finally, future research should explore the role of artificial intelligence in the early detection and prevention of BEC scams, including predictive modelling and anomaly detection in financial communication patterns.

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WAGE LEVELS AND WAGE DYNAMICS IN OCCUPATIONAL GROUPS RELATED TO NATIONAL SMART SPECIALISATIONS

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Purpose: The aim of the article is to assess the level and dynamics of wages in occupational groups related to the areas of national smart specialisations, in comparison to occupational groups not associated with these areas.

Design/methodology/approach: A review of scientific literature and official documents concerning smart specialisations was conducted. Occupational groups related to national smart specialisation (NSS) areas were identified, along with factors potentially influencing the level and dynamics of wages in the NSS sector. Subsequently, a statistical analysis was carried out based on data provided by Statistics Poland.

Findings: The results indicate that the average wages in occupational groups related to the areas of NSS were statistically significantly higher than in other occupational groups during the analysed period ($p\text{-value} = 0.01$). This suggests that occupational groups associated with the areas of NSS, as identified in the 2020–2030 strategy, are characterised by a higher average gross wage level.

Research limitations: The limitations of the study include the frequency and manner in which data are aggregated and published by Statistics Poland, the restriction of the research sample to a single country, and the absence of appropriate methods allowing for the unequivocal assignment of occupational groups to sectors identified as innovative.

Practical implications: Employees should develop competencies aligned with smart specialisations, as NSS-related occupations offer higher earning potential. Employers in NSS industries should maintain competitive wages. The government-initiated policy of supporting smart specialisations should be continued.

Originality/value: The study presents an original methodology aggregating occupations both related and unrelated to NSS sectors. It examines the relatively underexplored relationship between wage levels and dynamics in these groups. This analysis contributes to a deeper understanding of the economic effects of NSS development and provides insights that may inform future governmental policies and strategic initiatives in this domain.

Keywords: innovation, smart specialisations, wages, wage dynamics, labour market.

Category of the paper: research paper.

1. Introduction

Smart specialisations and their impact on the economy—particularly in the areas of innovation, sustainable development, and economic growth—have increasingly attracted the attention of researchers, as evidenced by numerous publications on the subject (Knefel, 2014; Marrocu et al., 2023). At the same time, the period that has passed since the implementation and conclusion of the Europe 2020 strategy provides an opportunity to examine the long-term effects of smart specialisations on the economies of EU countries and regions.

The aim of this article is to assess the level and dynamics of wages in occupational groups related to areas identified as national smart specialisations (hereinafter referred to as NSS), in comparison with other occupational groups. The analysis was conducted at the level of so-called medium-level occupational groups, for which aggregated data on average wage levels are published by Statistics Poland.

The article begins with a review of the literature on smart specialisations, with particular emphasis on documents published by executive authorities in the EU and in Poland. This is followed by an analysis of the relationships described in the literature between the implementation of the Europe 2020 Strategy and the level and dynamics of wages across different occupational groups. Secondary data concerning wages and the characteristics of work performed by individuals classified into various occupational groups (according to the methodology of Statistics Poland) were collected and analysed. The final section of the article presents the research methodology, the results of the analyses, and their interpretation. Based on the findings, recommendations for stakeholders are formulated. The article also outlines research limitations and potential directions for further study.

2. Smart Specialisations

In 2010, the European Commission adopted the Europe 2020 Strategy, aimed at long-term, intelligent development of the economies of the European Union member states. As a result of the decision to implement this strategy, the countries belonging to the community were obliged to select and indicate their smart specialisations at the national and regional level (European Commission, 2010). The document indicated three priorities on the basis of which the EU countries were to develop smart and sustainable economic growth in the coming years, these were:

- smart growth – understood as development strongly based on knowledge and innovation,
- sustainable growth – referring to the transformation of the economy into a low-emission and resource-efficient model, thereby enhancing competitiveness,
- inclusive growth – focused on supporting an economy that strives for high levels of employment and ensures economic, social and territorial cohesion (European Commission, 2010).

The concept of smart specialisations was initially introduced as a regional development strategy. By definition, its aim is to concentrate resources on areas of the economy with the greatest innovation and competitive potential. Foray, David, and Hall (2011) define smart specialisations as a process of strategic concentration in which regions and countries seek to identify and effectively exploit their unique economic, scientific, and technological strengths (Szymański, 2019). This approach makes it possible to support areas with the highest potential for creating added value and generating economic growth, while avoiding potentially inefficient fragmentation of investments (Foray, David, Hall, 2011).

According to the assumptions of the Europe 2020 strategy, smart specialisations may be defined at both national and regional levels, and EU Member States are expected to identify and indicate them at both of these levels (European Commission, 2012). The procedure for selecting smart specialisations has been described in documents published by the European Commission, as well as in numerous academic publications. The European Commission outlines a six-step process that includes: analysing the region's innovation potential; establishing an appropriate governance process and ensuring management structures; developing a shared vision that reflects the needs of the local community; identifying strategic priorities; defining an action plan and developing a policy mix; and continuously monitoring and evaluating the strategy (European Commission, 2012).

In Poland, the selection of NSS took place between 2012 and 2014. According to a description of this process published by the Ministry of Development, it consisted of multiple stages and was based on the principle of entrepreneurial discovery. The initial phase involved sectoral analyses and forecasting aimed at identifying areas with the greatest innovation and competitiveness potential. This was followed by public consultations with stakeholders and local communities. An important role in the entire process was played by the so-called NSS working groups, which analysed research, development and innovation (RDI) priorities and provided recommendations for further action (Ministerstwo Rozwoju, 2017). Researchers emphasise that the process, in line with EU recommendations, included extensive public consultations involving a diverse range of stakeholders—such as entrepreneurs, public administration representatives, scientists, and non-governmental organisations—and made significant use of the entrepreneurial discovery function (Michalak, 2016).

The above information indicates that the process of identifying National Smart Specialisations (NSS) in Poland—consistent with the smart specialisation concept promoted by the European Union—was based on a comprehensive analysis of the economic, scientific, and innovation potential of the entire economy. Researchers highlight that in Poland, smart specialisation strategies were developed with the active involvement of the regions. At the same time, efforts were undertaken at the national level to harmonise regional strategies within the framework of common priorities defined in strategic documents (e.g. the Strategy for Responsible Development). As a result of the proper implementation of this process, a flexible and well-defined system of priorities was established, aimed at enabling more effective use of public funds and contributing to the increase of innovation in the Polish economy (Ministerstwo Rozwoju, 2020).

The initial list of National Smart Specialisations (NSS) included 19 specialisations, which became the basis for investments under the Smart Growth Operational Programme and other related programmes. The selection process also incorporated the need for continuous monitoring and evaluation, in order to ensure flexibility in adjusting priorities to changing economic and technological conditions. This system was based on the analysis of implemented projects and market research findings, which made it possible to regularly update and adapt the NSS to the needs of the national economy (Ministerstwo Rozwoju, 2020). As a result, the list of smart specialisations has been updated several times over the years. The currently binding list, dated 13 February 2023, includes 13 smart specialisations (Ministerstwo Rozwoju i Technologii, 2023).

3. Job complexity and wage

Scientific literature frequently highlights that as the complexity of a given job increases—along with the level of creativity and innovation it requires—employee wages should also rise. Aufiero et al., in their 2023 study, demonstrated that greater occupational complexity is positively correlated with a higher level of abstraction, lower task routineness, and higher remuneration. Smart specialisations primarily focus on specialised sectors that demand substantial knowledge and creativity, which implies that these occupations should be characterised by a higher wage dynamic compared to others (Aufiero et al., 2023).

McCann and Ortega-Argilés note that occupations associated with smart specialisations are characterised by a high level of technological advancement and innovation. The authors point out that these professions often require specific, highly specialised competencies, such as knowledge of emerging technologies, analytical skills, and the ability to work in interdisciplinary teams. These occupations are frequently marked by a low degree of

routineness and a high level of flexibility in adapting to rapidly changing market and technological conditions (McCann, Ortega-Argilés, 2015).

The issue of how job complexity and innovation influence wages in the context of smart specialisations has also been addressed by Gębska. In her article on value creation and intellectual capital in the process of identifying smart specialisations, she emphasises that they focus on sectors with high innovation and economic potential. The success of enterprises associated with these specialisations largely depends on the quality of human and intellectual capital at their disposal. The author states that occupations related to smart specialisations are characterised by high requirements in terms of qualifications, knowledge, and innovativeness. Her analysis indicates that in certain industries and occupations linked to smart specialisations, wages grow at a faster rate than in others, which reflects the dynamic nature of activities undertaken in these sectors (Gębska, 2018).

In the context of the growing importance of smart specialisations and innovative sectors in Poland—as well as the research conducted by Gębska—it is worth noting that between 2014 and 2022, the share of innovative enterprises among all enterprises in Poland increased significantly. According to data from Statistics Poland, in 2022 the average share of innovative enterprises in the total number of enterprises was 32.2%, compared to 14.5% in 2014. The increasing innovation potential of Polish enterprises is also reflected in the rising value of innovation-related expenditures per economically active person. These expenditures grew from PLN 2,210 in 2014 to PLN 3,136 in 2022, alongside an increase in the number of employed persons from approximately 15.5 million to around 17.25 million¹. However, it should be noted that innovation expenditures did not increase in relation to GDP. Over the past decade, they have fluctuated between 1.5% and 2.5% of GDP.

Higher wages in occupations related to areas identified as smart specialisations may therefore be driven by multiple factors. First, these professions are closely linked to high value-added sectors, where labour productivity exceeds the average. Second, the educational and skill requirements result in a limited supply of qualified workers, which naturally leads to higher remuneration. Finally, these occupations are often essential for the implementation of innovation strategies and the attraction of investment, making them important for the development of both regions and countries. This, in turn, increases their associated prestige and enables employees in such roles to negotiate their wages more effectively (McCann, Ortega-Argilés, 2015).

The literature referenced above, along with statistical data, suggests that smart specialisations should not only support economic growth and innovation at the national or regional level, but also stimulate the development of employee competencies in innovative sectors and positively influence wage levels—and thus wage dynamics. At the same time, there is still a lack of scientific studies focused on wages in sectors and occupations related to

¹ Statistics Poland data.

smart specialisations, particularly at the national level, that could empirically validate the hypotheses proposed by researchers.

4. Methods

In order to assess the level and dynamics of wages in occupational groups related to the areas defined within the framework of national smart specialisations, in comparison to other occupational groups, data on average gross wages in occupational groups in Poland for the years 2014-2022 were collected. The data, obtained from the resources of Statistics Poland, are published at two-year intervals and cover 115 occupational groups. The research sample is representative. The analysis was conducted at the level of so-called medium-level occupational groups², excluding those included in the first major group ("Legislators, senior officials and managers"). The decision to exclude occupations assigned to this group was based on three main reasons. First, in many enterprises, the wages of managers are influenced by factors different from those affecting the wages of other employees. It should be noted that the scope of responsibilities and the nature of work performed by individuals in managerial positions differ significantly from the characteristics of other occupations (Tyrańska, 2004). Second, managers generally receive higher wages than specialists, which could distort the comparative analysis if most of them were assigned to one of the two groups under study. Third, aggregated data on the wages of a large group of individuals employed in managerial positions do not allow for an unambiguous assignment of representatives of this group to either the occupational groups related or unrelated to the areas defined within national smart specialisations. Although assigning occupations to one of the two categories—related or unrelated to smart specialisations—is a challenging and potentially ambiguous task in the case of other occupational groups as well, it is particularly problematic for managers. In their case, such a classification appears risky and potentially highly impactful on the results.

Each occupational group was classified as either related or unrelated to the areas identified as national smart specialisations in the most recent strategy, published on 13 February 2023. To achieve this, a researcher-designed methodology was employed, consisting of several stages of the research procedure, namely:

1. Identification of areas related to the NSS.
2. Definition of the set of occupational groups to be included in the analysis.
3. Analysis of connections between occupational groups and NSS areas.

² Statistics Poland publishes wage data for so-called major, sub-major, and medium-level occupational groups. This means that the occupational groups used in the study are the most detailed (i.e., the narrowest) for which wage data are available in the Statistics Poland databases.

4. Classification of occupational groups into one of two categories – those related to NSS sectors and those unrelated or only weakly related.
5. Verification of the resulting classification.

In the first stage, based on the reviewed literature—particularly government documents and publications—areas related to NSS were identified. The analysis resulted in the identification of 13 such areas, which can be grouped into five major categories: (1) healthy society, (2) agri-food, forestry, wood, and environmental bioeconomy, (3) sustainable energy, (4) circular economy: water, fossil resources, and waste, and (5) innovative technologies and industrial processes.

Next, data were collected for all occupational groups for which Statistics Poland (SP) regularly publishes wage data. For this purpose, the publications *Structure of Wages by Occupation*, issued by SP, were used. In the subsequent stage, the potential relationship between occupational groups and NSS areas was analysed. If a given occupational group could be classified as related to at least one broadly defined NSS area, it was assigned to the group of occupations related to NSS sectors. Otherwise, the group was classified as unrelated or only weakly related to NSS areas.

After the initial classification of occupations into the respective categories, the assignments were verified to ensure their consistency with the previously established criteria. The final classification served as the basis for further analysis, including the comparison of wage levels between occupations related and unrelated to the sectors identified as NSS.

As a result of the adopted procedure, the following occupational groups were classified within the first identified category:

Table 1.

Occupational groups related to the areas identified as NSS sectors

Healthy society; Agri-food, forestry, wood and environmental bioeconomy; Sustainable energy; Circular economy: water, fossil resources and waste; Innovative technologies and industrial processes	medical doctors, nursing professionals, other health professionals, pharmacists, health professionals not elsewhere classified, life science professionals, physical and engineering science technicians, engineering professionals (excluding electrotechnology), electrotechnology engineers, software and applications developers and analysts, mining, manufacturing and construction supervisors, process control technicians, life science technicians and related associate professionals, ship and aircraft controllers and technicians, medical and pharmaceutical technicians, dietary and nutritional associate professionals, traditional and complementary medicine associate professionals, other health associate professionals, sports and fitness workers, information and communications technology operations and user support technicians, telecommunications and broadcasting technicians, personal care workers, market gardeners and crop growers, animal producers, mixed crop and animal producers, forestry and related workers

Source: own elaboration based on data from Statistics Poland.

Following the classification of the 115 occupational groups in the sample, 38 groups were identified as related to broadly defined NSS areas, while 77 were classified as unrelated or potentially only very weakly related to these areas.

The secondary data were published in an aggregated form, which means that information was available only on the average wages within entire occupational groups and their sizes, rather than on individual observations (i.e., individual employees in the economy). This necessitated the artificial calculation of variance and standard deviation for both major groups. For this purpose, formulas (1) and (2) were applied. Subsequently, the corresponding standard deviations were calculated.

$$\mu = \frac{\sum_{i=1}^k n_i \mu_i}{\sum_{i=1}^k n_i} \quad (1)$$

where:

n_i – the size of the i – th sample;

μ_i – the mean of the i – th sample;

k – number of samples.

$$\sigma^2 = \frac{\sum_{i=1}^k n_i \sigma_i^2 + \sum_{i=1}^k n_i (\mu_i - \mu)^2}{\sum_{i=1}^k n_i} \quad (2)$$

where σ_i^2 – the variance of the i – th sample.

The use of statistical tests makes it possible to verify hypotheses concerning the values of specific variables in the entire population based solely on a sample, while accounting for a certain probability of error. To compare the means of the two identified groups, a Z-test for the equality of two means was applied. This test allows for the verification of the hypothesis that, in the full population as well, the average wage in occupations related to NSS sectors would be higher.

The lack of access to raw data made it impossible to verify the assumption of normal distribution. However, the existing literature clearly indicates that wage distributions do not meet this condition. The application of the Z-test is justified by the use of the Central Limit Theorem (CLT). This theorem states that if X_i are independent and identically distributed random variables with the same expected value (mean) μ and a finite σ^2 greater than 0, then the random variable defined as:

$$\frac{\sum_{i=1}^n X_i - n\mu}{\sigma\sqrt{n}} \quad (3)$$

where X_i – i – th observation;

converges in distribution to the standard normal distribution as n approaches infinity.

This means that with a sufficiently large sample size, the assumption of normality in statistical testing can be considered satisfied, provided that the distribution has a finite expected value and variance³. Since the size of the collected sample significantly exceeds the threshold required for the application of the Central Limit Theorem, it was assumed that the sample means and variances could be subjected to the selected statistical tests. As a result, the Z-test for the equality of two means was considered applicable in this case (Magiera, 2002).

It should be noted that the applied research methodology has its limitations. The main limitation concerns access to statistical data, which in certain respects may be considered insufficient or incomplete. While the data obtained from Statistics Poland are of high quality, the information regarding the occupational group to which an employee belongs is not always a sufficient criterion for classifying that individual as working in a sector related or unrelated to NSS areas.

Moreover, the process of assigning occupations to the appropriate group is inherently difficult and, to some extent, arbitrary. In addition, data for certain occupational groups may have been collected by Statistics Poland from individuals employed in both enterprises operating in areas related to NSS sectors and those unrelated to them. This ambiguity introduces a risk of classification error, as it prevents a precise and objective determination of the extent to which a given occupation—and, consequently, the individuals surveyed by Statistics Poland—was related to the areas identified as part of NSS.

Another research limitation, directly related to data quality, concerns the manner in which the statistical office collects, processes, and publishes wage information. Data from Statistics Poland (SP) are published with a two-year delay and only once every two years. This prevents the real-time monitoring of trends as well as short-term analysis on a yearly or quarterly basis.

The available datasets include wage information only for major, sub-major, and medium-level occupational groups, while data for smaller occupational groups are not publicly available. This limits the level of detail in the analysis and makes it more difficult to gain insight into the characteristics of specific occupational categories.

In the context of the statistical methods used, it should be noted that conducting research based solely on a small portion of the population limits the ability to draw general conclusions from the obtained results. Even when a representative sample is collected—such as the one on which Statistics Poland bases its research—there is no guarantee that the results will fully align with those that would be obtained from a study conducted on the entire population. Moreover, when analysing wage levels and wage dynamics within specific occupational groups, macroeconomic, microeconomic, legal, and financial factors should also be taken into account—factors that were omitted in the present study. As such, the conducted analysis leaves room for further research by scholars from other disciplines.

³ This does not mean that the distribution itself becomes normal as n increases. It only implies that the sampling distribution of the mean converges to normality, which allows for the application of appropriate statistical tests.

5. Results

Table 2 presents the average gross salaries in total in the analysed period and their dynamics. Over 8 years, the nominal increase in total salaries amounted to 70.40%. In real terms, the increase in wages was not so high and, according to Statistics Poland's estimates, amounted to 27.05%⁴. The recorded increases in nominal and real terms may reflect a continuous and systematic improvement of the economic situation in Poland.

Table 2.

Average gross wage (in PLN) and wage dynamics in Poland in the years 2014-2022

Year	Overall wage level	Overall wage dynamics
2014	4,107.72	-
2016	4,346.76	5.82%
2018	5,003.78	15.12%
2020	5,748.24	14.88%
2022	7,001.28	21.80%

Source: own elaboration based on data from Statistics Poland.

Based on the known average wages and variances for individual occupational groups, the average wages, variances, and standard deviations were calculated for the groups of occupations related and unrelated to NSS areas. Appropriate comparisons were then made in accordance with the principles of mathematical statistics.

Using the Z-test for the equality of means in two independent groups, the hypothesis was tested that the average wages of individuals employed in occupations related to smart specialisations are equal to the wages of individuals in other occupations. The results of the tests are presented in Table 3.

Table 3.

Results of one-sided statistical tests for the equality of means in two populations

Year	Statistics	Occupational groups related to the areas of the National Fiscal Information System	Other groups of professions
Year 2014	Average	4,489.05	3,556.93
	Standard deviation	2,776.19	2,168.31
	Sample size (in thousands)	1,464,50	5,070,80
	Critical Value (Z-Test)	374.65	
	p-value (Z-test)	0	
Year 2016	Average	4,737.56	3,786.06
	Standard deviation	2,840.37	2,274.77
	Average dynamics (until 2014)	5.54%	6.44%
	Sample size (in thousands)	1,601,30	5,492,70
	Critical Value (Z-Test)	389.09	
	p-value (Z-test)	0	

⁴ Notices available at: <https://stat.gov.pl/sygnalne/komunikaty-i-obwieszczenia/2024,rok.html>.

Cont. table 3.

Year 2018	Average	5,609.89	4,359.62
	Standard deviation	3,357.30	2,525.75
	Average dynamics (until 2016)	18.41%	15.15%
	Sample size (in thousands)	1,627,10	5,622,50
	Critical Value (Z-Test)	440.33	
	p-value (Z-test)	0	
Year 2020	Average	6,150.94	5,024.05
	Standard deviation	3,479.53	2,790.05
	Average growth rate (until 2018)	9.64%	15.24%
	Sample size (in thousands)	1,700,50	5,753,00
	Critical Value (Z-Test)	387.14	
	p-value (Z-test)	0	
Year 2022	Average	7,660.36	6,047.97
	Standard deviation	4,555.30	3,503.24
	Average growth rate (until 2020)	24.54%	20.38%
	Sample size (in thousands)	1,814,70	5,965,50
	Critical Value (Z-Test)	438.96	
	p-value (Z-test)	0	

Source: own elaboration, performed in R-studio.

The obtained results make it possible, at the p-value level of 0.01, to reject the null hypothesis formulated at the outset—that there are no significant differences in the average wages of individuals in occupational groups related to national smart specialisation (NSS) areas and those in other occupational groups—and to accept the alternative hypothesis, which states that wages in occupations related to NSS areas are significantly higher than those in other occupational groups. This means that there is a very low probability of obtaining a different result if the entire population were examined. Therefore, it can be stated with high confidence that wages in occupational groups related to the NSS areas identified in the most recent strategy are higher than in the remaining occupational groups.

The wage dynamics for occupational groups related to NSS sectors and for other occupational groups were calculated and compared. The obtained results do not provide sufficient grounds to claim that wage dynamics consistently remain higher in the group of occupations related to NSS sectors. In two out of the four analysed periods, wage dynamics were higher in the group of occupations related to NSS sectors, while in the other two periods, they were higher in the group of other occupations. Moreover, the wage dynamics in occupations related to NSS sectors exceeded the overall wage dynamics in only two of the four analysed periods.

6. Discussion

The aim of the conducted study was to assess the level and dynamics of wages in occupational groups related to national smart specialisation (NSS) areas in comparison to occupational groups unrelated to those areas. To achieve this objective, one-sided statistical tests for the equality of means in two independent samples were performed.

The obtained results indicate that, during the analysed period, the average wages in occupational groups related to NSS areas were statistically significantly higher than in other occupational groups ($p\text{-value} = 0.01$). Based on the conducted analysis, it can be concluded that occupational groups related to the NSS areas identified in the 2020–2030 strategy are characterised by a higher average gross wage level.

The results obtained are consistent with the findings presented in the literature. Gębska (2015) and McCann and Ortega-Argilés (2015) emphasise that sectors related to smart specialisations are characterised by high innovation and technological potential, which should naturally translate into higher wage levels. Aufiero et al. (2023) confirm that a higher level of job complexity—measured, among other things, by low task routineness and a high degree of technological advancement—is positively correlated with average wage levels.

The higher wage levels and faster wage growth observed in occupational groups related to NSS areas are consistent with the theory of wage growth in high value-added sectors, as well as with the theory of higher wages in occupations characterised by greater complexity and a higher degree of technologisation (Gębska, 2018; McCann, Ortega-Argilés, 2015; Aufiero et al., 2023).

The findings on wage dynamics in both groups may indicate that the NSS areas were correctly identified, and that the higher wages in occupations related to these areas are due to the greater difficulty and complexity of the work performed. However, this does not necessarily translate into faster wage growth in these occupation groups.

In light of the considerations presented, it should be emphasised that the results should be interpreted within the appropriate context and with full consideration of the identified research limitations, which clearly indicate the need for caution when drawing conclusions. These limitations highlight the necessity of further research in this area—particularly through the use of more detailed datasets on wages in occupations and occupational groups, or through the improvement of methods for assigning occupations and occupational groups to areas related to NSS. The study conducted may also serve as a basis for reflection and the development of academic works aimed at a more in-depth analysis of wage levels and wage dynamics in occupations or occupational groups, taking into account the priorities set out in strategies supporting regional or national smart specialisations in Poland and other EU countries.

The study's findings allow for the formulation of recommendations for relevant stakeholders. Employees should invest in the continuous development of competencies necessary to secure employment in workplaces that prioritise smart specialisations, as occupational groups related to NSS offer the potential for significantly higher earnings compared to other occupational groups. Employers operating in industries associated with smart specialisations should ensure the competitiveness of their enterprises in terms of employee remuneration, as these workers are well compensated on the market and may reject job offers that do not meet their financial expectations. From a macroeconomic perspective, it should be noted that the government's efforts to select and support smart specialisations appear to be yielding the desired effects. It is therefore advisable to continue this policy, while simultaneously increasing the availability of education and training programmes aligned with labour market needs and focused on smart specialisations. Moreover, attention should also be directed toward regional smart specialisations in terms of wage levels and wage dynamics, in order to ensure their balanced and local development.

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IDENTIFICATION OF KEY MOTIVATORS INFLUENCING EMPLOYEE COMMITMENT IN PROJECT TEAMS

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Purpose: This paper aims to identify the motivational factors that have the most significant impact on employee commitment in project teams and to determine their priority. The research was undertaken to address the issue of under-recognition of the hierarchy of employee commitment motivators in project teams.

Design/methodology/approach: The study was conducted in two phases, conceptual and implementation, between 2023 and 2024. The methodology included an analysis of the literature on factors that motivate and demotivate employees, as well as a questionnaire survey of 100 project staff members from various industries in southwestern Poland.

Findings: The study established a hierarchy of factors that motivate employees to work in project teams. Respondents stated that the most important factors included promotion opportunities upon the project's successful completion, remuneration, a clearly defined objective, financial and material rewards, and a friendly atmosphere.

The study confirmed the central research hypothesis, indicating a strong and positive relationship between the level of motivation and commitment to the project team. As many as 94% of respondents confirmed that a high level of motivation influences commitment to the project team.

Originality/value: The study presented in this paper provides valuable insights for the practice of human resource management, particularly in motivating employees within project teams. The most important finding is the confirmation of a strong link between motivation levels and employee commitment. This means that investment in employee motivation affects their commitment to the project team.

Keywords: motivation, motivators, extrinsic and intrinsic factors, commitment to work, Project management.

Category of the paper: Research paper.

1. Introduction

Human capital, including the project team's response, is a key factor in project success. The competence and motivation of the project team members are crucial, aside from the project's objective, investor support, and stakeholder commitment (Young, 2016). This is supported by The Standish Group's research, which shows that 32% of a project's success depends on a good location, the project team's competence, and a committed sponsor (Johnson, 2020). The first two factors are primarily determined by people, in particular, the project team.

Despite the widespread importance of project team commitment, there are still situations where individuals with insufficient skills, inadequate training, and low motivation are appointed to the team. Deficiencies in competence and motivation have a significant negative impact on project success.

To achieve a positive outcome in employee motivation within a project team, it is essential to understand the factors that either strengthen or weaken it. Employees' motivators for working in a project team change over time and require an individual approach, as what motivates one employee will not necessarily motivate another. Furthermore, the motivation of each project team member has a direct impact on the project's success and its ability to handle difficulties. As Knap-Stefaniuk, Karny, and Ambrozobe (2018) emphasize, effective motivation is based on understanding employees' needs and expectations, as well as on developing project managers' motivational competencies.

It is therefore crucial to accurately identify employee motivators and to utilize appropriate motivational tools to enhance this motivation or, at the very least, maintain it at a consistent level. Therefore, this paper aims to identify the motivators that have the most significant impact on employee commitment in project teams and to determine their priority.

2. Literature Analysis

Motivation plays a crucial role in ensuring effective work, particularly in project contexts where human capital is vital to success (Peterson, 2007; Pinto, 2008). Motivating employees involves stimulating their energy for action, which in turn leads to increased productivity and the successful overcoming of barriers that arise during a project (Peterson, 2007).

Definitions of motivation vary. Bieniok (1997) defines it as influencing attitudes and behaviour through stimuli. Kozdrój (1990) – as a conscious influence on the motives for behaviour. Reykowski (1979) – as a totality of motives. Borkowska (1985) – as the totality of motives influencing decisions. Schermerhorn (2008) – as the level, direction and sustainability of efforts. Gant (2014) – as the interaction of conscious and unconscious factors. Pink (2011)

emphasises intrinsic motivation, autonomy, and purpose in the 3.0 model. Nguyen (2017) defines motivation as incentives, while Umar (2018) defines it as causes of behaviour.

Two basic types of motivation are distinguished in literature: extrinsic and intrinsic. Extrinsic motivation is based on the impact of external factors such as remuneration, benefits, promotions, penalties, and prestige (Ganta, 2014; Walentek, 2019; Kilar, 2018; Kordziński, 2010). In contrast, intrinsic motivation stems from the employee's needs, values, and personal interests (Tian, 2024; Ganta, 2014). Factors influencing intrinsic motivation include interest in the job, job satisfaction, career development opportunities, self-fulfillment, and a sense of freedom (Ganta, 2014; Walentek, 2019; Kilar, 2018; Kordziński, 2010; Pierścieniak, Krent, Jakiela, 2013). Pink (2011) emphasises the role of intrinsic motivation for commitment and satisfaction, promoting autonomy, mastery, and purpose. Both types of motivation are important and require an individual approach.

Motivational factors are also divided into financial (remuneration, bonuses, commissions, profit sharing), material (training, social benefits, perks, rewards in kind, integration) and immaterial (organisational, psychological, technical) (Czarniawska, 1990; Kopertyńska, 2008; Krzysztofek, Kumańska, 2011; Kilar, 2018).

A manager's actions can also hurt employee motivation, leading to a decline in motivation. De-motivators include, but are not limited to: politically motivated actions, unclear expectations, ineffective meetings, lack of information, poor communication and lack of transparency, low standards, being ignored, criticism, ambiguous regulations, excessive workload, lack of autonomy and control, unequal distribution of responsibilities and lack of development opportunities (Spitzer, 1995; Line, 1992; Stelmach, 2005; Westover, 2024).

Numerous studies on motivation have been carried out over the past decade or so. These were focused on, among others: the impact of leadership style on motivation (Schmid, Adams, 2008; Matić, 2024), the effect of motivation on performance (Ganta, 2014; Bai, Hemalatha, 2024; Taning, Tanuwijaya, Gunawan, 2024), the impact of financial and non-financial factors (Umar, 2018), theories of motivation (Peterson, 2007), the impact of motivation on innovation (Tian, 2024) the relationship between strategic goals and motivation (Tuin, Schaufeli, Van den Broeck, Van Rhenen, 2020), the impact of occupational burnout on motivation (Bakker, Demerouti, Sanz-Vergel, 2014, 2024) and the differences in motivational factors concerning: company size and country (Hitka et al., 2021), professions, gender, and age (Hitka et al., 2023a, 2023b), as well as the impact of the Covid-2019 pandemic on employee motivation (Alves-Pereira et al., 2025).

However, these studies do not reflect the specifics of the Polish project implementation environment. The aim, therefore, is to identify motivators in project teams and to prioritise them. Financial and material factors were considered key due to their importance to employees.

3. Research Process

The research process, an integral part of reflective thinking, involves a series of activities (Apanowicz, 2005, p. 48). Despite minor differences in the literature (Apanowicz, 2005; Baran, 2021; Nowak, 2011), the process is characterised by similar stages. The paper adopts the approach of Apanowicz (2005), who distinguishes between theoretical assumptions, research problems, object and purpose of research, thesis and hypotheses, methods, techniques and research tools, population and sample, research area, results, and report. The research, which aimed to identify the factors that motivate employees to work in the project team, was divided into a conceptual phase (X-XII 2023) and an implementation phase (I-XII 2024).

The concept phase started in October 2023 and lasted three months. A literature analysis was conducted to identify the research problem: the insufficient recognition of the hierarchy of motivators influencing employee commitment in project teams. A central question and three specific questions were formulated to address the problem, along with a central hypothesis and six specific hypotheses (see Table 1).

Table 1.
Overview of research questions and hypotheses

Research Questions	Research Hypotheses
Main question: Which motivators have the most significant impact on the commitment of employees to the project team, and what is their prioritisation?	Primary hypothesis: There is a strong, positive relationship between the level of general motivation and commitment in project teams.
Detailed questions: Q1: Which motivators are seen as most important for engagement for project teams? Q2: What is the real impact of individual motivators on different aspects of commitment? Q3: How do changes in the level of key motivators during the project affect commitment?	Detailed hypotheses: H1: Financial rewards and bonuses are seen as one of the most important motivators for the commitment in further projects, but not necessarily the most important compared to other motivators, such as development opportunities. H2: Intrinsic motivators, such as job satisfaction and visible work results, have a more substantial positive impact on emotional commitment than extrinsic motivation factors. H3: A lack of financial rewards, the absence of visible work results, and negative evaluations (reprimands) significantly reduce motivation levels at the end of the project. H4: An established and measurable project objective has the most substantial positive impact on project commitment compared to other project factors. H5: Changes in the level of the most important motivators throughout the project have a proportional impact on changes in the level of commitment. H6: Promotion opportunities following successful project completion have a significantly positive impact on commitment.

Source: own elaboration.

The study identified several variables, encompassing two groups of factors: tangible (financial rewards, bonuses, and non-wage benefits) and intangible (praise, recognition, and personal satisfaction). In addition, incentives that enhance motivation (bonuses, material rewards, praise, satisfaction with performance, and visible work effects) and those that undermine it (absence of bonuses, rewards, praise, satisfaction, and work effects) were considered during the analysis. Factors affecting commitment, such as a precisely defined objective, adequate remuneration, prospects for personal development, a positive team atmosphere, a reward system, and a sense of job satisfaction were also taken into account during the study.

The study used a survey prepared using Google Forms due to its accessibility and broad reach. The survey questionnaire consisted of 27 questions and was divided into blocks that provided information on the research sample, the projects implemented, the level of motivation, and the motivators. It was assumed that the survey would be conducted among employees working in project teams from various industries in southwestern Poland. It was planned that 100 respondents would take part in the survey.

The research began in January 2024 with a survey questionnaire being made available to respondents. Data was collected until mid-March 2024. A statistical analysis of the data was conducted in May 2024, followed by a detailed examination of the impact of motivators on employee commitment and the prioritization of these factors. The research process will conclude with the development of a scientific publication.

4. Results

The survey was conducted online using Google Forms. The study involved 100 respondents from various industries who worked in project teams in southwest Poland. A diverse group of respondents, evenly split by gender (50/50), participated in the survey. Of the respondents, 40% held a Master's degree, 37% a Bachelor's degree or an engineering degree, 13% a doctorate, and 10% a high school degree. The predominant age group was 26-40 (40%), followed by 26-30 (27%), 41-50 (17%), 21-25 (14%), and 2% over 50. Seniority in the current companies varied, ranging from less than two years to more than 20 years.

Respondents worked in a variety of industries, including construction (16%), IT, logistics, and transport (13% each), as well as administration and medical (10% each). All respondents had experience in project work, with most having done so between 1 and 10 times (57%). Their roles mainly involved membership in project teams (47%), as well as acting as project management specialists and project managers (13% each).

Respondents most often implement internal projects (60%), service projects (46%), production projects, and external projects (27% each). In terms of size, respondents are most likely to implement small projects (50%). Most of the projects implemented by respondents are successful, with an overall success rate of 54% and a rate of 34% in most cases. A smaller number of projects fail (54%).

Most respondents (74%) declared themselves motivated during the survey. At the time of the survey, 13% reported a very high level of motivation, and 50% reported a high level of motivation. Opinions were divided on the relative importance of internal and external factors, making it impossible to determine the primary factors.

The most common motivators identified by respondents included financial rewards and bonuses (54%) and personal satisfaction (26%). After the project's completion, motivation is most strongly increased by a financial bonus (74%), visible work results, personal satisfaction, and praise from superiors (40% each). A drop in motivation after the project was associated with receiving reprimands (60%), the lack of visible results (54%), and dissatisfaction (46%).

Most respondents (94%) confirmed the impact of motivation on commitment. Changes in motivation throughout the project affect commitment, with dwindling motivation decreasing it (87%) and rising motivation increasing it (agreement among all respondents). Motivation after one project influences commitment in the next one (64%)—the level of motivation changes throughout the project, as highlighted by 84% of respondents.

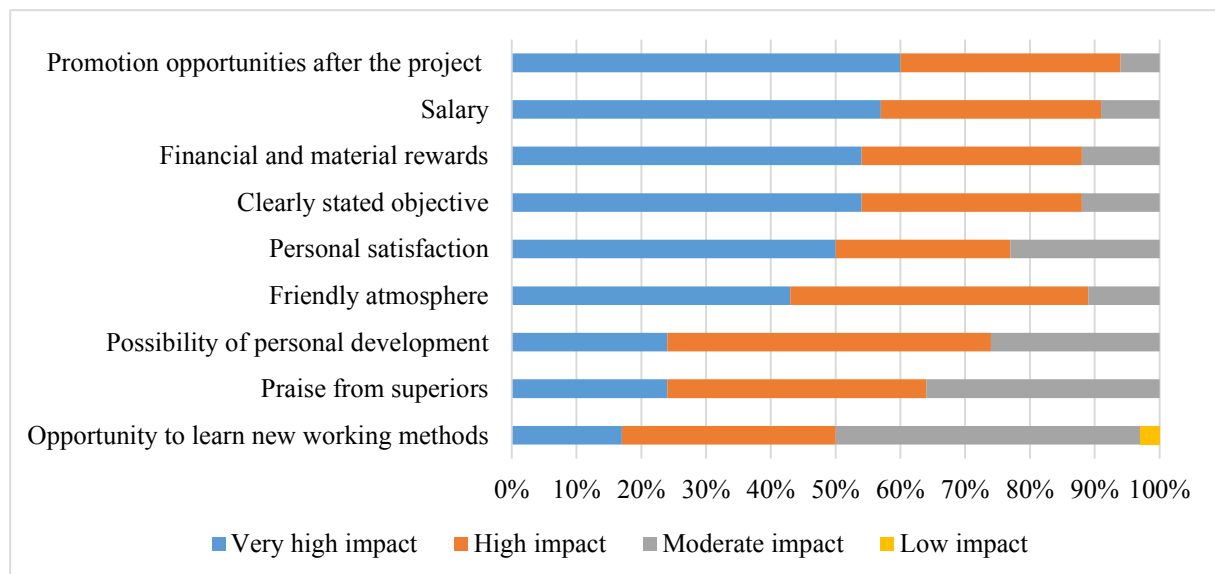


Figure 1. Hierarchy of Motivating Factors Affecting Employee Engagement in Project Teamwork.

Source: own elaboration.

Respondents (94%) also stated that motivation is strongly linked to commitment. Commitment is most strongly affected by promotion opportunities after the project (60% very high, 34% high), salary (57% very high, 34% high), a clearly stated objective (54% very high influence, 34% high), rewards (54% very high, 34% high) and personal satisfaction (50% very high, 27% high). Atmosphere (43% very high, 46% high), development opportunities

(24% very high, 50% high), and praise (24% very high, 40% high) are also important. The hierarchy of motivators is shown in Figure 1.

5. Discussion

The research presented in this paper aimed to identify the motivators that have the most significant impact on employee commitment to the project team and to prioritise them. To this end, answers to three specific research questions were sought (see Table 1). The answers were obtained through a literature analysis and a survey conducted among workers who implement projects in various industries in southwestern Poland. They also allowed to verify the formulated research hypotheses, including one main and six specific ones (see Table 1).

Hypothesis (H1) was that financial rewards are an important but not necessarily the most important motivator compared to development opportunities. The survey allowed to establish a hierarchy of motivators: promotion opportunities (60% rated the influence as very high, 34% as high), clearly defined objective (54% very high, 34% high, 12% medium), salary (57% very high, 34% high, 9% medium), financial and material rewards (54% very high, 34% high, 12% medium), friendly atmosphere (43% very high, 46% high, 11% medium), personal satisfaction (50% very high, 27% high, 23% medium), development opportunities (24% very high, 50% high, 26% medium), praise from superiors (24% very high, 40% high, 36% medium) and the opportunity to learn new ways of working (17% very high, 33% high, 47% medium, 3% low). Respondents most often cited financial rewards (54%) as the primary motivator. These results partly confirm the first hypothesis (H1) – rewards are important, but promotion opportunities and clear project objectives seem more important.

The second research hypothesis (H2) posited a more substantial influence of intrinsic motivation (satisfaction, work outcomes) on emotional commitment compared to extrinsic motivation. The survey found that 40% of respondents cited work outcomes and satisfaction as factors contributing to increased motivation after the project, while 74% cited a financial bonus as an external factor. This hypothesis cannot be unequivocally confirmed or rejected; further research is required.

Another specific research hypothesis (H3) concerned the negative impact of the lack of rewards, work outcomes, and reprimands on post-project motivation. Respondents identified lack of results (54%), reprimands (60%), and lack of bonuses (37%) as factors that reduce motivation. However, the degree to which they reduce motivation was not determined, making it impossible to verify the hypothesis conclusively. Additional research is needed to determine the factors with the most substantial impact on the decline in motivation.

The following detailed research hypothesis (H4) assumed the most potent positive effect of a set objective on commitment. 94% of respondents confirmed the objective's high (34%) or very high (54%) impact. However, salary (57% very high, 34% high) had a slightly more substantial impact, while development opportunities (24% very high, 50% high) and atmosphere (43% very high, 46% high) were also found to be important. The hypothesis was, therefore, partially confirmed.

The fifth research hypothesis (H5) concerned the proportional impact of changes in motivation levels on changes in commitment. As many as 74% of respondents highlighted that the change in their level of motivation during the project has an impact on their work commitment. In addition, up to 87% confirmed that declining motivation translates into a decrease in commitment, and all agreed that a rise in motivation increases it. The findings confirm the link between changes in motivation and employee commitment to the project team.

The last detailed hypothesis (H6) emphasised the strong positive impact of post-project promotion opportunities on employee commitment to working with the project team. The survey confirmed the hypothesis, as 60% of respondents rated the impact of post-project promotion opportunities as very high, and 34% rated it as high.

The results also confirmed the central research hypothesis, indicating a strong and positive relationship between the level of motivation and employee commitment to the project team. The research presented shows that as many as 94% of respondents confirm that a high level of motivation affects employee commitment to the project team.

6. Conclusions

The study's results confirm a direct link between the level of motivation and employee commitment to the project team. The most important motivators identified include: promotion opportunities after project completion, a clearly defined project objective, remuneration, as well as financial and material rewards. The results show that both internal and external factors influence employee commitment to the project team. However, the research did not determine a clear advantage for any of them. Furthermore, it helped identify factors with a strong influence on the decline in motivation, mainly a lack of visible work outcomes, criticism (reprimands), and a lack of bonuses. Changes in motivation throughout the project were found to have an impact on employee commitment: a rising motivation results in increased commitment, while a declining motivation results in reduced commitment. A strong and positive relationship between motivation and commitment to the project team's work was confirmed.

The research carried out enabled the research problem and research hypotheses to be verified and the research questions to be answered. As three of the six hypotheses were partially confirmed, the need for future research to fill the remaining gaps was identified. This research

should be extended to the entire country of Poland to obtain a more comprehensive understanding of the phenomenon under study and to determine whether similar work motivators can be identified in individual voivodeships. It is also recommended that the survey questionnaire be supplemented with questions to determine the actual importance of intrinsic and extrinsic motivators, as well as the factors that most strongly negatively affect motivation. It is also worth extending the research to include the impact of leadership style on motivation in project teams in Polish conditions and to identify practical motivational tools to optimise commitment to teamwork.

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REFORM OF THE ECONOMIC GOVERNANCE MODEL OF THE EURO AREA AFTER THE COVID-19 PANDEMIC

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Purpose: The purpose of this paper is to analyze the 2024 reform of the euro area's economic governance model in light of the macroeconomic challenges posed by the COVID-19 pandemic and subsequent geopolitical tensions. The study aims to assess whether the newly introduced fiscal framework enhances the resilience of euro area Member States and improves the coordination, sustainability, and credibility of their public finances.

Design/methodology/approach: The research employs a qualitative and institutional approach, grounded in the analysis of EU legislative documents, fiscal reform proposals, and secondary data concerning public finance management. The paper critically evaluates the design and implementation of new mechanisms such as debt sustainability analyses, reference trajectories, the control account, and corrective expenditure paths. It explores the theoretical framework of fiscal federalism and examines the practical implications of asymmetries within the Economic and Monetary Union.

Research limitations/implications: The study finds that the 2024 reform introduces greater flexibility and differentiation in fiscal governance, allowing for country-specific adjustment paths while enhancing EU-level oversight. Given the early stage of implementation, the study relies on institutional assessments and scenario-based inference rather than empirical data.

Practical implications: The findings suggest that the reformed framework can serve as a stabilizing tool for public finances by enhancing predictability and enabling more countercyclical fiscal responses. However, the effectiveness of the new rules depends on Member States' political will and capacities, while the absence of a central fiscal authority still hampers a unified response to asymmetric shocks.

Social implications: By supporting public investment and structural reforms - especially in green and digital transitions - the new framework has the potential to foster inclusive economic recovery and improve quality of life. The inclusion of defense-related spending as a mitigating factor in fiscal assessments reflects the EU's evolving approach to security and societal resilience.

Originality/value: This paper provides a comprehensive academic evaluation of the most significant reform to EU fiscal rules in over two decades. It offers value to scholars, policymakers, and fiscal authorities seeking to understand the dynamics of post-crisis economic governance in a monetary union lacking full fiscal integration.

Keywords: economic governance, euro area, fiscal policy reform, debt sustainability, public.

Category of the paper: Research paper.

1. Introduction

The European Union's fiscal reforms of April 29, 2024, significantly modified the principles of public finance management by adapting them to the post-pandemic economic landscape and the geopolitical implications of Russia's aggression against Ukraine. The newly introduced fiscal policy framework, based on individual debt sustainability assessments and flexible reference trajectories, replaces the previously rigid Stability and Growth Pact rules. The core objective of these changes is to bolster the resilience of euro area economies, ensure fiscal stability, and avoid repeating the policy errors that constrained crisis response capacities in the past.

The COVID-19 pandemic led to a sharp increase in public debt and necessitated the suspension of existing fiscal rules. In response to the crisis, broad support programs were launched, including the EU Recovery Fund (NextGenerationEU) (Council Regulation 2020) and the issuance of joint EU bonds, representing a milestone in the Union's fiscal policy evolution (European Commission, 2021). Concurrently, the European Central Bank pursued an expansionary monetary policy, stabilizing financial markets and enabling euro area countries to finance their deficits (ECB/2020/17, ECB/2015/10).

This study seeks to present and evaluate the reform of the euro area's economic governance model in the aftermath of the pandemic, with particular focus on the effectiveness of the tools applied and the impact of the new regulations on the public finances of EU Member States. Special attention is given to the 2024 reform of the euro area's economic governance provisions, their role in fostering greater accountability in fiscal policy, and the implementation challenges they pose.

This analysis addresses the central research question of whether the 2024 reform of the euro area's economic governance framework enhances the Union's resilience to future crises by examining the measures adopted in April 2024, with particular emphasis on their potential to strengthen Member States' fiscal robustness and improve the coordination of budgetary policy within a heterogeneous macroeconomic landscape. This paper goes beyond descriptive presentation by analyzing the potential of newly introduced fiscal instruments to deliver on fiscal sustainability and shock resilience objectives.

These issues have previously been addressed in numerous academic papers and institutional reports. The work of Blanchard, Leandro and Zettelmeyer (Blanchard et al., 2021) proved particularly influential, analysing the effects of low interest rates and growing public debt, calling for a reform of the EU fiscal framework towards greater flexibility and adjustment of rules to business cycles. In turn, Buti, Deroose and Veld (Buti et al., 2023), drawing on the institutional experience of the European Commission, pointed to the need to simplify the fiscal rules system and move away from the mechanical use of indicators towards a more coherent and understandable approach.

In a similar vein, Caselli and Wingender (2021) provide an empirical analysis of the differential effects of fiscal rules across EU countries, showing that the rigid Maastricht criteria did not always lead to the desired outcomes and that their effects were strongly dependent on national circumstances. This work provides an important reference point for assessing whether the new framework introduced in 2024 will indeed reconcile the need to ensure fiscal stability with the need to support growth and public investment.

The study is guided by the hypothesis that: The post-COVID-19 reforms of the euro area's economic governance model reinforce fiscal oversight mechanisms and enhance policy coordination. However, Member States remain the principal actors responsible for the stability of their public finances, implying the necessity for consistent application of the new rules and the ability to adapt flexibly to evolving economic conditions.

2. Reform of the EU Economic Governance Framework of April 29, 2024

The COVID-19 pandemic triggered a sharp increase in public debt (Bodnár et al., 2020) and necessitated the suspension of the existing fiscal rules, alongside the implementation of substantial support measures such as the EU Recovery Fund and the issuance of joint EU bonds (Recovery plan for Europe, 2024). Concurrently, the European Central Bank (ECB) pursued an expansionary monetary policy, stabilizing financial markets and enabling euro area countries to finance their budget deficits. The post-pandemic reform agenda was aimed at enhancing the resilience of national economies and ensuring the long-term stability of public finances, while avoiding the mistakes of the past that had constrained Member States' ability to respond to crises.

The EU's post-pandemic fiscal reforms introduced a new governance framework, replacing the rigid provisions of the Stability and Growth Pact (SGP) with a more flexible system based on individualized debt sustainability assessments (DSA) and reference fiscal trajectories. On April 29, 2024, the Council of the European Union adopted three new legislative acts reforming economic and budgetary governance in the EU.

The overarching objective of this reform is to guarantee the sustainability of public finances while promoting inclusive and sustainable economic growth across Member States. The new legal framework is designed to enhance the effectiveness of economic governance across the Union by strengthening debt management practices, encouraging structural reforms and public investment, and supporting job creation and long-term growth (Communication from the Commission, 2022). Successful implementation of these regulations requires timely and proper transposition into national systems.

The reform emphasizes a gradual, realistic, and sustainable reduction in public debt levels, while maintaining the fiscal capacity for strategic investments in digital transformation, environmental sustainability, and defense. Furthermore, the new framework establishes the foundation for conducting counter-cyclical fiscal policy, thereby improving the capacity of Member States to address macroeconomic shocks.

The revised EU fiscal architecture introduces significant changes to the governance of national public finances by advocating a flexible yet rigorous approach to the reduction of public debt and budget deficits. A core element of the reform is the implementation of the DSA, tailored to the specific macroeconomic and fiscal conditions of each Member State. This tool evaluates whether a country's public debt is on a credible downward trajectory or remains at a stable level, taking into account factors such as interest rates, economic growth, and the primary budget balance. The key variables in the DSA include GDP growth, interest rates, and the primary balance (i.e., revenues minus expenditures excluding interest payments). Higher growth facilitates debt stabilization or reduction, whereas rising interest rates elevate the cost of debt servicing, potentially undermining fiscal sustainability. The primary balance is pivotal in assessing whether a country generates sufficient resources to stabilize its debt without further borrowing.

The DSA also examines the risks associated with adverse macroeconomic developments that could drive debt levels beyond sustainable thresholds and assesses each country's capacity to respond to such shocks. It includes baseline scenarios based on current policies and economic conditions, as well as alternative scenarios incorporating potential disruptions such as rising interest rates, economic slowdowns, or shifts in fiscal policy. As a forward-looking tool, the DSA facilitates the formulation of realistic fiscal targets for each Member State.

Despite these innovations, the core benchmark of the 3% of GDP limit on budget deficits, as enshrined in the Treaties, remains in force (European Parliament, 2024). However, the reform introduces additional fiscal safeguards to ensure compliance and promote the long-term sustainability of public finances.

The first safeguard is the debt stability rule, which mandates that countries with public debt exceeding 90% of GDP must reduce their debt-to-GDP ratio by at least 1 percentage point annually. Countries with debt between 60% and 90% of GDP are required to reduce debt by at least 0.5 percentage points per year. This mechanism aims to secure a steady reduction in public debt, particularly in highly indebted economies.

The second safeguard, the deficit resilience rule, stipulates that the structural deficit must not exceed 1.5% of GDP. For countries exceeding this threshold, annual improvements to the structural balance of at least 0.4% of GDP are required. If the adjustment period is extended to seven years, the minimum correction is lowered to 0.25% per year. This measure is designed to curb excessive deficits and reinforce the long-term sustainability of fiscal policy.

Another innovation is the "no-backloading" rule, which mandates a uniform pace of fiscal adjustments throughout the corrective period. This rule aims to prevent the postponement of difficult budgetary decisions to the latter stages of the adjustment process - a pattern that has historically led to procyclical fiscal policy and endangered financial stability.

A major procedural change is the adoption of net expenditure paths as the sole operational fiscal rule (Buti et al., 2023). Net expenditure is defined as total general government expenditure, adjusted by excluding interest payments, discretionary revenue-increasing measures, fully EU-financed expenditures, national co-financing of EU programs, cyclical unemployment-related spending, and one-off or temporary expenditures. These expenditures must align with a pre-determined adjustment trajectory aimed at reducing deficits and debt in a sustainable manner.

Member States are now obliged to prepare medium-term fiscal-structural plans (MTFSPs) covering a four-year horizon. These plans include fiscal commitments, structural reforms, and public investment priorities aligned with EU-wide goals, particularly in the domains of green and digital transitions. The adjustment period may be extended to seven years if a Member State commits to ambitious reforms and investments that enhance both economic growth and fiscal sustainability. This adjustment introduces greater flexibility while ensuring that fiscal consolidation remains credible and tailored to each country's specific macroeconomic context (Darvas, Biovin, 2025).

2.1. Preventive Measures for Sound Public Finances

Under the new regulatory framework, each EU Member State is required to prepare a medium-term fiscal-structural plan covering a period of four to five years, depending on the length of the national parliamentary term. These plans must include a trajectory of net public expenditures and detailed explanations of investment and reform initiatives designed to address the challenges outlined in the European Semester, particularly the country-specific recommendations.

The April 2024 reform introduced two additional fiscal rules in the form of quantitative criteria, referred to as "safeguards", which apply to Member States whose public debt exceeds 60% of GDP and whose budget deficit exceeds 3% of GDP. These safeguards aim to enhance fiscal discipline in highly indebted countries and ensure that fiscal commitments are met in a sustainable manner in accordance with EU rules.

The new rules establish two specific safeguards to be incorporated into the reference expenditure trajectory:

1. Debt Stability Mechanism – ensures that general government debt levels are steadily reduced by at least the prescribed minimum.
2. Deficit Resilience Mechanism – ensures that the public deficit remains below the Treaty reference value of 3% of GDP, thereby enabling the creation of fiscal buffers.

The debt stability mechanism obliges Member States to systematically reduce their debt-to-GDP ratio during the adjustment period. In countries where public debt exceeds 90% of GDP, the annual reduction must be at least 1 percentage point. For countries with debt levels between 60% and 90% of GDP, the minimum annual reduction is 0.5 percentage points. This obligation applies throughout the adjustment period but is suspended for countries under an Excessive Deficit Procedure due to breaching the 3% deficit threshold. In such cases, the debt reduction requirement becomes effective once the country exits the EDP.

The deficit resilience mechanism requires that Member States reduce their structural deficit to no more than 1.5% of GDP. Countries exceeding this level must undertake annual fiscal adjustments of at least 0.4% of GDP. If the adjustment period is extended to a maximum of seven years, the required minimum correction is lowered to 0.25% of GDP annually. This mechanism aims to ensure gradual and sustainable reduction of fiscal imbalances over the medium term.

Compliance with these safeguards is monitored by the European Commission and the EU Council, which may require modifications to fiscal plans deemed inconsistent with the agreed standards. Once a plan is approved by the Council, the net expenditure path becomes the key reference for assessing a Member State's alignment with EU fiscal governance requirements. Deviations - whether positive or negative - from the expenditure path are recorded in a newly introduced control account. If a deviation exceeds 0.3% of GDP in one year or 0.8% over two years, countries with debt above 60% of GDP may be subject to the debt-based EDP, which mandates corrective measures and may lead to financial sanctions.

Countries with debt below 60% of GDP are not subject to sanctions for breaching debt criteria. However, they may receive warnings or recommendations under soft law if their fiscal policy deviates from the approved expenditure path. The only scenario in which these countries may be subjected to an EDP is by breaching the 3% deficit threshold. In such cases, corrective actions must be taken to align public finances with EU rules and avoid sanctions. The corrective expenditure path under EDP should aim to bring the general government deficit below the 3% reference value, as stipulated in Article 126(2) TFEU and Protocol No. 12. This corrective path must correspond to the trajectory initially established by the Council, ensuring at least a 0.5% structural adjustment annually, unless objective circumstances justify revision.

As of April 2024, the European Commission provides Member States with high debt or deficits a "reference trajectory" for net public expenditure. This applies to countries with public debt exceeding 60% of GDP or deficits over 3% of GDP. The trajectory reflects each country's financial stability challenges and sets out the required path for reducing or maintaining debt at a sustainable level. Member States must incorporate these reference paths - derived from the two safeguards - into their national fiscal-structural plans. These plans are subject to Council approval, and all deviations from the net expenditure path are recorded in the control account.

The control account is one of the cornerstone tools introduced in the governance reform to monitor adherence to approved expenditure trajectories. It tracks any deviation from the budgetary plans and identifies potential risks to fiscal stability. The mechanism enhances transparency and accelerates intervention in cases where Member States fail to meet their obligations. Operating as a virtual accounting tool, the control account records discrepancies between actual net expenditure and approved targets annually. Positive deviations indicate overspending, while negative ones reflect savings. If the control account balance breaches the set thresholds - 0.3% of GDP in one year or 0.8% over two years - the European Commission may recommend initiating an EDP. The procedure obliges the Member State to undertake corrective actions and may result in sanctions for non-compliance.

The reference trajectory and corrective expenditure path are two central elements of the reformed EU economic governance framework. Although interconnected, they serve different purposes. The reference trajectory, proposed by the European Commission, is intended to guide Member States in preparing their medium-term fiscal-structural plans. In contrast, the corrective path, imposed by the EU Council, is a binding plan implemented when a country breaches fiscal rules and enters the EDP.

The reference trajectory offers a forecasted path for net expenditure over four to seven years, intended to ensure a credible decline or stabilization in debt levels in accordance with EU debt sustainability analysis. While the reference path is negotiable, provided alternatives remain compliant with EU fiscal stability rules, the corrective path is non-negotiable and enforced by the Council.

By combining both instruments, the EU aims to establish a predictable and enforceable fiscal framework that safeguards macroeconomic stability while allowing flexibility in implementation. The control account reinforces this framework by enabling early detection of risks, encouraging timely corrective actions, and supporting long-term fiscal sustainability across the Union.

Table 1.

Key Differences Between the Reference Trajectory and the Corrective Net Expenditure Path

Feature	Reference Trajectory	Corrective Net Expenditure Path
Created by	European Commission	EU Council
Nature	Recommendation, point of reference	Mandatory adjustment plan
When applied	During negotiations of medium-term fiscal-structural plans	In the event of activation of the Excessive Deficit Procedure
Purpose	To assist Member States in planning expenditure adjustments	To enforce corrective fiscal actions in response to non-compliance with EU fiscal rules
Minimum adjustment	No minimum requirement	0.5% of GDP annually in case of deficit criterion breach; 0.25% annually if seven-year adjustment period applies
Flexibility	May be negotiated by the Member State	May only be amended under exceptional circumstances

Source: Prepared based on: European Council, *Economic governance framework*. Retrieved from: <https://www.consilium.europa.eu/pl/policies/economic-governance-framework/>, 15.01.2025.

The corrective net expenditure path is a mandatory adjustment plan imposed by the Council of the European Union, which must be implemented by a Member State subject to the EDP. Its primary objective is to bring the general government budget deficit below the reference threshold of 3% of GDP or to ensure that public debt is reduced in accordance with EU fiscal requirements. This path is typically established by the Council based on the original reference trajectory proposed by the European Commission. However, in contrast to the reference trajectory, the corrective path is legally binding and non-negotiable.

In cases where a Member State breaches the deficit criterion, the corrective path must deliver a minimum structural adjustment of at least 0.5% of GDP annually. If the breach concerns the debt criterion, the path must reflect the need to correct deviations from the established debt reduction target. Should the originally adopted path become unfeasible due to objective circumstances - such as unforeseen economic crises or significant macroeconomic shocks - the Council may designate a new adjustment path. Nonetheless, such revisions are permitted only in exceptional cases and require a thorough assessment of the new circumstances and their fiscal implications.

The fundamental distinction between the reference trajectory and the corrective net expenditure path lies in their nature and application. The reference trajectory serves as a non-binding guidance tool, aimed at supporting Member States in formulating their MTFSPs. In contrast, the corrective expenditure path is a compulsory recovery plan, activated when a country enters the EDP due to non-compliance with EU fiscal thresholds. Furthermore, the reference trajectory is prepared by the European Commission and can be negotiated, whereas the corrective path is established by the Council of the EU and may only be amended under extraordinary conditions.

In summary, the reference trajectory and the corrective net expenditure path serve as fundamental instruments in the reformed EU fiscal governance framework. While the reference trajectory offers strategic guidance developed by the Commission to help shape fiscal planning, the corrective path is a binding measure that enforces compliance in situations of fiscal deviation. Together, these tools aim to enhance the stability of public finances across the EU and provide more effective oversight over Member States' levels of debt and budget deficits.

2.2. Changes to the Excessive Deficit Procedure

As part of the reform of the EU economic governance framework, significant changes were introduced to the Excessive Deficit Procedure, particularly with respect to the public debt criterion. The new regulations promote a more flexible and individualized approach to fiscal policy management, accounting for the specific economic challenges of each Member State, while strengthening mechanisms for monitoring and enforcing fiscal commitments.

Member States are required to maintain their budget deficits below 3% of gross domestic product (GDP), unless the deviation is minor and temporary. Furthermore, countries must ensure that their public debt levels remain below 60% of GDP, unless the debt is on a downward trajectory moving toward the reference value at a satisfactory pace, as stipulated in Article 126(2) TFEU.

The EDP is triggered when the European Commission determines that a Member State has breached the fiscal thresholds. The Commission then issues recommendations for corrective measures, which, once approved by the Council of the European Union, obligate the Member State to implement the necessary fiscal adjustments (at least 0.5% of GDP annually).

From 2025 to 2027, the required correction will be assessed based on the structural primary balance, excluding interest payments and focusing on the underlying fiscal position. Starting in 2028, evaluations will shift to the overall structural balance, reflecting the need to incorporate debt servicing costs and adapt to evolving financial conditions.

This mechanism is especially important for Member States facing fiscal pressures during economic downturns, enabling gradual adjustments that reduce the likelihood of abrupt expenditure cuts or sudden tax hikes, which could destabilize growth and social cohesion.

Non-compliance with the annual correction requirement may lead to the initiation or escalation of the EDP, including the imposition of financial sanctions. The incentive structure promotes responsible fiscal behavior and adherence to EU budgetary rules.

Failure to implement corrective actions may result in a more stringent procedure and, in extreme cases, financial penalties. Although the EU has rarely enforced sanctions, evidence suggests that the EDP incentivizes compliance and helps maintain deficits below 3% of GDP (Caselli, Wingender, 2021).

The new rules also allow greater flexibility for countries undertaking structural reforms and public investments that support long-term economic development. In such cases, Member States may be granted extended deadlines for fiscal adjustment, provided they submit comprehensive reform plans aligned with EU priorities, such as green transition, digitalization, and energy security.

Defense-related investments have also been recognized as mitigating factors in EDP assessments (Guttenberg, Redeker, 2025). Expenditures on military modernization, procurement of advanced equipment, and capability enhancement may justify deviations from standard thresholds, especially in response to rising geopolitical risks (De Lemos Peixoto et al., 2025).

A sustainable approach to debt reduction is emphasized, allowing Member States to tailor debt reduction paths to their specific economic circumstances. Countries with debt exceeding 60% of GDP are required to present MTFSPs outlining net expenditure paths and concrete debt reduction strategies.

The 'no-backloading' rule is introduced to prevent deferral of fiscal adjustments. It mandates a consistent pace of consolidation throughout the adjustment period, avoiding a concentration of difficult reforms in the later stages that could jeopardize fiscal stability.

This rule responds to past instances where Member States delayed corrective measures, creating financial pressure toward the end of the adjustment period and complicating fiscal policy implementation. Systematic execution enhances credibility and mitigates economic and social disruption.

Moreover, the rule facilitates effective monitoring by the European Commission and Council, enabling timely intervention and early identification of risks. Its alignment with other safeguards, such as annual debt reduction requirements, contributes to more stable and balanced public finance management.

In conclusion, the reforms represent a major advancement in EU budgetary governance, balancing the imperative of debt stabilization with the need to support economic growth. The integrated approach ensures more resilient fiscal frameworks while preserving fiscal space for national and EU-level investment priorities.

3. Effectiveness of the Euro Area Economic Governance Reform Post-COVID-19

The 2024 reform of the euro area's economic governance framework constitutes a pivotal advancement toward aligning the European Union's fiscal architecture with evolving macroeconomic realities. It aims to bolster the resilience of public finances across Member States through improved fiscal coordination, a more flexible approach to debt management, and enhanced oversight of public expenditures. However, as implementation remains decentralized and rests with individual countries, concerns persist regarding the reform's operational effectiveness and consistency across jurisdictions.

A cornerstone of the reform is the departure from the rigid parameters of the Stability and Growth Pact in favor of country-specific debt sustainability analyses and flexible fiscal adjustment trajectories, tailored to the structural and cyclical conditions of each Member State. The inadequacy of uniform deficit and debt thresholds became particularly apparent during the COVID-19 crisis, which necessitated significant fiscal interventions and sharp increases in public debt. The new fiscal framework offers a more realistic and adaptive design, enabling national authorities to better absorb macroeconomic shocks without imposing excessive consolidation pressures during downturns. By integrating mechanisms aimed at ensuring debt sustainability and enhancing deficit resilience, the framework seeks to preempt fiscal imbalances and preserve countercyclical policy capacity.

Another key component is the strengthened role of EU-level fiscal oversight. The introduction of a “control account” to monitor deviations from agreed net expenditure paths enables earlier identification of fiscal risks and facilitates a more coordinated Union-level response. This instrument is expected to enhance transparency, reinforce budgetary discipline, and promote political accountability. Nonetheless, the existence of such monitoring tools is insufficient in itself; compliance will critically depend on enforcement mechanisms and the credibility of corrective procedures.

One of the first academic studies to evaluate the newly reformed EU fiscal rules is the analysis conducted by Pezzotti Piccoli and Luigi Gaetano (Piccoli, Gaetano 2025), who examines whether the updated framework - emphasizing simplicity, flexibility, and country-specific adaptability - is likely to strengthen or weaken fiscal discipline in terms of debt and deficit control. His research highlights both the potential advantages and the inherent limitations of the revised fiscal governance model.

On the side of greater fiscal discipline, the author points to the increased national ownership of fiscal planning. By allowing Member States to design their own MTFSPs, the reform encourages alignment between national and EU-level objectives, fostering a cooperative rather than hierarchical dynamic. The focus on net expenditure paths as the single operational indicator makes fiscal surveillance more transparent and implementable, while the ability of the EU Council to impose reference trajectories ensures that flexibility does not translate into laxity.

Further mechanisms - such as linear and proportional fiscal adjustments, the prohibition of backloading, improved methods for assessing deviations, and streamlined sanction procedures - enhance the credibility and enforceability of the framework. The retention of deficit and debt targets within safeguard mechanisms, like the Debt Stability and Deficit Resilience Mechanisms, ensures continuity with prior rules in a more adaptive form. Pezzotti Piccoli also notes the empowered role of Independent Fiscal Institutions (IFIs) under Directive (EU) 2024/1265, reinforcing oversight through the “comply or explain” principle.

Nevertheless, he cautions that certain elements may weaken the reform’s effectiveness. The complex and cumulative triggers for launching the EDP could undermine enforcement, while overuse of the national escape clause - especially if applied too broadly or frequently - risks diluting the framework’s integrity.

In conclusion, Pezzotti and Gaetano considers the reform a meaningful step toward improved fiscal governance, primarily through enhanced national engagement and more realistic implementation tools. Yet, some structural risks remain, which could challenge the framework’s durability and the consistency of fiscal discipline across the EU.

Due to the short period of operation of the new, reformed provisions, there is no experience of their application by Member States. However, a notable early evaluation is offered by Nicolas E. Boivin and Zsolt Darvas in their February 2025 study (Boivin, Darvas, 2025), which provides valuable insights into the reform’s preliminary efficacy. Their work makes

a meaningful contribution to the ongoing discourse concerning the practical relevance and sustainability of the new framework.

Boivin and Darvas concentrate their analysis on the consistency between MTFSPs and the requirements stipulated under the EDP. In particular, they investigate the alignment of macroeconomic assumptions embedded in national plans with the European Commission's guidelines, as well as the extent to which these plans safeguard or enhance public investment levels.

According to their findings, the European Commission had conducted an integrated assessment of the MTFSPs and EDP cases by November 2024. This approach was designed to ensure coherence between fiscal planning and compliance mechanisms. Notably, the fiscal adjustment paths mandated under the EDP were identical to those proposed within the MTFSPs, both of which were grounded in debt sustainability assessments and safeguarding mechanisms.

This convergence of MTFSP and EDP trajectories reflects a deliberate shift toward a coordinated model of fiscal surveillance under the reformed governance framework. The reform aspires to harmonize deficit and debt reduction requirements with national fiscal strategies, while accounting for country-specific macroeconomic conditions and investment priorities.

Boivin and Darvas assess whether the new framework meaningfully strengthens fiscal discipline without undermining public investment or ignoring economic heterogeneity. Their analysis highlights several critical implementation risks and proposes enhancements to bolster the system's functionality.

Of particular importance is the integrated evaluation process of the MTFSPs and EDP - a central innovation in the EU's revised economic governance model. This signifies a departure from the prior rules-based orthodoxy to a more tailored and outcome-oriented framework that emphasizes country-specific pathways while maintaining Union-wide consistency in fiscal expectations. The fact that both MTFSPs and EDP recommendations rely on the same analytical foundations (i.e., debt sustainability and risk buffers) is intended to improve the credibility and effectiveness of EU fiscal oversight by ensuring that national obligations are logically interlinked and mutually reinforcing.

However, Boivin and Darvas also underscore a fundamental limitation: the absence of a common methodology for quantifying the growth impact of structural reforms. This gap has led to divergent assumptions and methodologies among Member States, undermining the comparability and credibility of national reform plans. They advocate for the development of a unified framework to evaluate the macroeconomic returns of structural measures - a prerequisite for robust and transparent fiscal planning across the Union.

Furthermore, their study raises concerns regarding the potential crowding-out effect of fiscal consolidation on public investment. Drawing on post-2008 crisis data, the authors note that Member States pursuing aggressive fiscal adjustment often curtailed capital expenditure disproportionately. This raises the risk that the new fiscal plans, while striving for debt and

deficit reduction, could again suppress critical public investments essential for long-term growth and structural transformation. To mitigate this, Boivin and Darvas propose exploring alternative financing mechanisms, such as a loan-based EU-level investment fund modeled after NextGenerationEU.

Their findings suggest that the ultimate success of the fiscal reform will depend on several interrelated factors:

- Coherence and coordination: The integration of MTFSP and EDP assessments represents a step toward more consistent fiscal oversight.
- Methodological rigor: The absence of a standardized approach to evaluating the economic impact of reforms presents a significant analytical challenge.
- Safeguarding investment: There is a persistent tension between fiscal consolidation and public investment needs, which must be addressed through innovative funding mechanisms.
- Macroeconomic realism: Ensuring that national plans are consistent with the Commission's macroeconomic projections is crucial for maintaining the credibility of fiscal trajectories.

In sum, the long-term effectiveness of the reform hinges on the extent to which these challenges can be mitigated and whether Member States can implement the new rules in a manner that is coherent, realistic, and conducive to sustainable growth.

While the reform represents a significant step toward enhanced fiscal stability and surveillance, it does not fully address the structural asymmetries inherent within the monetary union. The euro area continues to lack a centralized fiscal authority, and national capacities to respond to crises remain highly uneven. Though the introduction of more flexible fiscal rules may enhance systemic stability, their effectiveness is contingent upon enforceability and the political will of national governments. There is an enduring risk that highly indebted countries may defer necessary structural reforms if they conflict with short-term political imperatives.

Ultimately, the credibility of the revised framework will be tested during the next significant economic shock. In theory, the new rules should empower Member States to better manage public finances while preserving fiscal space for countercyclical interventions (Kolm, 2024). However, the true resilience of the euro area will only be demonstrated when Member States are compelled to balance rule compliance with crisis responsiveness under real-world pressures.

The 2024 reform lays important groundwork for a more robust fiscal governance regime. Yet, its success will depend not only on institutional design, but also on the political commitment, administrative capacity, and economic foresight of the Member States entrusted with its implementation.

4. Summary

The post-COVID-19 reform of the euro area's economic governance framework introduced substantial changes to the EU's fiscal rules, adapting them to new financial, economic, and geopolitical challenges. The revised framework, adopted on April 29, 2024, is intended to improve fiscal resilience, enhance the sustainability of public finances, and establish a more flexible yet rigorous approach to debt and deficit reduction. The adoption of individualized reference trajectories and the control account mechanism strengthens fiscal oversight while allowing Member States greater room to tailor policies to their macroeconomic conditions.

The pandemic exposed weaknesses in the previous governance model, prompting a reassessment of EU fiscal principles. The launch of the EU Recovery Fund and the issuance of joint bonds marked a breakthrough in EU fiscal integration. While the reformed system still operates within rule-based constraints, it incorporates greater flexibility to manage fiscal policy during economic or geopolitical crises (D'Alfonso, 2021).

Key reform features include the 'no-backloading' rule, which prevents deferring adjustments to the end of the corrective period, and the recognition of defense spending as a mitigating factor in fiscal assessments. The reform also prioritizes structural reforms and public investment - especially in green and digital transformation - as essential to enhancing the EU's long-term competitiveness. It also accounts for the fiscal challenges posed by the need to expand defense capabilities through military modernization, defense technology development, and enhanced cooperation via EU defense programs such as the European Defence Fund.

These developments underscore the growing role of a common fiscal policy in the EU and the progressive alignment of the euro area with a model monetary union. The new rules, while expanding national policy flexibility, also demand stricter compliance with fiscal discipline (Blanchard et al., 2021). The effectiveness of the reformed fiscal framework will ultimately depend not only on the political willingness of Member States and the credibility of rule enforcement mechanisms, but also on the EU's capacity to ensure consistent implementation amid shifting economic conditions and the tendency of national governments to prioritize short-term political gains over medium-term fiscal discipline.

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MANAGEMENT CONTROL IN LOCAL GOVERNMENT UNITS – THEORY AND PRACTICE

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Purpose: The purpose of the work is: 1) to show the essence and importance of management control in its theoretical assumptions; 2) to present distortions of its essence in practice, including shortcomings, barriers, and related challenges; 3) to identify key instruments that can contribute to the proper implementation of management control.

Design/methodology/approach: The scope of the work is determined by its objectives, which were achieved through the appropriately selected structure of the work, subordinated to their implementation, and the research methods used. The work uses research methods and techniques developed in the social sciences, in particular, legal-dogmatic analysis.

Findings: Management control is a mandatory internal control of a managerial nature. To determine its essence, it is necessary to reach both the Law on Public Finance and the standards of management control. Despite the numerous advantages and benefits of management control, it does not function properly in many local government units. Despite different approaches to its implementation, almost every local government unit has documents/actions and procedures to support its implementation, a good foundation for the existence of functional management control. There are also numerous shortcomings and problems, such as the lack of self-assessment of management control, failure to set measures for achieving goals and objectives, errors in documents, etc. In this context, it is crucial to provide systemic support to local government units, if only by offering training, promoting good practices, and helping them make greater use of modern technologies.

Research limitations/implications: Fully showing the shortcomings, challenges, and their scale requires in-depth quantitative research.

Originality/value: This article is addressed to both theoreticians and practitioners dealing with management control issues.

Keywords: management control, internal audit, local government units.

Category of the paper: research paper.

1. Introduction

Despite the 15 years since the introduction of management control (MC) in local government units (LGU), its functioning still does not fulfill theoretical assumptions. Management control does not bring about achievable benefits because they are not recognized or ignored. Even cursory analysis and observation allow us to conclude that in many local government units, management control is perceived as a bureaucratic obligation, the implementation of which is reduced to the necessary fulfillment of statutory requirements. In such cases, we are dealing with management control „in documents” (procedure MC), although it should function as management control „in action” (functional MC).

The purpose of the article is: 1) to show the essence and importance of management control in its theoretical assumptions, 2) to present distortions of its essence in practice – shortcomings, barriers, and related challenges, and 3) to identify key instruments that can contribute to the proper implementation of management control. The structure of the work was subordinated to the realization of individual specific objectives.

The work lays the groundwork (preparation) for the next planned stage of research, which will be detailed quantitative research; one of the latest is a study conducted by P. Sołtyk (2018). The work uses research methods and techniques developed in the social sciences, including legal-dogmatic analysis.

2. The essence and importance of management control in local government units

Management control is a tool introduced into the Polish legal system by the Act of 27.08.2009 on public finance (ie: OJ 2024, item 1530 as amended). In the literature from the first years of its operation, one can find many attempts to define it and indicate its characteristics. Management control is indicated, among other things, as a tool:

- „interior arrangement” of public management, which includes solutions for „increasing efficiency in realizing the mission (goals) of public authority” (Kulesza, Sześciło, 2013, p. 149),
- raising the degree of confidence that the entity's tasks and goals are being carried out effectively and in accordance with the law, all thanks to its components, such as identifying and managing risks and improving the flow of information and documents, among others (see MF, 2016).

Basically, these definitions point out that management control:

- is integrated into the day-to-day operations of the entity (Szostak, 2010),
- involves the continuous or cyclical performance of managerial activities (Matysek, 2011),
- concerns management processes (Chojna-Duch, 2010).

Today, management control is defined similarly (see Dobrowolski, 2022; Szulin, 2021; Fleszer, 2021). However, the question is still relevant and valid: What is its essence?

When looking for the essence of management control, one should first turn to the legal provisions of the Law on Public Finance. Already, Article 68(1) defines what constitutes management control and why certain activities are undertaken as part of it. According to this provision, management control encompasses all actions that are taken to ensure that goals and tasks are achieved, so that the goals are achieved and the tasks are carried out in a lawful, efficient, economical, and timely manner (Mituś, 2017). Subsequent provisions, i.e., Articles 68(2) and 69(1) of the Law on Public Finance, indicate: what activities are included in the scope of management control; what these activities should be characterized by; and what benefits management control provides. According to them, management control includes those activities that will contribute to the achievement of goals and objectives, and the activities themselves should be adequate, effective, and efficient. In turn, among the many benefits that management control offers, one can point out that it provides assurance that the entity's activities are carried out in accordance with the law and internal procedures, and the actions taken are effective and efficient and protect the entity's resources (Mituś, 2017). At the same time, what specific actions should be taken to ensure the realization of goals and tasks are indicated by the Management Control Standards (Announcement No. 23 of the Minister of Finance dated December 16, 2009 on management control standards for the public finance sector, Official Journal of the Ministry of Finance, No. 15, item 84), which propose specific solutions in five areas of the entity's functioning. This legislative approach means that understanding the essence of management control and the benefits it can bring requires reaching not only the Law on Public Finance, but also to other acts/documents (e.g., Announcement No. 6 of the Minister of Finance of December 6, 2012 on detailed guidelines for the public finance sector on planning and risk management (Official Journal of the Ministry of Finance, item 56), and above all to management control standards.

The goals and objectives that are the key to management control should be defined on the basis of the Law on Public Finance. At the same time, it seems that their conceptual scope cannot be limited only to the goals and tasks referred to in Article 70(2) of the Public Finance Act (elements of the entity's activity plan), i.e., to organizational goals and tasks. This is supported, for example, by the fact that not every unit is obliged to draw up an activity plan, and a broader conceptualization of goals and tasks makes it possible to formulate them not only in relation to specific tasks or groups of them, but also to the entire activity of the unit or individual areas of its functioning (Mituś, 2017; see also Mituś, 2018).

Management control encompasses both instruments and mechanisms of a control nature for monitoring the achievement of goals and objectives, as well as tools and mechanisms of a management nature, which is the system for setting and achieving goals and objectives. Therefore, management control is a kind of symbiosis of internal control and management instruments (Mituś, 2017). However, its basic and even leading component is internal control, which is an integral part of management in the entity (see Budzeń, 2015). Such an approach results from the scope and manner of its regulation, and is also justified by the specifics of the entities required to implement it.

The introduction of management control changes the culture of local government entities, from a culture of executing the law to a culture of achieving results (Ignacy, 2016). Management control, by imposing solutions to increase the efficiency and effectiveness of the management of the entity's resources (see Wojciechowski et al., 2023), has introduced instruments for making the right decisions in the complex realities of modern management (Fedchenko et al., 2023). This is served by, among other things, the availability of up-to-date and reliable information and the analysis of data obtained in the monitoring process.

Analyzing the various instruments and mechanisms of management control, it should be noted that they are primarily managerial, controlling, and safeguarding against adverse events that may affect the achievement of goals and objectives (Mituś, 2017). The essence of management control is that it „ensures” (provides assurance, guarantees):

- a) realization of goals and objectives in a lawful, efficient, economical and timely manner. Here, the legislator uses the phrase „ensure” rather than „serve”, which indicates the need to achieve a certain result of the action, rather than just striving for due diligence (see Mituś, 2017),
- b) the proper functioning of the entity as a whole and within a certain scope of its activities.

In order for management control to fully fulfill its function and actually provide „assurance” it must be treated as a tool that brings concrete benefits (see MF, 2016). This is possible when management control is embedded in the structure and tasks of the entity and when it combines and organizes the elements of proper functioning of the entity. Thus, the effectiveness of management control comes from the combination of the entity's management (organizational component) and its performance of public tasks (material component).

3. Barriers and challenges in the implementation of management control in local government units

Management control is supposed to be a system tailored to a given unit („custom-made”), created on the basis of applicable laws and standards and guidelines, indicating organizational and management solutions that strengthen the unit institutionally (Ćwiklicki, Mituś, 2015).

Such an approach is reasonable because, in areas covered by management control standards, soft regulations work better.

After 15 years of management control in local government units, a variety of shortcomings and problems are still encountered, among which we can point out.

- 1) Variety of approaches to management control – many local government units view MC as an additional, bureaucratic, and unnecessary tool. In such units, its functioning is reduced only to the formal fulfillment of a statutory requirement, and the actions taken appear to be sham („for show”).
- 2) Insufficient understanding of the essence of management control – the effectiveness and proper functioning of the MC requires an understanding of its role and functions. The lack of this understanding leads to the perception that management control is overly formalized. Although risk estimation, metrics and indicators, self-assessment, and task monitoring have been introduced in many local government units, these activities are not actually implemented in practice.
- 3) Incomplete implementation of management control solutions / dominance of financial control – as a kind of heir to financial control, management control, instead of covering all areas of the entity's activities, is quite often limited only to control of its financial management.
- 4) Inadequate identification of risks – an important element of MC is the correct identification of risks and their effective management, which is still a challenge in practice in many units (Sołtyk, 2018).
- 5) Problems with implementation of management control mechanisms/adherence to standards – difficulties in implementing and adhering to MC standards may be due to their nature as soft law solutions, which means that they are not treated as mandatory.
- 6) The need for continuous improvement and adaptation – an indispensable feature of MC is its continuous implementation, improvement, and adaptation to changing needs and conditions (Józwiak, 2023). Although this feature determines the effectiveness of management control, the need to constantly respond to changes taking place is quite a challenge for many units.

The actual state of operation of management control in Poland seems unsatisfactory. Based on observations and interviews with local government employees, this is the picture of management control that emerges: many employees are not familiar with the entity's goals and deadlines for achieving them; they are not familiar with the measures and indicators of the goals and tasks/results achieved, which makes it impossible to monitor the progress and pace of their achievement. Even if risk identification is carried out in the unit, many employees often lack knowledge of what happens next; has a risk register been drawn up or have measures been taken to reduce it to an acceptable level?

A review of the implementation of management control standards in each management area allows the following observations to be made:

- A. Internal environment – there are usually written ethical principles in units, and this is confirmed by codes of ethics, bylaws, or guidelines on how to deal with situations of unethical behavior.
- B. Goals and risk management – in general, many employees do not see the benefit in setting goals and objectives. Risk management, on the other hand, is given more attention, as most units have introduced detailed guidelines for identifying and managing risks. It seems that several years of experience in this area have led to the acquisition of the ability to identify risks that are relevant to the unit.
- C. Control mechanisms – this is the most noticeable manifestation of management control in the entity, although it is often reduced only to the existence of internal documents and procedures for the effective and efficient performance of tasks - these are both general regulations, such as „Management control in ...”, and specific solutions concerning, for example, the security of communication and information systems.
- D. Information and communication – the basic shortcoming of this area is the multiplicity of information and communication solutions, which can lead to chaos. This state of affairs is often compounded by the poor quality of information and its transmission with delay, which hinders decision-making and management of the unit.
- E. Monitoring and evaluation – documenting the review of management control procedures seems to be implemented only in some units. Internal audit is most often cited in this area.

Interesting conclusions and assumptions can be drawn by analyzing management control in internal documents/acts of the units. These should primarily include:

- a) The document on the functioning of management control in the eleven – almost every unit has a document pinning down the functioning of management control. Attempts to embed management control in the organizational structure of the unit can be seen in it.
- b) Organizational bylaws – the existence of management control is often indicated in the organizational bylaws, which should be standard. The bylaws as an act of internal management provide an opportunity to quickly change its provisions and adapt the organization of the unit/office to the tasks carried out and the goals set.
- c) Development strategies – define the vision, mission, and directions of activities, being a point of reference for the set goals and tasks.
- d) Report on the state of the LGU – contain information on the execution of the budget and the status of tasks in various areas of activity, implementation of strategies and implementation of programs.

Analysis of these documents/acts allows us to assess whether management control is embedded in the entity's management system. Generalizing, the analysis of these documents makes it possible to assess whether they are consistent with each other and whether the obligations contained in them are reflected in other official documents and publicly available sources of information.

4. Internal control and audit and the attitude of the entity manager as an opportunity for the development of management control

Taking on the problems identified above will help increase the efficiency and effectiveness of management in local government units. Although management control in its scope includes many instruments and components, only some of them can contribute to overcoming the difficulties that have arisen. These include:

a) Internal audit.

Internal audit is an independent and objective activity that supports the head of the entity in achieving its goals and objectives through systematic evaluation of management control and advisory activities (Art. 272(1) of the Law on Public Finance). In the context of auditing, it is worth noting the issue of auditors' independence and objectivity, both functionally and organizationally. Although this independence and objectivity is guaranteed by certain legal solutions, including the legal status of the auditor, in practice this independence can be violated. A fundamental problem is the scope of the auditor's permissible advisory activities, which can lead to too deep involvement of the auditor in the entity's activities and thus undermine his objectivity (see Ogórek, 2023).

b) Institutional internal control.

Internal control plays an important role in local government units (see Jagielski, 2018) and is a practical dimension of management control. Functioning in the offices of local government units, the organizational units or positions for internal control (the so-called classical institutional internal control) are part and manifestation of management control. However, the absence of such control in an entity makes management control even more perceived as a formal obligation, limited to documents such as „Management Control in Municipality X”. This does not mean, however, that it is wrong to create a formal framework. However, the formal framework for taking action should not just be created but should translate into actions that bring tangible benefits. Unfortunately, only half of LGUs have internal institutional control.

In addition to internal control, one of the most recognizable management control instruments for employees is risk estimation. The problem, however, is that many of them do not see the benefit in it, treating it merely as a formal requirement that no one

needs. As a result, what emerges is an understanding of management control as a classic follow-up control, rather than the continuous, ongoing control that management control is, which includes self-control, functional control exercised by a supervisor, and institutional control carried out by an employee or control unit. The lack of understanding of the essence of management control leads to a limitation of its potential as a tool to support effective management of the entity.

c) Attitude and role of the head of the unit.

According to Article 69 (1) of the Law on Public Finance, management control operates at two levels in local government units, that is, at the level of the unit (eg, budget unit [office], school) and at the level of the local government unit. Responsible for the functioning of management control at level I is the head of the unit, and at level II the head of the unit is the mayor (mayor, city president), the head of the district, and the head of the province, who are simultaneously responsible (as managers) for the functioning of management control at level I in their subordinate office. As a result, the LGU office acts as the center for the implementation, coordination, and monitoring of management control activities in the entire local government unit (Mituś, 2017).

If the person responsible for the operation of management control sees the benefits of it, then it will be implemented to the fullest, as his will affect the lower levels of the organizational structure. It is the head of the entity that manages its activities, sets its goals and objectives, and implements them in accordance with the approved plans. Only when the goals and objectives are formulated at the level of the entire unit can they be detailed at lower levels of the organizational structure. The problem arises when the head of the unit does not see the benefits of management control. In such cases, it is highly likely that the employees of the office/unit will not implement it either. Of course, it is possible to imagine a situation where employees at lower levels, seeing the advantages and benefits of management control, will, for example, formulate goals and objectives. However, in such a case, will management control bring as much benefit as it could if it operated throughout the entity? One can also imagine a situation in which the role and tasks of the head of the entity, e.g. the mayor in terms of management control are taken over by the secretary of the municipality or the treasurer. But then the question arises as to whether their vision of goals and objectives and their implementation will coincide with that of the head of the unit? Therefore, the most correct solution is for the unit manager to formulate goals and objectives in cooperation with the unit's management or with lower-level management.

5. Summary

Management control is a mandatory internal control of a managerial nature (MF, 2012). Despite its many undoubted advantages and benefits, it does not function properly in many local government units. However, despite its many shortcomings and deficiencies, as well as different approaches to fulfilling the obligations of management control, there are areas that favor its viable functioning. These include: various types of documents/internal acts regarding the management control system in the unit; internal procedures included in these documents/acts; detailed responsibilities of employees and organizational units, etc. However, one should not forget about the lack of implementation of many important elements of management control, such as the lack of self-assessment, the lack of setting yardsticks or errors in documents, etc.

A key issue for change is systemic support of local government units through various types of activities, especially training, workshops, or good practices demonstrating the benefits of management control - this lays the groundwork for a change in approach to make management control a functional tool that realistically supports the efficiency and effectiveness of operations. Additional levels of support include basing management control on internal institutional control, making greater use of modern information and communication technologies for communication and reporting, and considering new legal solutions or even additional management control standards.

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RELATIONSHIPS BETWEEN SOCIOLOGICAL, DEMOGRAPHIC AND MACROECONOMIC FACTORS AND E-COMMERCE MARKET TURNOVER

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Purpose: The purpose of this article is to examine the relationship between the value of turnover in the booming e-commerce market and variables from economics, demographics and sociology.

Design/methodology/approach: The focus was on the analysis of panel data from 18 European economies over the period 2017-2022. Both static econometric models with fixed and random effects and dynamic models using the Blundell-Bond estimator were used.

Findings: The analysis conducted showed a significant and strong relationship between the value of e-commerce turnover per capita in the earlier period and its value in the later period. Furthermore, a positive relationship was found between the degree of urbanisation, the level of real GDP per capita and the increase in the percentage of internet users in the population and the value of e-commerce turnover per capita.

Research limitations/implications: The analysis focused mainly on panel data from 18 European economies, which limits the possibility to generalise the results to other regions or markets with different social and economic structures.

Practical implications: E-commerce enables companies to reach new markets and customers more easily, leading to increased sales and faster growth. Understanding the mechanisms of e-commerce growth in Europe can help companies optimise their strategy and expansion decisions.

Social implications: Analysis of demographic and sociological factors enables a better understanding of the purchasing preferences of different social groups, which provides valuable information for marketing and strategic planning.

Originality/value: The study's added value is its integrated approach to analysing the development of the e-commerce market in Europe, taking into account history, the evolution of consumer behaviour, business trends and econometric data analysis to understand the complexity of the phenomenon.

Keywords: e-commerce, e-commerce, internet, panel data, static and dynamic models.

Category of the paper: Research paper.

1. Introduction

Over the past decade or so, e-commerce has become an important part of the economy, representing a major sales channel for many companies. The growth of the e-commerce market is a result of technological advances, the increasing accessibility of the internet and, in recent years, the COVID-19 pandemic, which has accelerated the digital transformation of businesses (Zou, Cheshmehzangi, 2022). Personalisation of the shopping experience, digital marketing and social media have begun to play a key role in the development of this sector. Consumers are increasingly choosing to shop online, valuing convenience, a wide selection of products and the ability to quickly compare prices. In addition, the development of modern logistics technologies has improved delivery efficiency, increasing customer satisfaction. Younger generations, proficient in the use of the internet, are becoming an increasingly important target group for companies, prompting businesses to invest in e-commerce.

The development of e-commerce is a multidimensional phenomenon whose dynamics depends on a number of factors. The aim of this paper is to examine the relationship between the value of turnover in the rapidly growing e-commerce market and variables from economics, demography and sociology. The paper estimates both static models on panel data with fixed and random effects and selects the more appropriate of the two, as well as dynamic models with a systematic estimator of the Generalised Method of Moments (Arellano, Bover, 1995; Blundell, Bond, 1998). The models use annual panel data from 2017-2022 for eighteen European countries collected from Eurostat, World Bank and Statista.com databases.

The topic is relevant because of the growing role of e-commerce in business development and consumer behaviour. E-commerce enables companies to reach new markets and customers more easily, leading to increased sales and faster growth. Understanding the mechanisms of e-commerce growth in Europe can help optimise strategy and expansion. Analysis of demographic and sociological factors provides a better understanding of the purchasing preferences of social groups, which is valuable for marketing and strategic planning.

Based on the review of the related literature and the data analysis, research hypotheses were formulated and will be tested in the paper. Each hypothesis focuses on a different aspect related to the e-commerce market.

Hypothesis 1. There is a positive relationship between the value of e-commerce turnover per capita in the preceding period and the value of turnover in the following period. According to IMF research, countries with a higher share of online transactions before the pandemic experienced a greater increase in e-commerce turnover during the pandemic, while early-stage economies such as Brazil and Thailand had a smaller acceleration (Alcedo et al., 2022).

Hypothesis 2. There is a relationship between the percentage of people with higher education and the size of the e-commerce market. Studies indicate that consumers with higher education are more likely to shop online, have higher incomes and better internet literacy

(Li et al., 1999; Swinyard, Smith, 2003). According to Eurostat's 2024 report, 88% of those with a university education have shopped online, compared to only 57% of those with primary or no education (Eurostat, 2023).

Hypothesis 3. There is a relationship between the level of urbanisation and the size of the e-commerce market. Although e-commerce reduces income inequality between urban and rural areas (Wang, 2023) and supports rural areas (OECD, 1999), a report by the World Bank and Alibaba Group (2019) indicates that cities drive e-commerce growth, as urban residents are more likely to shop online and more businesses operate in cities. A study by Wang, Liu (2015) on data from China confirms that urbanisation, GDP per capita and education level are important variables affecting e-commerce growth.

Hypothesis 4. There is a relationship between real GDP and e-commerce turnover. In European countries, the value of e-commerce turnover represents between 2% and 9% of GDP (PPRO, 2023). In developed countries, e-commerce has a higher value and better growth prospects due to access to ICT infrastructure and higher levels of consumption and income (Molla, Licker, 2005; Roszko-Wójtowicz et al., 2024). A study by Wang, Liu (2015) also confirms that GDP per capita influences the development of the e-commerce market.

Hypothesis 5. There is a positive relationship between the increase in the percentage of Internet users in society and the development of e-commerce. Internet access and the spread of ICT are key to the development of the e-commerce market. Cheba et al. (2021) identified internet access as one of the most important factors influencing the development of e-commerce, and Dumičić et al. (2018) and Wang, Liu (2015) confirmed this relationship in their analyses of Europe and China. The increase in the number of internet users may therefore be an important element to foster the development of the e-commerce market.

The added value of the article is the integrated approach to analysing the development of the e-commerce market in European countries, taking into account the history of development, the evolution of consumer behaviour and business trends, and econometric data analysis, which allows for a better understanding of the complexity of the phenomenon. The comprehensive analysis, compared to the existing literature (e.g. Wang, Liu, 2015; Cheba et al., 2021; Dumičić et al., 2018; Roszko-Wójtowicz et al., 2024), is based on data from a period of dynamic changes in the e-commerce market in many European economies, focusing on variables potentially related to the sector. The findings may be useful for e-commerce companies in terms of expansion decisions, strategy optimisation and forecasting.

The second section presents the literature on the e-commerce market, including early research, trends, barriers to growth, the relationship with the economy and the impact of the Covid-19 pandemic. The third section is the analysis, describing the econometric models, the survey methodology, the dataset and presenting the conclusions of the analysis.

2. Literature review

The first studies on the e-commerce market emerged in the late 1990s, when the sector was still young and internet access limited. Early research focused on understanding what motivated consumers to buy online and how e-commerce companies could enhance the shopping experience (Keeney et al., 1999). From the outset, e-commerce explored improving the shopping experience through product recommendation systems (Burke et al., 1997).

Efforts were also made to characterize consumers based on demographic factors and attitudes toward online shopping. Online shoppers tend to be younger, better educated, wealthier, and more knowledgeable about the internet compared to non-shoppers (Li et al., 1999; Swinyard, Smith, 2003). A lack of online experience is a characteristic of those who avoid shopping online (Novak et al., 2000; Miyazaki, Fernandez, 2001). Studies of Spanish consumers revealed that men are more likely to use e-commerce than women, and e-commerce is more popular among younger people. Higher education, digital skills, and income also increase the likelihood of using e-commerce. The study also identified e-banking and e-government as important predictors of consumer engagement in e-commerce (Pérez-Amaral et al., 2020).

Wang, Liu (2015) discuss factors driving e-commerce growth in China, such as mobile service penetration, disposable income, number of computers per 100 households, and urbanization. Research on the impact of the Covid-19 pandemic highlights its significant effect on e-commerce growth, with a record 27% increase in 2020 (Cramer-Flood, 2021). Restrictions on traditional trade shifted demand to e-commerce, facilitating contactless transactions and reducing the risk of virus transmission (UNCTAD, 2021). The pandemic forced businesses to accelerate digital transformation, and e-commerce activity remained high in 2021. The proportion of internet users shopping online rose from 53% before the pandemic to 60% afterward across 66 countries. Notable increases were seen in the UAE (from 27% to 63%) and Bahrain (from 15% to 45%), while developed countries such as Greece, Ireland, Hungary, and Romania saw increases of 15-18 percentage points (UNCTAD, 2022). A PwC report (2021) indicates that the surge in online shopping in Poland during the pandemic represents a lasting shift in consumer behavior, with nearly 85% of Poles continuing to shop online to the same or greater extent after the pandemic.

E-commerce and the internet are vital to the economy, influencing GDP growth, productivity, and the labor market. Literature shows that online consumers are predominantly young, educated, and affluent. Key factors driving e-commerce growth include internet accessibility, urbanization, and high disposable income. Research on the Covid-19 pandemic underscores its role in accelerating e-commerce growth, shifting consumer behavior, and driving digital transformation in businesses.

3. Data description

A panel of data from 18 European countries for each year from 2017-2022 was used for the study. The countries analysed include: Bulgaria, Czech Republic, Germany, Estonia, Ireland, Spain, France, Italy, Cyprus, Lithuania, Hungary, Netherlands, Austria, Poland, Romania, Slovakia, Sweden, Norway. Data are taken from Eurostat, World Bank and Statista.com databases.

The research sample was selected taking into account countries with varying degrees of economic development and e-commerce market sophistication, focusing only on European countries. Countries for which data was not available for all periods analysed were not included in the study. The sample includes six countries where the e-commerce turnover per capita did not exceed €400, five where the value did not exceed €800 and seven where it was above €1000 per year.

Table 1 presents the variables used in the study, while Table 2 shows their descriptive statistics. The explanatory variable, **ECREVperCapita**, represents the total gross e-commerce turnover per capita in a country for a given year (in Euros) (see Figure 1), and was logarithmized in the study (e.g., Augustine, Rasp, 2023). The data includes only online sales of physical goods to private end consumers (B2C) and is derived from annual reports, national statistical offices, Google Trends, Alibaba.com, and industry knowledge. The statistics exclude sales of digital goods and services, as well as transactions between private individuals and businesses (B2B). The data was sourced from Statista.com, a German service specializing in data collection and visualization (Statista Market Insights, 2023).

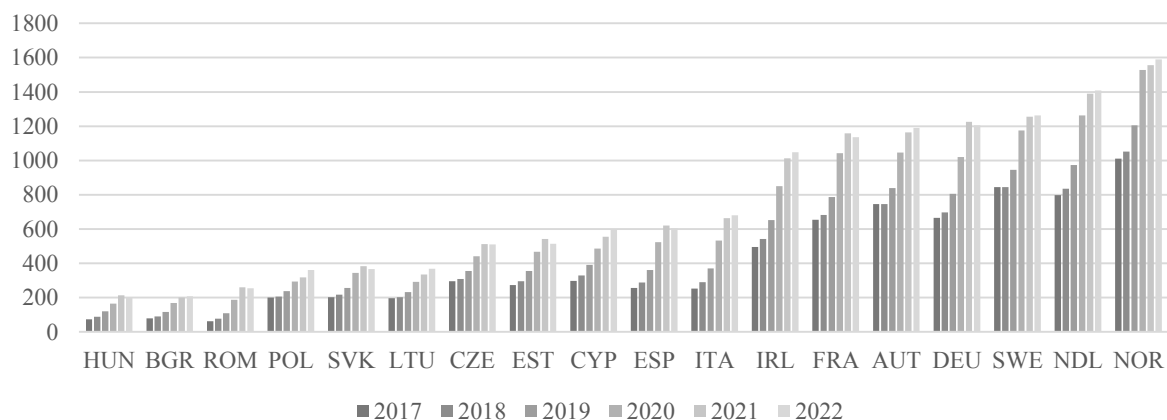


Figure 1. Value of annual e-commerce (B2C) market turnover per capita (in Euros).

Source: own elaboration.

Table 1.*Inventory of variables used in the study*

Variable name	Description of the variable	Source
ECREVperCapita	total e-commerce turnover per capita in the country in a given year	Statista.com
Sociological variables:		
INT	percentage of the population with access to the Internet	Eurostat
X3M	percentage of the population who have made an online purchase in a given year at least once in the last 3 months	Eurostat
EBANK	percentage of the population using internet banking	Eurostat
ECOM	percentage of businesses in the economy that sell online	Eurostat
Demographic variables:		
URB	percentage of population living in urban areas as defined by the UN	World Bank
AGE	median age of the population in a given year in a given country	Eurostat
EDU	percentage of population with tertiary education	Eurostat
Macroeconomic variables:		
UNEMP	unemployment rate	Eurostat
GDP	real GDP per capita in a given year in a given country	Eurostat
INFL	inflation rate	Eurostat
EX_IMP	the ratio of the value of exports to imports in a given country in a given year	Eurostat

Source: own elaboration.

Table 2.*Descriptive statistics of the variables used in the study*

Variable	Number of observations	Average	Standard deviation	Min	Max
ECREVperCapita	108	582.86	400.34	62.43	1589.99
INT	108	89.22	6.22	67.33	99.01
X3M	108	49.57	18.79	11	83.26
EBANK	108	58.75	23.30	5.49	96.13
ECOM	108	17.87	7.82	4.30	44
URB	108	71.55	10.75	53.73	92.89
AGE	108	42.35	2.43	36.9	48
EDU	108	42.70	10.31	23.3	62.30
UNEMP	108	6.24	2.94	2.00	17.20
GDP	108	28100	17767.16	6120	77490
INFL	108	3.57	3.94	-1.10	19.40
EX_IMP	108	1.07	0.14	0.86	2.04

Source: own elaboration.

Due to the existence of a collinearity problem when variables such as median age, the percentage of consumers purchasing online in the population, and the extent to which e-banking is widespread in society, it was decided to exclude them from the model.

4. Methods

In the analysis of economic phenomena that require accounting for the heterogeneity of the groups under study (e.g., different countries), panel models with fixed or random effects are commonly used (Baltagi, 2005). This approach is also applied in studies of e-commerce market development (Ho et al., 2008; Roszko-Wójtowicz et al., 2024). In this paper, both fixed-effects (FE) and random-effects (RE) models are estimated, with appropriate tests conducted to

determine the more suitable model. However, it should be noted that static models do not account for dynamics or potential endogeneity issues, which can lead to inconsistent estimators. To address these concerns, dynamic models are used to control for endogeneity and improve estimator efficiency (Alzate et al., 2021; Shanmugalingam et al., 2023; Myovella et al., 2020). The Generalized Method of Moments (GMM) approach, proposed by Arellano, Bond (1991) and Blundell, Bond (1998), is commonly employed for this purpose.

5. Results

Table 4 shows the estimated values of two static models: fixed effects (Model 1 - general form and special forms) and random effects (Model 2 - general form and special forms), and two dynamic models: with a one-step and two-step GMM estimator (Model 3, Model 4). Spearman correlation coefficients were examined before proceeding to estimation (see Table 3).

Table 3.
Spearman correlation coefficients

	INT	Ln(GDP)	URB	EDU	EX_IMP	UNEMP	EBANK	ECOM	INFL
INT	1.00								
Ln(GDP)	0.72	1.00							
URB	0.52	0.44	1.00						
EDU	0.42	0.51	0.22	1.00					
EX_IMP	0.31	0.51	0.33	0.18	1.00				
UNEMP	-0.16	0.05	0.00	0.26	-0.26	1.00			
ECOM	0.33	0.44	0.23	0.17	0.34	-0.26	0.49	1.00	
INFL	0.13	-0.21	-0.04	-0.12	-0.26	-0.39	0.11	0.09	1.00

Source: own elaboration.

Based on the tests conducted, the preferred static model is a special version of the random effects model with a robust stratified estimator. In contrast, the preferred dynamic model is the one with the two-step systematic estimator of the generalized method of moments (GMM), due to its ability to account for the true variance-covariance structure of moments and its higher estimation efficiency compared to the one-step systematic GMM estimator (cf. Roodman, 2009; Windmeijer, 2005).

The research hypotheses presented in the introduction were verified based on the estimation results. The first hypothesis posited a positive relationship between e-commerce market turnover per capita in the preceding period and turnover in the following period. In the dynamic models, the lagged variable was significant at the 1% level with positive estimates, confirming that turnover in the previous period can shape future turnover. This aligns with predictions based on International Monetary Fund research (Alcedo et al., 2022).

The second hypothesis explored the relationship between the percentage of the population with higher education and e-commerce turnover per capita. In the RE model, the EDU variable was insignificant, suggesting that higher education does not significantly affect e-commerce turnover. Although the literature suggests that consumers with higher education are more likely to shop online (Eurostat, 2023; Li et al., 1999; Swinyard, Smith, 2003), the observed relationship was not strong enough for statistical significance. In the dynamic models, EDU showed a negative parameter significant at the 10% level, indicating that higher education may reduce e-commerce turnover. This could be due to better-educated consumers prioritizing other spending over online shopping. Thus, hypothesis 2 is rejected. Further research is needed to explore this relationship in more depth.

Table 4.
Parameter estimates for static and dynamic models

Explanatory variables	Model 1 Fixed effects			Model 2 Random effects			Model 3 One-step system GMM	Model 4 Two-step system GMM
	General form*	Specific form*		General form*	Specific form*			
Ln(ECRE VperCapit a) at t-1	-	-	-	-	-	-	0.783*** (0.052)	0.823*** (0.059)
Ln(GDP)	0.651## (0.404)	0.642## (0.398)	-	1.012*** (0.206)	1.012*** (0.196)	-	0.217*** (0.056)	0.162** (0.061)
INT			0.020*** (0.0055)			0.0278 *** (0.0066)		
ECOM	0.002 (0.004)	-	-	0.001 (0.005)	-	-	-0.003** (0.001)	-0.0016 (0.0011)
URB	0.123* (0.070)	0.127* (0.068)	0.106 ## (0.0659)	0.013** (0.007)	0.013** (0.006)	0.0274 ** (0.011)	0.00146* (0.0008)	0.0017** (0.0007)
EX_IMP	-0.204* (0.098)	-0.203** (0.087)	-0.229*** (0.076)	-0.269** (0.108)	-0.256** (0.104)	-0.2552 *** (0.069)	-	-
UNEMP	-0.042## (0.025)	-0.042## (0.024)	-	-0.029# (0.021)	-0.282# (0.020)	-	-	-
EDU	-0.023## (0.014)	-0.023## (0.014)	-0.0097 (0.0128)	0.006 (0.010)	0.005 (0.009)	0.0087 (0.0088)	-0.00176** (0.00083)	-0.0018* (0.001)
INFL	-0.002 (0.007)	-	-0.0045 (0.0056)	-0.004 (0.007)	-	-0.0073 # (0.0056)	-	-
Time effects								
2018	0.012 (0.035)	0.011 (0.032)	0.024 (0.025)	0.215 (0.026)	0.020 (0.024)	0.012 (0.014)	-0.1865*** (0.037)	-0.1516*** (0.037)
2019	0.14** (0.058)	0.140** (0.056)	0.149 *** (0.049)	0.161*** (0.044)	0.160*** (0.042)	0.128 *** (0.026)	-0.0679** (0.032)	-0.0408 (0.033)
2020	0.473*** (0.083)	0.476*** (0.086)	0.386 *** (0.077)	0.509*** (0.058)	0.511*** (0.058)	0.356 *** (0.037)	0.0861*** (0.012)	0.0936*** (0.016)
2021	0.585*** (0.116)	0.583*** (0.112)	0.493 *** (0.115)	0.610*** (0.077)	0.603*** (0.074)	0.448 *** (0.064)	-	-
2022	0.540*** (0.167)	0.520*** (0.127)	0.514 *** (0.144)	0.591*** (0.113)	0.553*** (0.079)	0.494 *** (0.084)	-0.1125*** (0.022)	-0.0919*** (0.02)
Const	-8.137## (5.264)	-8.239## (5.081)	-2.909 (4.818)	-4.603*** (1.625)	-4.637*** (1.530)	1.337 * (0.791)	-0.6454** (0.242)	-0.3948 (0.244)
R ² between	0.4076	0.3986	0.2756	0.8777	0.8787	0.5437	-	-
R ² within	0.9197	0.9195	0.9262	0.9116	0.9112	0.9201	-	-

Model verification								
Name of the test	Test statistic [p-value]							
F test / Wald test: joint insignificance of variables	163.79 [0.000]	164.54 [0.000]	444,78 [0,000]	1629.90 [0.000]	1498.08 [0.000]	3798,84 [0,000]	-	-
F test/Wald test: joint insignificance of <i>year</i>	24.75 [0.000]	27.46 [0.000]	50,93 [0,000]	393.94 [0.000]	438.86 [0.000]	392,54 [0,00]	-	-
Hausman test	9.80 [0.4584]						-	-
Breusch-Pagan test: random effects	-		-	169.18 [0.000]	173.55 [0.000]	142,01 [0,000]	-	-
Test F: fixed effects	32.49 [0.000]	36.31 [0.000]	92,81 [0,00]	-	-	-	-	-
RESET test	1.79 [0.199]	1.80 [0.197]	2,06 [0,113]	2.61 [0.056]	2.06 [0.113]	2,06 [0,113]	-	-
Jarque-Bera test	52.97 [0.000]	53.15 [0.000]	52,55 [0,000]	29.50 [0.000]	28.13 [0.000]	54,59 [0,000]	-	-
Wald test: gr. heteroskedasticity	12170.96 [0.000]	11074.02 [0.000]	2763,61 [0,000]	565.67 [0.000]	483.21 [0.000]	507,34 [0,000]	-	-
Wooldridge test	412.02 [0.000]	668.31 [0.000]	44,585 [0,000]	412.02 [0.000]	668.30 [0.000]	44,585 [0,000]	-	-
Pesaran CD test	-0.54 [0.590]	-0.45 [0.656]	-1,46 [0,144]	1.52 [0.129]	1.52 [0.128]	-0,628 [0,53]	-	-
Sargan test	-	-	-	-	-	-	1.88 [0.390]	1.89 [0.389]
Hansen test	-	-	-	-	-	-	4.16 [0.125]	4.16 [0.125]
Arellano-Bonda AR(2) test	-	-	-	-	-	-	-1.33 [0.183]	-1.12 [0.261]

Note: *Models estimated with robust cluster estimator.

Significance level # 0.20 ## 0.15 * 0.10 ** 0.05 *** 0.01.

Source: own elaboration.

The third hypothesis, concerning the relationship between urbanization and e-commerce turnover, found that the URB variable in the RE model was significant at the 5% level. An increase in urbanization is associated with higher e-commerce turnover per capita, consistent with the findings of the World Bank and Alibaba Group (2019) and other studies (Wang, Liu, 2015). Urbanization promotes economic development, better internet access, and a higher standard of living, facilitating e-commerce growth. Both static and dynamic models support this conclusion, allowing us to accept hypothesis 3.

The fourth hypothesis concerned the link between real GDP per capita and e-commerce turnover per capita. The ln(GDP) variable was significant at the 1% level in the RE model. Dynamic models also showed a significant positive relationship. As GDP per capita increases, so does e-commerce turnover. This aligns with previous studies (Roszko-Wójtowicz et al., 2024; Molla, Licker, 2005; Wang, Liu, 2015). Higher GDP supports purchasing power and online shopping, while also fostering investment in ICT and logistics infrastructure, further boosting e-commerce.

The fifth hypothesis examined the relationship between internet accessibility and e-commerce turnover. The INT variable in the RE model was significant, showing that increased internet access leads to higher e-commerce turnover, consistent with prior research (Wang, Liu, 2015; Dumičić et al., 2018; Cheba et al., 2021). Expanding internet access allows

businesses to reach more consumers and reduces transaction costs, fostering e-commerce growth. Therefore, hypothesis 5 is confirmed.

Other variables were also tested. The ECOM variable was insignificant in the dynamic model with a two-step system estimator, possibly because large market players dominate e-commerce turnover (Soava et al., 2022). The EX_IMP variable showed a significant negative relationship with e-commerce turnover, suggesting that economies with a higher export-to-import ratio may have lower per capita e-commerce turnover. However, this finding contradicts other studies (Noroozi et al., 2010; Wang et al., 2021; Terzi, 2011), and further research is needed to clarify this relationship.

The UNEMP variable showed a negative coefficient significant at the 20% level. E-commerce's relationship with unemployment appears neutral (Biagi, Falk, 2017). While e-commerce may support labor market activity in developed economies (Banescu et al., 2022), no direct link between e-commerce turnover and unemployment was found.

The INFL variable was insignificant, suggesting that the e-commerce market is more resilient to inflation than traditional trade (Goolsbee, Klenow, 2018). However, high inflation may still limit e-commerce growth by reducing purchasing power and creating a challenging business environment (Beyrouthy, 2024).

Finally, the time effect estimates for 2020 indicate that it was the year in which e-commerce growth was the most significant.

6. Discussion

The findings highlight not only the complexity of the e-commerce landscape but also the need to view it through the lens of broader socio-economic structures. While factors such as urbanisation and GDP per capita appear to support market growth, their impact is likely mediated by deeper systemic elements like infrastructure development, logistics networks, and consumer trust in digital services. The lack of a link between education and e-commerce turnover challenges assumptions about digital literacy and suggests that access and usability may outweigh formal education levels in driving online shopping behavior.

The strong influence of internet penetration and the pandemic's acceleration of digital adoption also point toward a growing digital divide — where participation in e-commerce is increasingly shaped by access rather than traditional socio-economic status. These observations raise further questions about equity in digital economies and the long-term sustainability of e-commerce growth across different social groups. As the market evolves, especially with the rise of mobile commerce and AI-driven platforms, future research should aim to capture these nuances and shifts in user behavior more granularly.

7. Summary

The study of the e-commerce market is complex due to its dynamic nature, rapidly changing trends, and the variety of factors influencing its development. Nevertheless, the analysis conducted provides important insights into this sector and the variables associated with it. This study investigates the existence of correlations between sociological, demographic, and macroeconomic factors and e-commerce turnover, aiming to show how changing socio-economic conditions affect the dynamics and development of the e-commerce market.

In recent decades, technological advances have contributed to the rapid growth and transformation of e-commerce. The study found a strong relationship between per capita e-commerce turnover across different periods, suggesting no grounds to reject Hypothesis 1 concerning the positive relationship between the lag of the explanatory variable and its current value. Similarly, there were no grounds to reject Hypotheses 3 and 4, which suggested that urbanisation and higher GDP per capita positively influence the development of the e-commerce market. Urbanisation facilitates better consumer access, and, when combined with higher GDP per capita, supports more efficient logistics and investment in digital technologies. However, Hypothesis 2 was rejected, as no significant relationship was found between education level and e-commerce turnover. Additionally, the study found no grounds to reject Hypothesis 5, which posited a positive correlation between the percentage of internet users and the value of e-commerce turnover. The COVID-19 pandemic further accelerated digitalisation, acting as a key factor that contributed to the rapid transformation of the e-commerce sector and its record growth.

Despite the valuable results, the study has certain limitations. The analysis is based mainly on panel data from 18 European economies, which may limit the generalisability of the findings to other regions with different socio-economic structures. Future research could focus on a deeper understanding of differences in consumer behaviour, especially in the context of technology adoption in various social groups. Moreover, given the growing popularity of m-commerce, it would be valuable to further explore this segment, particularly aspects such as user engagement, mobile device usage, and the adaptation of logistics to the mobile-first model—areas that may offer important avenues for future exploration.

The findings of this study can support strategic decision-making by e-commerce companies and provide valuable insights for researchers in this field. However, continuous monitoring and analysis of developments in this area are essential for businesses to remain competitive in the evolving digital economy.

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DETERMINANTS OF THE ELECTROMOBILITY DEVELOPMENT SECTOR ON WATER

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Purpose: The aim of the article is to identify selected factors of the development of electromobility in water tourism.

Design/methodology/approach: The subject of the conducted analyses was to determine the demand for energy to propel tourist vessels, possible gains from energy generated in photovoltaic panels installed on yachts and the condition of the tourist infrastructure necessary to support electromobility on water.

Findings: The conducted analysis allowed to determine the energy consumption graph for the tested unit and the real energy yield from PV panels.

Research limitations/implications: Energy consumption for propulsion depends to a large extent on the type, weight and speed of the yacht. Further research should focus on optimizing the hull shape, the type and systems of PV panel installation. It is also necessary to analyze the even distribution and modernization of existing infrastructure and indicate directions of development and good practices in the management of inland ports.

Practical implications: The research conducted indicates the validity of using ecological electric drives in water tourism.

Social implications: Lack of awareness of the benefits of using ecological propulsion on vessels and the inadequacy of existing infrastructure limits the possibilities of developing electromobility.

Originality/value: The conducted research provided results of energy consumption and possible yields from installed PV panels during normal operation of the vessel. The results may contribute to the popularization of the use of electric drives.

Keywords: Ecomobility on water, PV panel efficiency, inland waterways, tourist infrastructure.

Category of the paper: Research paper.

1. Introduction

Waterways have been used for economic purposes since ancient times. The extensive system of lakes and rivers constituted natural connections used for the transport of commercial cargo and promoted the development of adjacent areas. In different periods, these roads gained or lost their importance, but they always played a key role in the development of the local economy. Inland waterway transport is considered more environmentally friendly and economically justified compared to road transport (Chrysty et al., 2020; Barros et al., 2022; Calderón-Rivera et al., 2024; Erceg, 2019). Studies conducted in many places around the world indicate the benefits of using inland waterway transport (Calderón-Rivera et al., 2024b; Cheranchery, 2024; Kader, Olanrewaju, 1AD; Kenc, Szostak, 2022; Plotnikova et al., 2022a; Rohács, Simongáti, 2007; van Lier, Macharis, 2014; Xie, 2021). The most important advantages include financial benefits resulting from reduced logistics costs (Nachtmann et al., 2015, p. 46), and reduced negative environmental impacts (Jurkovič et al., 2021, p. 250; Barros et al., 2022; Calderón-Rivera et al., 2024a; Kader, Olanrewaju, 1AD; Kenc, Szostak, 2022; Maloberti et al., 2022). The waterway network in Europe is well developed. Despite numerous environmental benefits, in many regions, such as Spain, France, the Czech Republic, Serbia, Belgium and England, there is a noticeable decline in the importance of inland waterway transport (Erceg, 2019). However, it should be noted that there are countries, such as Bulgaria and Hungary, where an increase in the volume of cargo transport was noted (UN, 2022, p. 127).

In the face of the green transformation and the assumptions adopted by world leaders to reduce CO₂ emissions, an increase in interest in developing inland transport networks should be expected (Bielawa, Cywiński, 2024, p. 6; Calderón-Rivera et al., 2024a; Erceg, 2019; Kader, Olanrewaju, 1AD; Kenc, Szostak, 2022; Plotnikova et al., 2022b; van Lier, Macharis, 2014).

Inland waterways and unclassified waters suitable for navigation are also an attractive tourist area with high natural values and great development potential. The need to expand infrastructure enabling safe operation of navigation can be used to develop water tourism, including the increase in the use of vessels powered by electric engines. The development of electromobility on water, due to the specificity of using yachts with ecological drive, will have a positive impact on the state of the natural environment (Barros et al., 2022; Calderón-Rivera et al., 2024a; Rohács, Simongáti, 2007; Xie, 2021). Determining the real energy consumption necessary to drive electric yachts, and therefore their range, and identifying requirements for the equipment of marinas and ports will allow for the popularization and development of ecological water tourism.

In planning and modernizing tourist infrastructure related to the service of users using vessels on inland waterways, special attention should be paid to compliance with the principles of sustainable development, taking into account the possibilities of technical progress and the directions of changes in European legislation. The development potential of the electromobility

sector on water depends on a number of factors (Kramarz et al., 2024, p. 49), which include, among others, the condition of tourist infrastructure, economic and technical barriers related to the acquisition and storage of energy to drive small vessels

2. Waterways in Poland

Waterways in Poland constitute an extensive network of connections including regulated navigable rivers – 65.6% (2522 km), canalized sections – 17.8% (656 km), canals – 9.4% (355 km) and navigable lakes – 7.2% (255 km) (GUS, 2023). The hydrotechnical infrastructure, managed by the State Water Management Polish Waters, includes locks and slipways, which enable safe movement of vessels. Currently, 94.2% of navigable routes are available for use, which is 3549 km.

Detailed operating parameters of inland waterways are specified in the regulation of the Council of Ministers on their classification (Rozporządzenie..., 2002). The document specifies the minimum navigation parameters for selected waterways. The regulation also specifies the maximum parameters of vessels for individual classes of waterways. According to Annex 1 to the regulation, vessels with a maximum length of 24 meters, width of 3.5 meters and a draft of up to 1 meter may sail on waterways of regional importance (class Ia, Ib, II and III). The total length of routes of classes I, II and III is 3561.5 km (GUS, 2023). Access to water bodies in Poland is not formally limited, but violations of the regulations, such as blocking access to the coastline, often occur (Józwiak, 2024, p. 39).

Despite favourable infrastructural conditions and structural support, there has been a clear decline in interest in water transport in Poland, which is also visible in the aging rolling stock (Kenc, Szostak, 2022; Zielińska, 2018, p. 838).

Many years of neglecting investments in maintaining proper navigation parameters of waterways resulted in 90% of domestic cargo transport taking place on local sections of the Oder (Deja et al., 2017, p. 87).

Taking into account the parameters of vessels used in recreational navigation, there are no practical restrictions on their use on classified waterways, even with the lowest parameters, provided that the current hydrological conditions and the specific nature of the route are taken into account.

3. Determination of energy demand for the propulsion of vessels

Economic analyses show that inland waterway transport is definitely the cheapest and more environmentally friendly. This is mainly due to the amount of power required to move a given mass of cargo. Road transport requires 8-10 kW of power per ton of cargo, rail transport 0.8-1.0 kW, while inland waterway transport only 0.2-0.4 kW of energy (Winter, Kulczyk, 2003, p. 13).

Table 1.

Energy consumption and pollutant emissions in different means of transport (German data)

Means of transport	Energy consumption kJ / tkm	Pollution, g/ tkm			
		CO ₂	CH ₄	NO _x	WHAT
Rail	677	41	0.06	0.2	0.05
Shipping	584	42	0.06	0.5	0.17
Car	2889	207	0.3	3.6	2.4
Plane	15800	1106	1.5	5.3	1.4

Source: Kulczyk, Winter, 2003.

The development of hybrid yachts powered by energy from photovoltaic (PV) panels and diesel fuel can significantly reduce fuel consumption and CO₂ emissions (Kenc, Szostak, 2022). In the case of 70% coverage of energy from PV, CO₂ production drops to 2.1 tons per year, while fuel savings mean that the payback period for this type of boat can be achieved after 12 years (Kurniawan, 2016, p. 5).

A yacht equipped with a purely electric drive is a solution that can result in a complete reduction of CO₂, NO_x and SO_x, which are dangerous to the ecosystem. The return on high investment costs is estimated at 10 years (Kurniawan, 2016, p. 6). Yachts powered exclusively by electricity, which is mainly obtained from PV panels, are small recreational vessels and fishing boats. Depending on the purpose and conditions in which they are to be used, they are designed using the latest technologies to optimize its technical parameters, including resistance, weight and possible areas for PV panel installations (Pencheva et al., 2019; Xie, 2021; Kurniawan, 2016, p. 2).

A houseboat-type motor yacht built on the hull of a seagoing lifeboat was used to conduct tests of the drive's energy consumption. The basic technical parameters of the unit are: total weight 3.5 t, length L_c-7.95 m, width B_c-3 m, draft T-0.6 m. The main drive was an INTO electric motor (induction, asynchronous) with a maximum power of 38 kW, powered by energy stored in 8 150 A 12 V AGM VRLA batteries, creating a 300 Ah power bank at 48 V. The yacht was equipped with devices enabling the recharging of electric energy based on the available basic technical infrastructure, most common on Polish waterways (Łapko, 2015).

Energy demand tests were conducted in conditions optimal for recreational sailing – wind up to 3 m/s, small waves, which corresponds to 2 on the Beaufort scale. Energy measurements were read from on-board devices Victron Energy Battery Monitor BMV 712 Smart 12/24/48V. Speed measurement was performed based on the NavShip application using GPS positioning.

The conducted research allowed to determine the real demand for energy necessary to move the unit. Graph 1 shows the relationship between the speed of sailing and the consumption of electricity stored in the batteries. Analyzing the presented graph, the unit used 1-1.4 kWh of energy at a speed of 6-6.5 km per hour. Considering that the speed limit in the channels is usually 6 km/h, the achieved cruising speed of the yacht is acceptable. However, it should be noted that, as in the case of eco-driving, the adoption and adherence to the assumed rules regarding the style of driving the vehicle must be fully understood and accepted by the driver or helmsman.

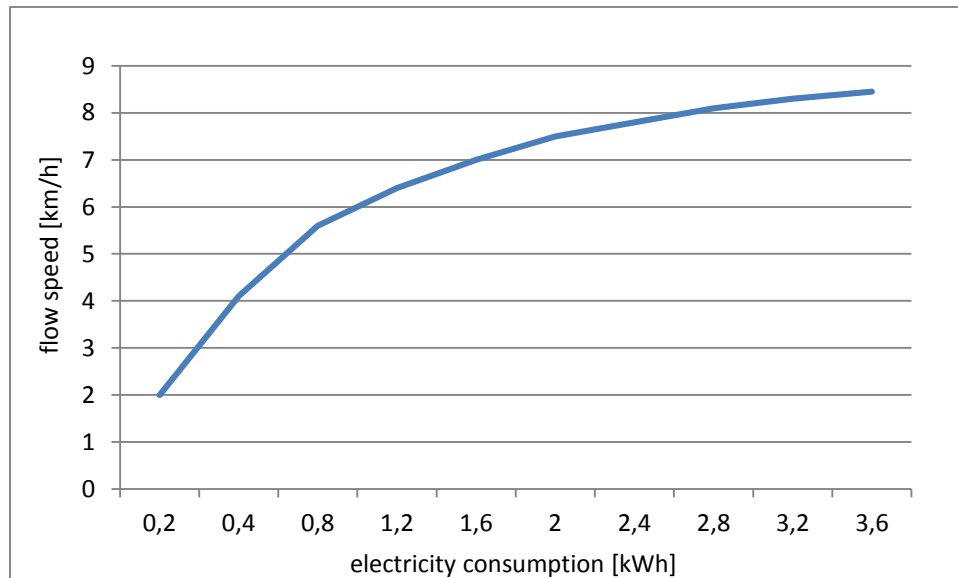


Figure 1. Relationship between flow speed [km/h] and electricity consumption [kWh].

Source: own study.

It is also worth paying attention to the economics of sailing itself. In the case of using vessels equipped with a combustion engine (leaving aside the issues of noise and pollution resulting from exhaust emissions), pleasure yachts consume from 3 to 5 liters of fuel per hour. The cost of sailing for 5-7 hours is therefore PLN 100-220 per day. Even with maximum economical sailing on similar vessels and at the same speed, it is difficult to achieve a cost below PLN 60 per day.

During the measurements, the duration of the electric engine operation depended on the distance to be covered on a given day, and the average time of its use was 9.5 hours per day. On the Gdańsk-Łąwa route, energy consumption was 12-13 kWh per day. Energy consumption during sailing on the Łąwa-Ostróda-Zalewo route was an average of only 7 kWh per day.

The measurements carried out indicated a significant increase in the consumption of electric energy from the batteries at speeds above 6.5 km/h. Achieving higher speeds is possible, but not very economical and involves a significant limitation of range or the need to increase the battery capacity, and therefore an increase in the yacht's weight.

The batteries of the tested unit have 14.4 kWh of energy available. Taking into account the battery life, the maximum degree of energy use was assumed at 70%, which gives about 10 kWh of energy to be used. It should therefore be assumed that the energy stored in the batteries allows economical sailing for up to 8-10 hours, covering up to 60 kilometers.

An additional source of energy that increases the potential distance that can be covered are photovoltaic panels. Currently, photovoltaic panels are increasingly installed on vessels, where they support the power supply of on-board systems. The introduction of new solutions and technologies will allow for increased energy production and its use also for the propulsion of the unit (Pencheva et al., 2019; Xie, 2021).

4. Testing the efficiency of PV panels on a vessel

Analysis of the efficiency of photovoltaic panels has been conducted on the tested vessel since 2021. The aim of the analyses is to determine the amount of energy that can be obtained in real conditions, i.e. during standard use of the yacht.

The vessel was initially fitted with flexible photovoltaic panels, which are a popular solution on yachts due to their ability to adapt to the curves of the hull. For testing, eight flexible Green Cell photovoltaic panels (100 W, 12 V/18 V ETFE) with a total power of 800 W were fitted. The electricity generated during the voyage was directly used by the vessel's drive engine. During the stop, the energy generated by the panels was stored in batteries.

To determine the potential for energy yield in real conditions, weekly periods from July and August in 2021–2024 were analyzed, selecting those with the highest energy production. This approach corresponds to the length of a standard recreational cruise and allows for a reliable assessment of the system performance. The measurement results are presented in Table 2 and Table 3.

Table 2.

Performance study of flexible PV panels on a vessel in 2021-2023

Date	Energy yield (Wh)	Max PV power (W)	Max PV Voltage (V)	Min. battery voltage (V)	Max battery voltage	Time in mode	Time in mode	Time in mode
					(V)	bulk (m)	absorption (m)	float (m)
18/07/2021	2710	624	85.57	48.98	56.9	858	2	128
17/07/2021	2880	568	78.62	46.58	54.78	988	0	0
16/07/2021	1680	512	85.33	48.27	56.73	904	1	91
15/07/2021	1840	564	80.68	50.07	56.66	526	71	390
14/07/2021	3790	479	80.05	49.89	55.93	1008	0	0
13/07/2021	3720	658	80.57	49.84	55.62	1009	0	0
12/07/2021	2620	592	86.55	49.25	56.91	849	1	148
Total 2021	19240							

Cont. table 2.

23/07/2022	1340	548	86.56	46.73	56.79	702	1	248
22/07/2022	2140	560	86.22	48.17	56.76	778	1	198
21/07/2022	3060	487	81.43	49.14	56.88	889	60	34
20/07/2022	2510	470	81.57	49.18	57.04	993	14	55
19/07/2022	1830	479	82.99	49.92	57.07	489	65	122
18/07/2022	1900	585	86.44	50.21	57.16	711	96	178
17/07/2022	1690	675	87.47	49.53	57.04	695	51	246
Total 2022	14470							
07/07/2023	770	209	88.05	49.04	56.94	939	1	86
07/06/2023	640	192	81.77	47.32	56.15	1009	0	0
07/05/2023	840	166	81.23	47.04	55.98	971	0	0
07/04/2023	970	213	78.36	48.17	52.99	1026	0	0
07/03/2023	660	175	81.82	51.6	53.88	1032	0	0
07/02/2023	810	355	80.2	51.7	54.3	1006	0	0
07/01/2023	760	277	81.16	51.75	53.66	1009	0	0
Total 2023	5450							

Source: own study.

In the most efficient weekly cycle in 2021, the PV panels produced a total of 19,240 Wh of energy, reaching a maximum instantaneous power of 658 W. Daily efficiency on July 13 and 14, 2021 exceeded 3.7 kWh, which significantly affected the yacht's range.

The 2022 results showed a decrease in energy yield of almost 5 kWh per week compared to the previous year. Nevertheless, daily maximum power values were comparable to the 2021 results. This decrease in efficiency raised suspicions about possible degradation of the flexible panels.

In 2023, a clear drop in the efficiency of flexible panels was noted - they produced 5450 Wh of energy in a week, and the maximum instantaneous power was only 355 W. These results confirmed the progressive decline in the efficiency of flexible panels, but the rate of degradation in a relatively short time remains surprising.

In connection with the above, a decision was made to dismantle the flexible panels in order to conduct detailed studies aimed at explaining the causes of premature loss of efficiency. The results obtained will contribute to the development of technology and deepening knowledge about the degradation processes of PV panels.

Table 3.*Performance testing of rigid PV panels on a vessel in 2024*

Date	Energy yield (Wh)	Max PV power (W)	Max PV Voltage (V)	Min. battery voltage (V)	Max battery voltage (V)	Time in mode bulk (m)	Time in mode absorption (m)	Time in mode float (m)
7/19/24	840	195	79.29	51.99	56.95	260	21	739
7/18/24	1060	234	79.94	52.04	56.95	272	58	686
7/17/24	4630	651	76.74	50.62	56.77	770	107	141
7/16/24	3710	781	75.73	49.18	56.9	956	68	0
7/15/24	3330	657	75.93	50.26	56.92	827	65	119
7/14/24	4580	712	75.11	49.97	56.55	1038	0	0
7/13/24	1140	412	79.44	49.85	56.98	570	70	376
	19290							

Source: own study.

In July 2024, panels in a rigid aluminum frame were installed on the tested vessel - two JA SOLAR JAM60S20-HC MONO 385W MR modules, with a total power of 770 W. In the most efficient week in 2024, 19,290 Wh of energy was obtained, reaching a maximum instantaneous power of 781 W. Daily energy production exceeded 4.5 kWh twice, reaching values of 4580 Wh and 4630 Wh.

In 2024, in two cases, the daily energy yield was almost 1 kWh higher than the best results from 2021, despite the fact that rigid panels had 30W less nominal power than flexible panels. The disadvantage of rigid panels is the inability to adjust to the curves of the yacht's hull. However, on houseboats, the installation of rigid panels is possible and practical.

5. Adaptation of infrastructure to support electromobility on water

A key element of the development of electromobility on water is investing in infrastructure that enables battery charging on inland waterways. The results obtained indicate that the energy produced by PV panels can significantly extend the range of navigation. However, in houseboat -type vessels, most often used for recreational leisure, it is necessary to supplement the energy deficit.

In the case of using electric yachts, including those supported by energy obtained from PV panels, there is no need to use specialist electrical installations. The specificity of recreational inland navigation means that units most often spend the night in ports adapted for this purpose. The demand for energy and the scale of required security do not significantly affect the energy system. The vast majority of ports and marinas already have sufficient infrastructure or can easily adapt their installations to service yachts powered by electricity.

Development of electromobility sector on water, including the support and motivation system for recipients, can be compared to the development of electric road transport. The existing financial incentive systems for car users and for companies involved in the construction and operation of vehicle charging infrastructure are an important factor in the development of the sector (Kosiarz, 2021, p. 119).

The Act on Electromobility and Alternative Fuels specifies the principles for the development of infrastructure for electromobility on water, treating it on an equal footing with other transport segments (Act..., 2018).

The formal requirements specified in the Act (Act..., 2018), e.g. regarding the technical inspection of power supply points by the Transport Technical Supervision, mean that in Poland there is probably no single point enabling the legal charging of large commercial vessels with electric drive currently. However, taking into account the specificity of charging tourist vessels, in almost every port there is sufficient infrastructure to replenish the energy in batteries.

In the unit used, the cost of replenishing the energy balance was around PLN 5-7 per day (if it was necessary to recharge the batteries) and it was included in the standard fee for staying at the marina.

6. Summary

Electric yachts may be the future of water tourism. Taking into account the specificity of using units with an electric engine, cruise routes should be designed based on the possible distance, time and possibilities of recharging batteries in ports adapted for this purpose. Apart from the main water tourism centres, such as the Great Masurian Lakes route, the infrastructure is poorly developed, which significantly limits the possibilities of developing water tourism based on electric yachts. Further research into the optimal development of waterway infrastructure, dissemination of research in this area and promotion of good practices will be conducive to the development of tourism using electric boats, positively affecting the state of the natural environment.

Research conducted in 2021-2024 showed the feasibility of installing an electric motor in houseboat yachts. The electric motor used together with a 300 Ah 48 V energy storage proved to be a sufficient source of propulsion, consuming an average of 1.2 kW of energy per hour. Additional energy obtained from PV panels improved the energy balance, significantly extending the time of recreational sailing.

Dynamic technical progress, mainly in the area of using capacious energy banks, results in increased possibilities of using electric energy to propel vessels. In addition to research on the capacity of energy banks and their charging speed, further research may focus on optimizing the shape of the hull and the type and systems of PV panel installation. The collected research results indicate a large potential for the development of tourism with electric yachts on inland waterways, but also the need for additional analyses in the area of even distribution and modernization of existing infrastructure.

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LABOUR PRODUCTIVITY VERSUS STRUCTURAL CHARACTERISTICS OF FARMS IN POLAND COMPARED TO OTHER EU COUNTRIES

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Purpose: The aim of this study was to assess labour productivity on farms in Poland against their structural characteristics and those of other EU Member States.

Design/methodology/approach: The research was carried out on the basis of Farm Accountancy Data Network (FADN EU) data from 2013-2022, on which labour productivity indicators, relations between production factors, and correlations between productivity and selected structural characteristics were calculated.

Findings: Despite the high dynamics of change, labour productivity in Poland is one of the lowest among EU countries (21st place in 2022). The low level of labour productivity is accompanied by unfavorable structural characteristics of farms and inappropriate relationships between production factors. Research has shown a correlation between the level of labour productivity and the economic size and technical equipment of agricultural holdings.

Practical implications: The results of this research provide a clear indication of the continuation of the development path of agriculture in Poland related to the improvement of the agrarian structure.

Originality/value: The study is a contribution to the discussion on the relationship between the level of labour productivity and structural characteristics of farms.

Keywords: labour productivity, farms, structure of agriculture, Poland, European Union.

Category of the paper: Research paper.

1. Introduction

The concept of structural change and the problems associated with its study are not new phenomena. Their impact on the development of the economy and the social changes induced by them have caused constant interest among researchers in this phenomenon (Prokopiuk, Maksimczuk, 2015). Structural changes themselves are understood as permanent transformations occurring over a long period of time in the system of a certain whole (Syrquin, 2007), making it possible to understand and formulate the construction and description of the development of any economy or its individual sectors (Onufer, 2009).

Attempts to bridge the development disparities between EU member states by means of numerous economic policy instruments have been carried out in various areas of socio-economic life, including agriculture. In many member countries, there is a need to modernize the agricultural sector, including improving the efficiency and economic strength of farms through structural changes (Rzeszutko, 2017). The structure of agriculture is the result of many economic and historical processes taking place in agriculture and the environment (Biernat-Jarka, 2017). In Poland, the most important role in these transformations was played by systemic transformation, followed by accession to the EU and the inclusion of agriculture in the instruments of the Common Agricultural Policy (CAP) (Bański, 2018; Wicki, 2019, p. 286). The consequences of these processes were changes in the indicators characterizing the macroeconomic importance of agriculture (the declining share of agriculture in total employment and gross value added), as well as in the size, structure, and profitability of farms (Wawrzyniak, 2017, p. 50; Szabo et al., 2018; Badach et al., 2023; Strojny, 2020, p. 62). According to Wawrzyniak (2017, p. 50), it is possible to derive a relationship between the length of the impact of CAP financial instruments and the average size of farms. Regarding the situation of Polish agriculture, many researchers point to the still unfavorable structure of farms as a reason for the low efficiency of the sector (Biernat-Jarka, 2017; Badach et al., 2023). It is also mentioned as one of the key factors shaping the level of competitiveness of agriculture (Nowak, 2020), especially in the long term (European Commission, 2008, p. 7; Guth, Smędzik-Ambroży, 2020). Therefore, this area requires further research, especially since the literature review indicates a relatively low level of labour productivity of Polish farms in relation to other EU member states (Ancans, 2023, p. 126). An additional argument for undertaking research in this area is that the available scientific studies usually focus only on one of the structural characteristics, i.e. area size (Biernat-Jarka, 2017) or economic size (Wicki, 2019; Nowak, 2020). However, there is a lack of analyses that examine the structural characteristics of farms in the context of labour productivity. Considering this, the purpose of this study was to assess labour productivity on farms and compare it with their structural characteristics in Poland and other EU member states.

2. Research methods

Assessments of labour productivity and structural characteristics of farms were made based on the Farm Accountancy Data Network (FADN) Public Database (2024) from 2013-2022. This is the only database for which information is collected according to uniform rules, and the farms form a statistically representative sample of commodity farms operating within the European Union (Pawłowska-Tyszko et al., 2023, p. 10). The FADN observation field included commodity farms. The individual variables selected for analysis were assigned symbols according to FADN methodology.

This study was conducted in two stages. In the first stage, labour productivity indicators were calculated as the ratio of the value of output (SE131) to the number of full-time employees (AWU - Annual Work Unit) (SE010), as well as the dynamics of change and the average annual rate of change of this indicator in 2013-2022, according to the following formula (Pułaska-Turyna, 2011):

$$\bar{T} = \sqrt[n-1]{\prod_{i=2}^n \frac{y_i}{y_{i-1}}} - 1 \quad (1)$$

where:

$\bar{T}$ – average rate of change of a phenomenon over time,

Π – is the multiplication,

y – the observed magnitude of the phenomenon,

y_i – i th expression of the time series,

$i = 1, 2, \dots, n, \frac{y_i}{y_{i-1}}$ – index with a variable base (base is the previous year).

The second stage of the research concerned the analysis of the structural characteristics of farms and the confrontation of these characteristics with the level of labour productivity in individual EU member states. The following farm characteristics were included in this study:

- average agricultural area (ha) on the farm (SE025),
- average farm economic size (SE005),
- technical armament of labour as the ratio of fixed assets (SE441) to full-time employees (SE010),
- number of working people (SE010) per 100 hectares of agricultural land (SE025).

The scope of the study included 27 EU member states, with a focus on Poland.

3. Results

Poland ranked 21st among EU member states in terms of labour productivity in 2022. One fully employed person produced an average output of 40500.7 euros per year. This means that this indicator reached only 51.4% of the average indicator for the 27 EU countries. In 2013, Poland's position improved slightly (promotion from 23rd to 21st place), and the ratio of the value of the labour productivity index to the EU average increased by more than 10 percentage points (Table 1). Among other member countries, the highest labour productivity is observed in Denmark and the Netherlands (373.3 thousand euros/AWU and 266.8 thousand euros/AWU, respectively). Productivity exceeding 200 thousand euros/AWU in 2022 was also marked by Luxembourg and Sweden, followed by Belgium, Finland, Germany, and France occupied the next places. At the other end of the ranking with the lowest labour factor productivity were countries such as Portugal, Slovenia, Romania, Greece and Croatia.

Table 1.*Labour productivity on farms in EU member states 2013-2022*

Specification	Labour productivity (EUR/AWU)			Ranking in 2022
	2013	2022	średnia 2013-2022	
EU-27	43802.0	78866.5	54614.8	-
Denmark	269831.8	373273	265068.6	1
Netherlands	186183.5	266833.1	196918.5	2
Luxembourg	112993.4	212627.1	141644.4	3
Sweden	139767.8	211920	146105.1	4
Belgium	129036.8	199303.2	142361.5	5
Finland	83857.3	151767.8	102206.6	6
Germany	121558.0	150918.7	125325.8	7
France	96759.8	140852.2	106253.7	8
Estonia	57479.5	139957.6	78645.6	9
Ireland	57163.9	110203.4	70282.1	10
Czechia	50678.4	97830.3	63455.7	11
Austria	53181.7	95863.8	63801.6	12
Slovakia	39612.4	93160.5	60611.6	13
Hungary	43103.8	81794.0	54563.1	14
Italy	44914.7	65951.1	55360.6	15
Latvia	27954.1	58063.1	36690.3	16
Lithuania	22242.9	57286.3	29886.3	17
Spain	38488.3	57215.3	49789.4	18
Bulgaria	16256.4	45990.6	25735.4	19
Malta	29496.5	42499.3	35500.1	20
Poland	17766.5	40500.7	23251.3	21
Cyprus	27104.5	36687.8	30885.2	22
Portugal	18723.1	29795.7	22690.5	23
Slovenia	16550.0	28206.7	22762.7	24
Romania	9911.8	26116.0	16041.7	25
Greece	20265.7	25670.4	22454.9	26
Croatia	12524.5	21058	16254.2	27

Source: Own elaboration based on FADN EU data.

From 2013 to 2022, agricultural labour productivity steadily increased in all member states. However, in most of the countries newly admitted to the EU (in 2004 and later), both the dynamics in 2022 relative to 2013 and the average annual rate of change were higher than those in Western European countries. This can be explained by the low initial level of agricultural labour productivity in these member states. Their accession to the EU has promoted growth. In Western European member states, on the other hand, the situation varied. For example, in Finland, Ireland or Austria, the growth dynamics were among the highest among the countries of the so-called “old EU-14”. Ancans (2023) reached similar conclusions. In Poland, the growth rate of labour productivity in the studied period reached 228%, and the average annual rate of change reached 8% (Fig. 1). In contrast, the leaders in terms of the growth rate of the productivity indicator under study were Bulgaria and Romania, with dynamics of 282.9% and 263.5%, respectively. Among the old EU members, the lowest labour productivity growth was recorded in Germany; however, it was still more than five times higher in 2022 than in Poland.

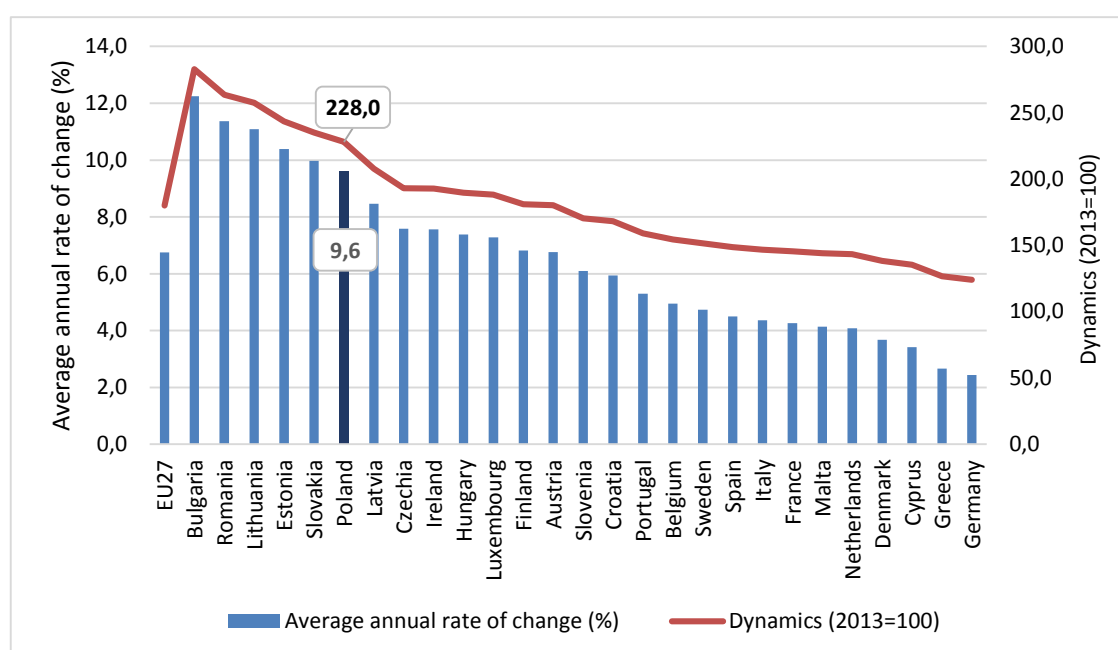


Figure 1. Dynamics and average annual rate of change in labour productivity on farms in EU member states 2013-2022.

Source: Own elaboration based on FADN EU data.

The next stage of the research was to determine the level of labour productivity in the selected structural characteristics of farms. Table 2 shows the relationship between labour and land resources and capital and labour resources. Countries were ordered in descending order based on the average value of fixed assets per 1 AWU in 2013-2022. Malta, Cyprus, Croatia, Greece, and Slovenia are among the countries with the highest land endowment in labour expressed in terms of the number of employed per 100 ha of utilised agricultural area (UAA) are Malta, Cyprus, Croatia, Greece and Slovenia. In Poland, this indicator is much higher than the EU average, although it has decreased from 9 to 7.1 people per 100 hectares between 2013 and 2022. The average value of the technical armament of labour in the period under review, which is the ratio of fixed assets to the number of employees, placed Poland 17th among the member countries with an indicator below the EU average. Denmark, the Netherlands, and Ireland remained the leaders in this regard, while Romania and Bulgaria ranked last.

Table 2.

Relationships between production factors on farms in EU member states 2013-2022

Specification	AWU per 100 ha UAA			Fixed assets per 1 AWU (EUR 1 000/AWU)		
	2013	2022	2013-2022	2013	2022	2013-2022
EU-27	4.9	4.1	4.4	151.3	198.8	172.9
Denmark	1.8	1.6	1.7	1216	1252.7	1213.7
Netherlands	7.5	7.7	7.7	770.9	972.3	831.5
Ireland	2.4	2.5	2.4	717.5	805.4	770.5
Luxembourg	2.2	1.8	2	563.5	774.7	660.9
Sweden	1.4	1.5	1.5	479.8	679.7	592.4
Germany	2.5	2.2	2.4	339.3	417.8	381.2
Belgium	4	4.1	4	313.7	438.1	377.6

Cont. table 2.

Finland	2.1	1.9	1.9	295.6	374.7	344.6
Austria	4.3	4.4	4.8	249.9	332.5	273.2
Italy	7.6	5.9	6.3	237.4	214.5	222.1
Slovenia	13.1	10.5	11.8	127.2	223.1	176.3
Malta	53.4	46.2	49.3	131.2	175.6	149.8
Estonia	1.5	1.1	1.3	100.9	214.8	146.8
Spain	3.3	4.2	3.7	147	126.2	139.1
France	2.4	2.2	2.3	128.1	146.4	132.3
Poland	9.0	7.1	7.8	85.6	126.9	106.9
Greece	11	10.4	10.7	96.5	96.7	102.1
Czechia	2.9	2.4	2.6	109.6	131.1	99.8
Cyprus	14.9	13.2	13.3	108.6	90.2	92.3
Hungary	3.2	3.1	3.2	70.5	132.8	92.2
Croatia	11.7	9.8	10.5	73.9	88.8	84.9
Slovakia	2.5	2.0	2.3	37.8	91.2	68.8
Latvia	3.0	2.5	2.8	48.2	87.3	68.4
Lithuania	3.6	3.0	3.2	42.4	78.6	59.1
Portugal	6.1	5.4	6.4	54.2	60.0	54.3
Bulgaria	6.4	3.7	4.7	18.8	47.9	32.8
Romania	12.8	5.7	8.9	23.4	39.6	32.1

Source: Own elaboration based on FADN EU data.

Table 3 shows the average economic size and farm area. Countries are listed in descending order of their economic size. The average value of standard farm production in the EU was 94,500 euros in 2022 and averaged 82,000 euros in 2013-2022. Farms in the Netherlands, Denmark, and Slovakia have the highest economic potential, reaching 614.8%, 607.2%, and 417.5% of the EU average economic size in 2022, respectively. Poland is one of the countries with both low economic size of farms and a relatively small area of agricultural land. In 2013-2022, only Slovenia, Croatia, Greece, and Romania had a lower average economic potential for farms than Poland, and six countries (Cyprus, Malta, Slovenia, Croatia, Greece, and Romania) had a lower area of farms.

Table 3.

Average area of agricultural land and economic size of farms in EU countries in 2013-2022

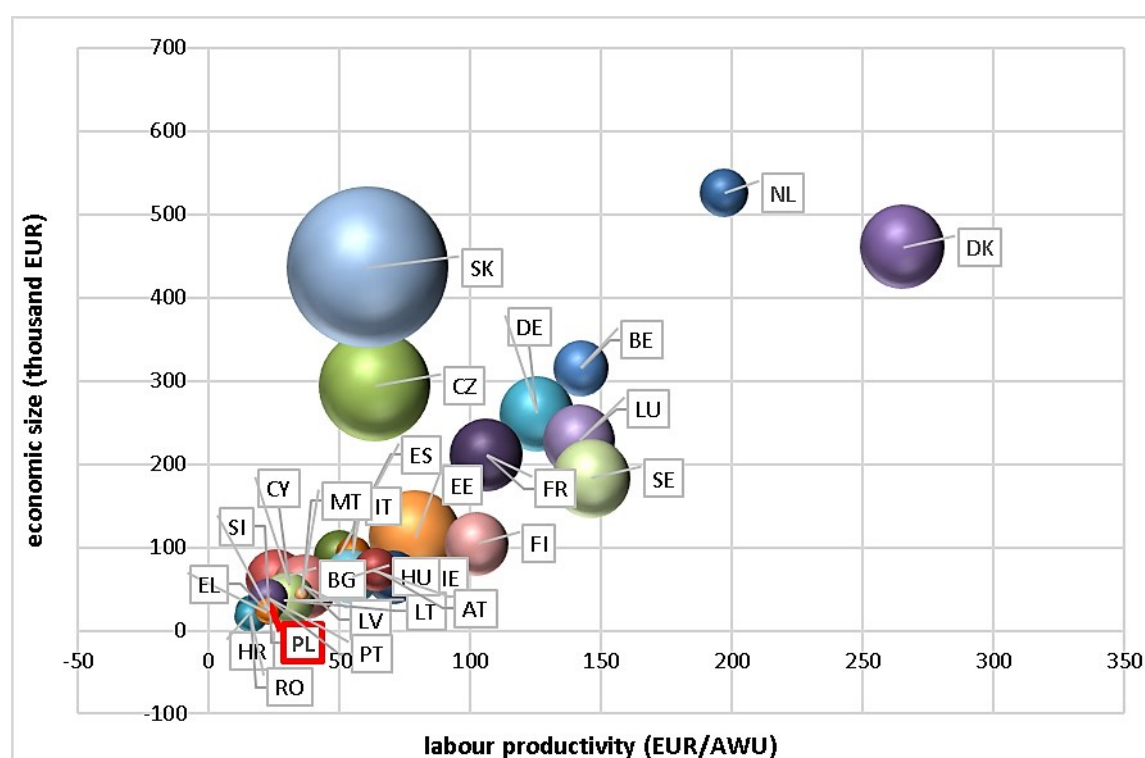
Specification	Utilised agricultural area (ha)			Economic size (thousand euro)		
	2013	2022	2013-2022	2013	2022	2013-2022
EU-27	30.5	40.4	35.9	61.0	94.5	82.0
Netherlands	36.5	41.2	39.0	417.5	581.0	525.6
Denmark	97.9	152.1	122.9	357.4	573.8	460.8
Slovakia	550.9	409.5	452.2	460.9	394.5	436.2
Belgium	51.0	53.1	52.5	296.7	321.5	314.9
Czechia	202.0	254.3	213.4	245.7	351.5	294.6
Germany	88.9	103.4	95.5	234.6	276.9	260.4
Luxembourg	82.9	96.0	88.2	192.9	238.8	227.8
France	86.4	94.1	90.3	180.5	225.3	210.8
Sweden	102.8	104.4	104.7	149.5	197.9	182.5
Estonia	137.0	150.9	144.7	91.6	124.5	113
Finland	57.7	78.3	69.1	82.3	121.4	104.1
Italy	17.0	23.6	21.5	66.0	99.4	92.0
Spain	41.0	44.1	44.2	58.9	107.1	89.3
Austria	32.7	33.7	32.3	56.8	83.4	72.8
Hungary	48.7	52.8	49.7	53.9	73.7	64.9

Cont. table 3.

Ireland	49.5	45.7	48.3	49.0	73.1	64.0
Bulgaria	37.9	75.9	62.2	33.2	75.6	61.7
Cyprus	8.9	11.1	10.8	37.8	66.3	55.0
Latvia	69.1	73.6	70.8	40.1	59.0	52.4
Malta	2.7	3.0	2.8	37.4	54.8	43.6
Portugal	26.4	25.8	24.3	34.2	40.6	38.7
Lithuania	48.6	51.4	50.6	28.7	43.4	36.4
Poland	18.8	21.3	20.4	27.7	36.9	33.7
Slovenia	10.6	11.5	10.7	22	26.8	24.1
Croatia	15.7	16.0	15.6	23.6	24.2	23.7
Greece	9.8	10.4	10.1	20.7	25.5	22.4
Romania	9.3	26.3	17.2	9.8	25.3	17.3

Source: Own elaboration based on FADN EU data.

To better illustrate the relationship between the level of labour productivity of farms and their structural characteristics, a graph showing the position of each member country according to the value of the labour productivity index and the average economic size of farms is developed. The size of the sphere represents the average area of agricultural land of farms in 2013-2022.



Note: Country abbreviations: BE - Belgium, BG - Bulgaria, CZ - Czechia, DK - Denmark, DE - Germany, EE - Estonia, IE - Ireland, EL - Greece, ES - Spain, FR - France, HR - Croatia, IT - Italy, CY - Cyprus, LV - Latvia, LT - Lithuania, LU - Luxembourg, HU - Hungary, MT - Malta, NL - Netherlands, AT - Austria, PL - Poland, PT - Portugal, RO - Romania, SI - Slovenia, SK - Slovakia, FI - Finland, SE - Sweden. The agricultural area of the farm is the size of the sphere.

Figure 2. Distribution of EU countries according to labour productivity, economic size and agricultural area of farms from 2013 to 2022.

Source: Own elaboration based on FADN EU data.

It can be seen that the Netherlands and Denmark achieved the highest level of labour productivity with a very high level of economic size and, in the case of Denmark, also high UAA. At the other extreme are countries with very low labour productivity, economic size, and UR area. This group includes Poland, Romania, Croatia, Greece, Portugal, Slovenia, Bulgaria, Lithuania, Latvia, Cyprus, and Malta, most of which joined the EU in 2004 or later. It is noteworthy that Slovakia and the Czech Republic are characterized by economically strong and large-area farms, but still achieve fairly low labour productivity, although higher than that of the previously mentioned countries.

The next step of the analysis was to examine the correlation between labour productivity (X_1) and the structural characteristics of farms: UAA (X_2), economic size (X_3), value of fixed assets per AWU (X_4), and number of fully employed persons (AWU) per 100 hectares of UAA (X_5). Table 4 presents the correlation matrix between the variables mentioned above. This shows that there is a strong correlation between the level of labour productivity and the economic size and technical labour equipment of farms. There is a weak correlation between labour productivity and the area of agricultural land and the armament of land for labour. This should be explained, among other things, by the fact that some farms small in area can carry out intensive production and achieve high efficiency in the factors of production involved, such as vegetable farms. It should also be added that in accordance with the current methodology, the smallest farms, below the standard production threshold adopted by each country, were not included in the FADN sample.

Table 4.

Correlation matrix between labour productivity and structural characteristics of farms

Variable	Mean	Standard deviation	X_1	X_2	X_3	X_4	X_5
X_1	74242.5	61540.1	1.000	0.211	0.812	0.879	-0.295
X_2	72.8	89.8	0.211	1.000	0.589	0.025	-0.332
X_3	145.3	147.2	0.812	0.589	1.000	0.611	-0.272
X_4	270.6	296.5	0.879	0.025	0.611	1.000	-0.196
X_5	6.7	9.2	-0.295	-0.332	-0.272	-0.196	1.000

Source: Own elaboration based on FADN EU data.

4. Discussion

Agriculture in many new EU member states, including Poland, is characterized by a relatively low level of labour productivity (Bilenko, 2022). A study by Smędzik-Ambroży et al. (2019) shows that agriculture in Poland, compared to EU countries, was characterized in 2004-2017 by the lowest competitive capacity as a result of resource productivity. The analysis of labour productivity and structural characteristics of farms conducted in this study showed that there have been changes in the agriculture of member countries between 2013 and 2022.

This has also been confirmed by other studies. Neuenfeldt et al. (2019, p. 714) note that the European Union's agriculture has undergone significant structural changes in recent decades. The most visible and significant changes are reflected in the decreasing number of farms, increase in farm size, and specialization of production. The area structure of farms in EU countries varies significantly. Babiak (2010, p. 90) explains that in addition to natural conditions, these differences depend on the advancement of the process of structural transformation in each country. According to Peng et al. (2024, p. 11), agriculture in the European Union is struggling to find the optimum farm size, with some CAP support measures encouraging family farming and others prompting an increase in the scale of farming, which promotes consolidation processes. According to the study, in Poland, the average farm size is one of the lowest among the EU member states, although it shows an upward trend. According to Pawlak and Poczta (2025, p. 4), one cannot expect a remarkable stimulating effect of CAP on structural changes in Polish agriculture in the short term. Given the slow pace of structural changes, they will continue in the coming years. In the discussion supporting the existence of small farms within the framework of state agricultural policy, one can distinguish extreme views on the subject. Some point to the necessity of eliminating small farms so that their resources can be used more efficiently by more developmental farms, while others point to the need to sustain them to reduce poverty (Davidova et al., 2009) or achieve sustainable development goals (Adder, 2017).

Research has shown that low labour productivity remains a problem in Polish agriculture. The efficiency of production factors, including the labour factor of Polish farms in 2010-2013 was analyzed by Orłowska (2014). She showed that the economically larger a farm, the higher its productivity of land, labour, and capital (except for very large farms). Wicki (2019) arrived at a similar conclusion, pointing out that the economic size of farms is one of the most important factors affecting productivity. This characteristic determines not only the growth of labour productivity but also the ability to invest, introduce technical progress, and achieve both internal and external economies of scale. Structural transformations aimed at concentrating processes in agriculture are justified. Peng et al. (2024) emphasize that increasing the quality of human capital in the agricultural sector can help increase agricultural labour productivity and ultimately income. Based on an analysis of FADN data, Takács (2013), showed that labor productivity has a strong positive relationship with net farm value-added, which has a decisive impact on farm performance. Ancans (2023) showed that labour productivity in agriculture was low in almost all Eastern European member states, with the exception of the Czech Republic and Slovakia. He explained the relatively high productivity in these countries based on the average farm size. Forgacs (2020), on the other hand, found that the productivity of land and labour depends largely on the specialization of farms. The research presented in this paper showed a relatively lower growth rate of labour productivity in most old EU member states. Similar conclusions were reached by Jarka (2017), who explained the low growth dynamics in Germany and the Netherlands by the fact that these countries have perhaps reached a maximum level of labour productivity that will be difficult to exceed under unchanged conditions.

5. Conclusions

This study contributes to the discussion on the relationship between the level of labour productivity and the structural characteristics of farms. The research results show Poland's unfavorable situation in terms of labour productivity, although its growth dynamics was one of the highest among EU countries. A low level of labour productivity is accompanied by unfavorable structural characteristics of farms, inappropriate relations between production factors, and a high level of employment. Poland is a country where the number of people employed in the agricultural sector is one of the highest among the Member States. According to Eurostat data, in 2022, Polish agriculture employed 8.5% of the total workforce, with only three countries (Bulgaria, Romania, and Greece) having a higher percentage. Although there have been structural changes in agriculture in Poland over the years under study, their pace is still too low. In addition, the research showed a correlation between the level of labour productivity, the economic size and technical equipment of farm labour. This is a clear indication of the continuation of the development path of agriculture in Poland related to the improvement of the agrarian structure, which remains related to the increase in the economic size of farms. Further changes are also required in the relations between the production factors, especially between land and labour, and labour and capital.

This study is not without its limitations, as it does not consider all structural characteristics of farms. Farms in Poland are diverse, not only in terms of area and economic size but also in terms of production direction or level of mechanization. Hence, it is reasonable to conduct further analysis of labour productivity for more homogeneous groups, separated, for example, based on economic size or agricultural type (specialization).

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FROM THE PAST TO THE FUTURE: A FUTURISTIC APPROACH TO MANAGEMENT

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Purpose: The primary aim of this paper is to illustrate the long-term evolution of management principles and practices, starting from the early seventeenth century and extending into a speculative future scenario in the twenty-fifth century. By contrasting a historically grounded analysis with a far-reaching futurist perspective, the paper seeks to highlight how shifting contexts social, technological, and economic transform the very foundations of how organizations and societies are managed.

Design/methodology/approach: This study adopts a methodological framework consist of: historical analysis and futurological approach. By contrasting historical practices with these speculative projections, it provides a comparative lens through which to reflect on the continuity and dynamism of management concepts over an 800-year span.

Findings: The research reveals that historically, management practices were primarily shaped by hierarchical, preindustrial structures, with limited specialization. In a far-future perspective, management appears more decentralized, network-based, and driven by advanced technologies, social norms, and the role of leadership.

Research limitations/implications: The futurist projections are speculative and not readily verifiable in a traditional empirical sense. The historical analysis relies on interpretative secondary sources and focuses on illustrative rather than exhaustive examples.

Practical implications: Although set in a distant future, the paper's explorations prompt practitioners and policymakers to anticipate technological disruptions, foster ethical and cultural awareness and adopt scenario-based strategies.

Originality/value: The paper's contribution lies in bridging early modern European management practices and speculative futuristic models. This dual perspective underscores how the fundamental drivers of management resource coordination, leadership, cultural values remain pivotal across time, while their expressions shift dramatically with changing technological, economic, and societal landscapes. The research is particularly valuable to academics exploring the interplay between history, strategy, and future studies, as well as practitioners who benefit from long-range thinking.

Keywords: management evolution, historical analysis, futurology, artificial intelligence.

Category of the paper: conceptual paper / research paper.

1. Introduction

Let us travel back approximately four centuries, to around the year 1625. This was the first half of the seventeenth century, a time of great transformation and conflict in Europe, characterized by the emergence of modern states, the colonial expansion of Europeans into other continents, and an era of both religious and political wars within Europe itself (Pietschmann, 2002, pp. 59-119). Let us examine this period on both a global and a European scale, with particular attention to the Polish lands. In those days, the world was still pre-industrial, based on manual labor, craftsmanship, and small manufactories. Mechanization and mass production were still far off. Nevertheless, various parts of Europe were experiencing technical innovations and inventions, especially in the fields of optics, cartography, maritime navigation, military technology, and mathematical calculations (Ulmer, 2017, pp. 39-46). A new, rational, experimental, and empirical scientific approach was also emerging one that would, over the next centuries, bring about a genuine industrial revolution and a technological leap forward (Kleszcz, 2022, pp. 129-153).

We now shift our perspective to about four hundred years in the past to the first half of the seventeenth century and attempt to view management from a historical standpoint, from a futurist viewpoint, and through the lens of contemporary management theory. The aim is to understand how work, resources, and people were organized at the time and to explore how concepts of authority, power, and planning took shape. Concurrently, we will analyze the social, economic, cultural, and technological context within which these management practices developed.

Next, we will look into the distant future specifically the year 2425 from the perspective of a futurist who, drawing on current knowledge and trends, attempts to envisage a fully formed world, and also from the viewpoint of a future historian reflecting on centuries-long processes from afar. The following vision is, of course, speculative, hypothetical, and based on extrapolation and contemplation of long-term social, economic, technological, and political trends. From the vantage point of 2424, the world is incomparably more complex and, in a sense, simpler at the same time technology and automation have done extensive work behind the scenes, freeing humanity from many of the old burdens. Europe has become an advanced eco-cultural federation of diversity, Poland is a region rich in cultural heritage, and industry has been transformed into an intelligent, integrated system of material production and recycling. Challenges that once dealt solely with manufacturing and meeting basic needs have given way to struggles over meaning, identity, and values in a post-scarcity world. What we used to call “industry” has turned into an invisible, fluid process of manipulating matter, powered by energy and information, controlled by algorithms, and fully integrated into the planet’s life cycle and that of its inhabitants.

2. The World, Europe and Poland in the 17th. Historical Context

During this era, global power structures were shaped by Europe's maritime powers. Spain and Portugal still held extensive colonies in the Americas, Africa, and Asia. Although Spain was gradually entering a period of decline, it remained an economic powerhouse, relying on precious metals from the New World. Portugal, in a personal union with Spain since 1580, maintained its trade routes to India and the Far East.

At the same time, the Netherlands was experiencing its "Golden Age", steadily solidifying control of trade routes and engaging in the spice trade while also waging an eighty-year fight for independence from Spain (Miścicki, 2014, pp. 23-34). Under the rule of the Stuart dynasty, England expanded its fleet and colonies in North America by 1620 the ship *Mayflower* had reached New England's shores, and in subsequent years English settlements developed along the eastern coast of the American continent (Grzebyk, 2018, pp. 59-68). Meanwhile, in France, Louis XIII and the increasingly influential Cardinal Richelieu gradually consolidated power, laying the groundwork for the French absolutism that would flourish in the second half of the century under Louis XIV (Skwara, 2013, pp. 339-347). In the Far East, powerful states such as the Ming Empire in China and the Mughal Empire in India were at their zenith or nearing a period of crisis, but still constituted significant centers of global civilization and economic strength (Mencel, 2020, pp. 97-118). The Ottoman Empire continued to hold vast territories in Asia Minor, the Middle East, the Balkans, and North Africa, though initial signs of a slowdown in its territorial expansion were emerging (Kołodziejczyk, 1987, pp. 375-394).

Poland and Lithuania had been in a real union for more than half a century, forming the Polish-Lithuanian Commonwealth one of the largest states in Europe at the time. The throne was occupied by Sigismund III Vasa, a monarch with dynastic ambitions who aimed to strengthen his family's position and claim the Swedish throne, which had led to wars with Sweden in previous decades. Although the country's greatest prosperity and stability, known as the "Golden Age", spanned the turn of the sixteenth and seventeenth centuries, it was beginning to feel the effects of ongoing conflicts with its neighbors. In 1624, the Commonwealth found itself between wars and tensions: still shadowed by conflicts with Sweden in Livonia and along the Baltic (the Polish-Swedish War of 1621-1629 ran somewhat concurrently), facing Tatar incursions from the southeast, and contending with strained relations with the Ottoman Empire. Despite these challenges, the Commonwealth still maintained a relative internal order based on noble democracy, local sejmiks, and the national parliament. The spirit of the nobility's freedom its renowned *złota wolność* remained vibrant, although it would later contribute to the weakening of central authority. Cultural life in the Commonwealth thrived: the Cracow Academy (Jagiellonian University) was still a significant center of scholarly thought, Gdańsk was a lively port and hub of Baltic trade, and the Commonwealth's territories were distinguished by ethnic and religious diversity.

At that time, Polish Baroque culture was just maturing, influenced by Italian, Western European, and also Eastern currents, brought in part by ties with Turkey and the Orient (Hroch, Petrafi, 1964, pp. 1-21).

In sum, four centuries ago, we find ourselves in a restless Europe, torn by religious and political wars, in a world where vast colonial empires set the parameters for the global economy while new centers of maritime and commercial power emerged. In the Polish-Lithuanian Commonwealth, Sigismund III Vasa reigned over a state that was still strong and prestigious but beginning to grapple with early signs of impending difficulties. It was a time of contrasts: the rise of trade, colonization, culture, and the sciences, yet also bloody conflicts that would, over the next few decades, define the shape of the new Europe. By the mid-seventeenth century, the world had yet to enter the era of industrialization as we understand it today. The predominant economic model remained pre-industrial production took place mainly in small workshops, manufactories, and smithies, with the majority of the population still engaged in agriculture. Nevertheless, the first stirrings of change were already visible, and in some sectors, technology and science were making significant progress, laying the foundations for future revolutions.

3. Industrial and Economic Situation

In both Europe and the Polish-Lithuanian Commonwealth at that time, the kind of industry familiar from the nineteenth century had not yet emerged. Workshops, small manufactories, and the guild system still predominated. The production of textiles, metalwork, ceramics, brewing, and milling was organized along craft lines, strictly regulated by guild corporations. In certain parts of Europe particularly in the Netherlands, northern Italy, and England more complex forms of production organization were starting to develop. These included larger workshops and early precursors to manufactories, where attempts were made to divide work among employees in order to boost productivity.

The growth of mining and metalworking of iron, copper, and silver ores, as well as salt mining, played a major role in the economy of many states. In the Polish-Lithuanian Commonwealth, the salt mines of Bochnia and Wieliczka were particularly significant, along with several ironworking centers powered by charcoal from nearby forests and traditional bloomery furnaces. In Central Europe, as well as in parts of Germany and Bohemia, ore extraction and metallurgy continued to advance, driven by the gradual improvement of existing technologies although the true industrial revolution was still far off (Jezierski, Leszczyńska, 2010, pp. 48-52).

International and maritime trade became an important “economic sector”. The Dutch, Portuguese, and English developed substantial merchant fleets, which in turn generated demand for ships shipbuilding thus became one of the more sophisticated branches of the era’s

“industry”. Yet it remained a craft-based endeavor, reliant on skilled shipwrights and traditional techniques.

4. The World, Europe and Poland in the 25th Century: Global Social and Economic Structures

Over the course of 400 years, beginning in 2025, humanity underwent a period of dramatic transformation. Artificial intelligence, nanotechnology, genetic engineering, and far-reaching climate and ecological modifications changed both living conditions and social structures, as well as the global political balance of power. Although still requiring massive resources, space travel became part of larger exploration and colonization programs within the Solar System: representatives of different nations and cultures are scattered across Mars, the Moon, and various orbital stations. Meanwhile, Earth experienced a prolonged period of adaptation to climate change through global geoengineering initiatives that integrate the biosphere with advanced systems for controlling the flow of energy and resources.

The centuries-long rise in the importance of artificial intelligence and automation has meant that, by the year 2424, economies are largely based on intelligent systems for resource management, goods production, and service delivery. Industry, understood in the traditional sense (factories, assembly lines), is a thing of the past. Production takes place in automated, autonomous environments so-called “fabricators”. AI systems and robots enable a smooth and flexible response to demand, minimizing waste and losses.

High levels of automation and production efficiency have led to what is referred to as a post-scarcity economy: many material goods are readily accessible, and “work” in its traditional sense employment necessary for survival is greatly reduced. Societies are experimenting with various forms of social participation, where basic living needs are guaranteed by resource distribution systems. This gives rise to new social and psychological challenges: how to provide a sense of purpose for people no longer engaged in traditional forms of work? Culture, art, science, creative endeavors, and personal development become the pillars of new social activity.

The global political structure has changed national divisions still exist, yet they hold a different significance. Large-scale federations and alliances are dominated by shared AI-based decision-making platforms that account for ecological, social, and economic balances. Former superpowers have evolved into networks of collaboration built around the exchange of information, knowledge, and innovation. Cultural and linguistic differences remain, but they are fluid: real-time universal translation, along with the flow of ideas and ideals, has made national or regional identities more symbolic and cultural than political or economic in nature.

In Europe once, some four centuries earlier, a stage for political, migration, and climate crises has, by the 25th century, evolved into a “megafederation” of regions. The former European Union went through numerous reorganizations, ultimately resulting in a structure resembling a constellation of autonomous regions and city-states. These are interconnected by a dense network of high-speed transportation (hyperflights, vacuum tubes, gravitational vehicles) and energy-exchange systems. Europe has become a largely sustainable human ecosystem, where the natural environment has been extensively restored through ecological engineering: reforested areas, reclaimed rivers, and clean air and water are the product of centuries of work to remedy damages inflicted before and during the climate crises of the 21st to 23rd centuries. Populations are more mobile and cosmopolitan; Europe is a mosaic of diverse cultures, collectively benefiting from universal communication tools. For the people of 2425, the concept of nation-states as they existed in 2025 is merely a historical curiosity understood as one stage in humanity’s political evolution rather than a fundamental element of identity.

The former Polish state, like other European countries, now functions primarily as a cultural region with certain traditions, a distinct language (though natural languages are instantly translated through neural interfaces), characteristic architecture, and a unique lifestyle, rather than as a sovereign political entity equipped with its own army or currency. Polish society continues to preserve its history and language, nurturing a centuries-old literary, musical, political, and social heritage, yet it does so within a broader European and planetary community. Polish cities stand out for their particular aesthetic, blending historical building traditions with ultra-modern infrastructure. Kraków, Warsaw, Gdańsk, Wrocław, and Poznań serve more as hubs of knowledge, art, and innovation, connected to the rest of Europe via high-speed transport and information routes. Agriculture is either entirely synthetic or carried out in highly efficient external “bio-factories,” while forests and natural areas are maintained as a form of protected heritage, managed through precise ecological analysis.

While such a vision might appear overly optimistic and the drawn landscape too rosy it is crucial to bear in mind the hardships humanity has overcome along the way. These include numerous climate crises, pandemics, and conflicts over new forms of resources and information. By the 25th century, societies have become much more attuned to the complexity of the systems in which they exist. Considerable effort has been invested in maintaining a balance between individual freedom and collective stability, as well as between technological progress and the preservation of humanity itself. A central question has become: What is the essence of human nature in a world where neither physical survival nor material abundance poses a significant challenge? Cultural values, as well as spiritual, artistic, and intellectual development, have assumed key importance in human life.

Gone are the days of smoke-belching factories and massive production plants in their traditional sense. On-demand manufacturing reigns. Industry has transformed into a network of intelligent production units positioned near consumers or crucial resources. These units can produce highly complex goods from tools and infrastructure components to advanced implants

and living modules by manipulating materials at the molecular and atomic levels (nanotechnology).

Smart materials and sustainable cycles predominate. Most raw materials are derived from molecular recycling. Matter moves in closed loops, drastically reducing the need to extract traditional resources. Any product can be reverted to its base state and reshaped into a new form at any time. Industry is fully powered by renewable energy, harnessed and stored with exceptional efficiency. A global AI-managed energy network balances supply and demand, optimizing the use of solar, fusion, geothermal, and even atmospheric or tidal forces.

5. The Fall of Superpower Dominance: Evolution over Continuity

At the beginning of the 21st century, both Russia and China displayed models of governance that were authoritarian or quasi-totalitarian in nature, marked by tight social control, limited pluralism, and the dominance of state apparatuses over the public sphere. How might these countries look four centuries from now?

A span of four centuries is longer than the period separating our own time from the early modern era, and no political structure remains unchanged for that long. Under the combined pressures of internal dissent, climate, economic, and social transformations, and rapid technological development, Russia and China like many other former states would likely pass through a series of stages: reforms, crises, fragmentation, and reorganization. Russia would experience successive waves of territorial disintegration and reconsolidation. In the context of global climate shifts, Siberia became a strategically significant region (for example, due to its arable land, natural resources, and energy potential), attracting the attention of global networks. These changes could lead to liberalization or the emergence of new governance models centered on local autonomies, supported by artificial intelligence and global platforms. Over time, a move away from centralized, repressive power toward more networked forms of political organization seems probable albeit accompanied by dramatic upheavals and tensions.

In contrast, by the 21st century, China already combined an authoritarian government with a dynamic, technology-driven economy. Over subsequent centuries, this model evolved into something far more complex: an administrative-technocratic state harnessed AI to manage society, while simultaneously minimizing internal conflicts. Yet, with the ongoing globalization of information, the growing importance of culture and individual expression, and the integration into a global system of knowledge exchange, even the most closed and regulated structures eventually faced the need to adapt. Over hundreds of years, there may have been dozens of “digital revolts,” shifts in values, and a gradual dismantling of the totalitarian character of the state.

In the span of four centuries, even the most entrenched political regimes underwent profound change. The world envisioned here in the 25th century presupposes sweeping social, technological, and systemic transformations on a global scale. This does not imply that the path to that stage was smooth or conflict-free. Totalitarian regimes struggled to maintain long-term control in a technological environment that enabled hidden forms of communication, education, and self-determination for individuals and groups. In a future world where information and innovations circulate with astonishing ease, even the most advanced surveillance systems would be vulnerable to internal erosion. While China and Russia might still deploy digital authoritarianism in the 21st and 22nd centuries, the increasing complexity of systems, the symbiosis of humans and AI, and the cosmopolitan nature of intellectual and scientific elites in subsequent centuries would undermine both the rationale and feasibility of upholding a totalitarian political monoculture.

By the year 2425, any former states that once maintained control through totalitarian methods exist only as historical examples of transitional epochs. Today's nation-states are seen as once-distinct organisms that gradually merged into a global and interplanetary network of interdependencies.

Global decision-makers, in the face of the need for universal coordination to combat climate catastrophe and to manage the environment and energy on a planetary scale, were ultimately compelled to develop governance forms in which the old authoritarian models became ineffective and contrary to the common interest. The pressure exerted by global public opinion (potentially in the form of collective consciousness supported by neural networks and AI), and the real possibility for individuals and small communities to influence decisions at a planetary level, gradually destabilized and dissolved oppressive regimes.

Naturally, both Russia and China possess rich cultural, scientific, and artistic heritages that remain valuable in the future. Their languages, literature, philosophy, and achievements in science and the arts will endure as part of humanity's global legacy. Future societies, even if they no longer recognize Russia and China as totalitarian states, will study those historical periods to understand the evolution of governance forms, power-society relationships, and the long-term process of human and informational emancipation from the control of certain entities over others.

In conclusion, the concept of a "totalitarian state" appears anachronistic. The world has passed through numerous phases in which authoritarian systems not only in China and Russia but also in many other regions collapsed, underwent reforms, or evolved into alternative forms of organization. Global networks of collaboration, AI support, the disappearance of traditional national borders, and the dominance of knowledge, culture, and sustainable planetary management have rendered the totalitarian model unsustainable in the long run. New forms of order, grounded in transparency, distributed power, and global coordination, have taken the place of former empires of fear and control.

6. Management: A Historical Context

At the In the seventeenth century, there was no formal concept of “management” in the modern, academic sense. No textbooks, university departments of management, or organizational theories existed. All decision-making depended on authority, tradition, experience, and social hierarchies (Wojtaszek, 2014, pp. 347-356).

At the state level, “management” primarily involved the exercise of monarchical power, supported by the aristocracy, administrative bureaucracy, and the Church. Monarchs and princes did not manage in the contemporary sense; instead, they wielded power, determining policy, law, and economic affairs according to personal judgment, tradition, or immediate needs. In towns and smaller communities, the role of manager was often fulfilled by guild leaders (in the guild system), heads of merchant families, or owners of craft workshops. Production management was straightforward: a master would assign tasks to journeymen and apprentices, check quality, monitor deadlines, and handle customer payments. No standardized procedures or quality control in the industrial sense existed, nor were modern motivational methods employed.

We can identify several characteristic features:

1. Hierarchy. Relationships were rigidly hierarchical, based on social status. Decisions were made at the top and carried out by those below.
2. Absence of specialized management functions. A ruler, military leader, merchant, or guild master would simultaneously oversee people, production, finance, and resources. No clear separation existed between managerial, marketing, or financial roles.
3. Lack of formal analytical tools. Decisions were made largely on the basis of experience, instinct, and tradition rather than data, analysis, and strategy in today’s sense.
4. Patronage and clientelism. Many managerial relationships were rooted in personal ties, protection, patronage, and social dependence rather than substantive competencies or transparent rules.

Viewed through the lens of four centuries of development, seventeenth-century management can be seen as an embryonic form of what later blossomed during the eras of industrialization and capitalism. Those spontaneous methods rooted in lineage, social status, and the monarch’s authority would be rationalized over subsequent centuries.

The structures of that era contained the seeds of future organizational models. When the Industrial Revolution arrived in the 18th and 19th centuries, it created the need for a systematic approach to production management, division of labor, and standardized processes. This gave rise to modern management theories (Taylor, Fayol) only in the 20th century. The “management” methods in use at the time were not efficient by today’s standards and could not meet the complex challenges of mass production or global supply chains. Nevertheless,

the simplicity and personal character of those relationships stand in stark contrast to the coming era of formalized and professionalized management.

A contemporary researcher of management would regard 17th-century organizational systems as prototypes without formalized principles, models, or theories. Many core concepts of modern management strategic planning, controlling, employee motivation, internal communication, and organizational culture simply did not exist as distinct categories. From the viewpoint of current management science, the practices of that period were characterized by:

1. Minimal organizational scale. Activities occurred in small groups, workshops, and modest manufactories. Managing large institutions (such as a state) involved political power rather than organizational oversight.
2. Lack of cost and efficiency awareness. Resource management took place without precise cost calculations, performance metrics, or process-improvement methods.
3. Weak standardization of processes. No guidelines, job instructions, or quality procedures existed. Each master or merchant employed their own methods.
4. Authority rather than modern leadership. Power was based on social status (estate, birth, wealth) and religious or traditional sanction, rather than managerial skills, charisma, vision, or today's coaching-style approach.
5. A heavily stratified society with limited social mobility. Such stratification shaped managerial relationships: peasant, townsman, nobleman, and clergyman all had roles assigned from birth.
6. Primary reliance on agriculture and small-scale craft production without mechanization. Management was thus direct and personal, obviating the need for extensive organizational structures.
7. Culture and religion legitimized hierarchies and power relations. Managing "souls", influencing morale, or mobilizing people to work often took place via ethical, religious, or customary norms.
8. No tools for long-distance communication (other than letters and couriers), no information systems, and no methodical data gathering, so management remained local and intuitive.

Management at that time bore little resemblance to the academic discipline we know today. It was more a matter of authority and tradition, without formal methods, metrics, or strategic planning. Organizations were small, hierarchies were rigid, and decisions were made based on custom, intuition, and social bonds. From a historical perspective, we can see this as a natural pre-industrial phase. From a futurist or contemporary management science standpoint, one could say it was the starting point for the processes of rationalizing and structuring organizational thought, which eventually led to the development of management theory, the rise of corporations, and an entire body of knowledge and practice focused on efficiency, innovation, and strategy.

7. Management: Historical and Futuristic Context

Let us move to the early 25th century and outline what management might look like when taking into account the evolution of societies, economies, technologies, and shifting values and organizational forms. This analysis is multidimensional, merging global, European, and Polish perspectives. While the vision is speculative, it is grounded in the extrapolation of current trends, as well as inferences drawn from technological, social, and economic developments.

By the year 2425, the world has become a network of intelligent systems in which the primary driver of management is information: the flow of ideas, data, knowledge, and values. Nation-states in the form known in the 21st century no longer exist as key power nodes; instead, they have been transformed into hubs within a planetary network that manages resources, infrastructure, and knowledge. A post-industrial, post-scarcity economy supported by advanced artificial intelligence, nanotechnology, and genetic engineering provides access to goods and services without the necessity of large-scale physical labor. The defining characteristics of this complex environment are as follows:

1. Knowledge and information management as the foundation of all activity.

Decision-making no longer relies on hierarchical orders but on real-time flows of information. Artificial intelligence (AI) acts as an analyst, consultant, and moderator, using environmental, social, and economic data to recommend optimal courses of action. Management is largely holistic and adaptive: systems continuously “learn” the dynamics of their environment and social behavior, adjusting policies and strategies accordingly.

2. Holarchic and networked organizational structures.

Hierarchies have been replaced by network models, holarchies, and decentralized collaboration structures. Management is carried out through exchange platforms, where every entity from individuals to local communities to global consortia can participate, make proposals, and co-create decisions (Kozłak, Żabińska, 2011, pp. 271-279). Decentralization, however, goes hand in hand with advanced coordination, enabled by AI and intelligent protocols. Conflicts of interest are resolved through simulated scenarios and cognitively assisted negotiations (so-called “mind augmentation”).

3. Sustainable resource and environmental management.

Ecology and the well-being of the planetary system are central values. Managing energy, water, and biological resources takes place in circular and regenerative models. All participants in the management system recognize that resource allocation must continually be balanced. Environmental standards are not so much imposed as negotiated and enforced by intelligent systems that monitor ecosystem parameters.

4. Managing cultural diversity and social values.

The society of the future is global, mobile, and culturally intermingled, yet also highly individualized. Social management centers on moderating a diversity of needs, values, and aspirations. Virtual decision-making forums emerge, where various groups ethnic, ideological, aesthetic negotiate common goals. “Meaning management” and “perception management” become key: designing communication interfaces that enable comprehension and collaboration free from conflict. Here, AI serves as a mediator and translator of values.

Within Europe, a multilayered network of regions, city-clusters, and thematic communities has taken shape. Traditional states have evolved into regional hubs that maintain a degree of historical and cultural identity; however, political and economic authority is dispersed. Management involves the dynamic orchestration of transregional projects:

Infrastructure and transport. Automated and autonomous transport systems are coordinated by intelligent traffic management systems to minimize energy consumption and environmental impact.

Culture and education. European educational networks, representing continuous “lifelong learning” in virtual-physical environments, are overseen by global knowledge platforms. There are no ministries of education rather, there are councils of “knowledge meritocracy”, groups of experts, and AI that jointly establish standards and curricula, later personalizing them for individual users.

Politics becomes a process of continuous negotiation over values and resource allocation, conducted on deliberative platforms. Management in Europe is about building consensus based on data, simulations, and ethical principles, rather than on cyclic democratic elections or the actions of specific lobbying groups.

Poland, as a European region, is no longer fully sovereign in the old sense. Rather, it is a cultural and historical community that retains a distinct identity language, certain architectural and artistic patterns, as well as historical memory. Managing this region focuses on integrating local communities. Poland has become a mosaic of local clusters urban-regions, creative communities, research, and cultural centers. Their governance is about facilitating cooperation and knowledge exchange. Local communities jointly decide on infrastructure, public space design, and cultural policy, while AI systems help reconcile differing needs into a harmonious model of social life. Management of historical heritage (archives, museums, digital reconstructions of old cities) is integrated with new technologies. Historical education aligns with social-technological development programs, and local policies aim to combine traditional values of hospitality, cooperation, and solidarity with a modern ethic of planetary responsibility.

Management concentrates on harmonizing diverse social interests, individual needs, and global values. In a society without classic scarcity of goods, management focuses on quality of life, personal growth, social harmony, and environmental integrity. By contrast, the economy

is a system of flows and exchanges of information, energy, and materials in closed loops. Management's task is to maintain resource balance and to reconcile technological innovation with ecosystem stability.

Social structures are multilayered and fluid. Management involves designing interfaces that enable collaboration among groups with different values and lifestyles. This is an ongoing process of forming networks of interdependencies, wherein each participant can influence processes without being dominated by authoritarian structures.

From a cultural and ethical standpoint, management also involves concern for moral frameworks governing the use of technology AI must serve the common good. Ethical codes emerge to regulate artificial intelligence and decision-making processes. The culture of management is one of dialogue and co-creation.

Management in the future is far more complex, yet paradoxically simpler in its operational dimension, thanks to AI support. It is no longer hierarchical, based on control over people and resources, but rather networked, grounded in collaboration, knowledge, and information. On a global scale, management takes the form of an intelligent ecosystem; in Europe, it manifests as a grand laboratory of consensus and cultural synergy; in Poland, it becomes a careful balancing of tradition and identity with the global logic of cooperation. Management here serves a purpose that extends beyond mere economic efficiency it is a tool to sustain balance, beauty, human dignity, and the integrity of the planet's environment.

8. Conclusion

The analysis indicates that seventeenth-century management focused on traditional ways of organizing work and resources, closely tied to politics, the military, and local power structures. By contrast, the futuristic perspective of the 25th century envisions a post-scarcity world in which automation and intelligent matter-processing systems play a pivotal role, and production once a heavy burden on people largely recedes into the background. Priorities have shifted: ethical, cultural, and identity-related issues gain significance, while traditional forms of labor oversight lose ground.

Ultimately, the article's comparison of 17th-century practices with possible future scenarios captures the continuity of management processes and their enduring foundations the need for planning, organization, and authority while also accounting for dynamic historical, cultural, and technological factors. The authors emphasize that reflecting on the centuries-long development of management enables the design of organizational solutions more effectively suited to the demands of both the modern era and the world to come. Such a distant even "exaggerated" perspective serves several essential cognitive and didactic purposes in the field of management studies. First, it heightens our awareness of how management concepts and

tools evolve over time. By spanning both the 17th-century world and a speculative 25th-century scenario, we see that the fundamentals of management work organization, power structures, and the relationship with technology are historically contingent. This underscores that the methods used today are not “natural” or “eternal”, but rather conventions arising from particular social, economic, and technological conditions.

Next, this approach stimulates creative thinking and scenario-based strategies. Employing a far-reaching timeline liberates us from contemporary institutional and technological constraints. Although such a futuristic vision is largely unverifiable, it moves us beyond linear thinking and enables a multi-stage view of change. By embracing this broader horizon, managers, researchers, and students of management can craft innovative strategic concepts that factor in “improbable” influences often overlooked in near-term planning.

A long-range perspective also helps us recognize the importance of non-technical factors cultural, ethical, and philosophical in shaping management. Management does not evolve solely in tandem with emerging technological tools such as artificial intelligence, but also in response to shifting societal values and norms. This leads us to ask how culture, religion, or the concept of community might affect future organizations, revealing the complex interplay between the technical and the human.

Finally, contemplating a post-scarcity world and high-level automation encourages the development of axiological sensitivity. In such an environment, managers move beyond resource coordination to become guardians of meaning and values. Over the long run, ethics, trust, and responsibility toward both individuals and the environment can become as pivotal as, or even more crucial than, short-term economic objectives. Ultimately, this distant temporal lens underscores that management is a dynamic process tied to broader civilizational contexts. It also promotes flexible, interdisciplinary thinking attributes indispensable in both present-day and future organizations.

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IMPACT OF THE COVID-19 PANDEMIC ON MARKETING STRATEGIES EMPLOYED BY CRUISE OPERATING COMPANIES

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Purpose: The aim of this article is to identify and compare marketing strategies which have been employed by cruise shipping companies before the pandemic, during the crisis and currently, after the revival of the market.

Design/methodology/approach: The following methodology has been employed in this article: observation, individual case studies, analysis and critique of sources and statistical methods based on secondary sources of statistics. These methods have been helpful in characterizing the phenomenon of sea-cruises, analysing the impacts of the COVID-19 pandemic on the maritime tourism industry market and identifying marketing strategies employed by companies operating cruise ships. The character of this article is theoretical, based on the use of various studies pertaining to the analysed issues.

Findings: The article explores the models of marketing strategies used by companies operating cruise ships and compares these strategies in various marketing conditions.

Research limitations/implications The primary limitation is the use of analysis and critique methodology and relying on secondary statistical sources. Studies in the future may include observation of individual operating companies and the impact of those enterprises on the tourist markets.

Originality/value: The article presents results of research on the phenomenon of maritime tourism which are well-recognized in Poland, although not widely known around the world. The article is addressed to tourism industry entrepreneurs and students.

Keywords: maritime tourism, marketing strategies, COVID-19 pandemic.

Category of the paper: Case study.

1. Introduction

The concept of maritime tourism is linked to the use of ships for tourist cruises which are not part of otherwise standard transportation processes. A tourist has certain expectations, and travelling on a ship allows for access to various locations, with specific natural and anthropomorphic (cultural) attractions (Seweryn, 2003; GUS, 2023; Kowalczyk, 2013; Richards, 2002). A cruise-ship fulfils the role of a hotel and a means of transport, enabling

voyages to chosen regions of the world. The vessel is an attraction in itself, as it offers a variety of comforts: over-night accommodation, entertainment, sport activities, catering and numerous services for travellers, which allows the tailoring of offers to individual preferences (Altkorn, 2006; Miotke-Dzięgiel, 2002; Richards, 2002).

Maritime tourism can be described as an activity connected to marine areas involving offers of voyages on cruise-ships and other vessels and as possible activity in coastal areas (Gostomski, Nowosielski, 2019; ECORYS, 2013). The supply of services in the maritime tourism market comes primarily from operating companies offering ocean-going travel (Pallis, 2015; Gaworecki, 2003; Miotke-Dzięgiel, 2002).

Cruise-ship operators use various strategies, allowing them to increase their market participation and offer new tourist products. Selected marketing strategies supported unbroken development of the maritime tourism industry over a period of 29 years, up until 2019. The growth of the market was abruptly cut short by the emergence of the COVID-19 pandemic, which caused serious economic losses for the companies operating cruise-ships and affected the whole maritime economy.

The aim of this article is to identify and compare marketing strategies which were employed by the cruise-operating companies before the pandemic, during the crisis and currently, following the revival of the market. It appears that the strategies adopted by these companies were structured so effectively as to ensure a certain flexibility in reacting to emerging market shifts. Using a combination of strategies enabled a re-activation of the demand for maritime tourist cruising.

The identification of marketing strategies used by cruise ship operators before, during and after the COVID-19 pandemic was based on observations of individual company cases, analysis and critique of available sources describing the phenomenon under study and secondary statistical sources. The methods used made it possible to identify the essential marketing strategies, their modifications during the pandemic and the directions of strategy changes in the post-pandemic period. A limitation of the research conducted is the use of the aforementioned methods, which over-generalise the phenomenon. Future research should take into account the observation of specific ship-owning companies and the changes associated with their impact on tourism markets.

2. Characteristics of the maritime tourism market during the COVID-19 pandemic – a case study

From 2016-2019 the world supply of maritime tourist services was increasing and the largest number of tourists came from North America (tab. 1). During this four-year period the American sector transported over 55 million people on cruises. This was linked to an extensive

offer of 6-7 day-long sea trips, readily purchased by consumers (CLIA, 2019). Maritime tourism services were also becoming increasingly popular in other parts of the world due to skilfully designed and employed marketing strategies resulting in increased demand (Georgsdottir, Oskarsson, 2017). Up until 2019 the sale of these tourist services experienced stable, annual growth, and the market reached 27.5 million passengers (Cruise Market Watch).

The maritime cruise market collapsed in 2020 with the outbreak of the COVID-19 pandemic which caused a serious fall in demand for these services in the years 2020-2021 (Table 1). The pandemic became global in March 2020. At this point the World Health Organisation (WHO) declared a state of epidemic of the SARS-CoV-2 virus and governments of individual countries issued directives on freedom of movement and public assembly restrictions. From the 9th to 26th March 2020 individual cruise-operating companies made decisions on suspending tourist cruises, aligning with the epidemic regulations.

Table 1.

Transport of tourists on cruise-ships, by region, from 2016-2023 (in thousands)

Origin of Passengers	Number of transported tourists in thousands							
	2016	2017	2018	2019	2020	2021	2022	2023
United States	12403	13019	14240	15408	3008	2215	12592	18103
Western Europe	6344	6516	6731	7226	1223	1671	5433	7722
Asia	3370	4052	4240	3738	497	626	791	2329
Australia, New Zealand and the Pacific	1370	1434	1460	1351	340	7	471	1339
South America	791	799	883	935	458	89	426	997
Eastern Europe	205	192	213	263	72	32	161	332
Scandinavian Countries and Islands	241	229	225	218	52	45	131	151
Africa	144	151	154	169	68	0	88	150
Middle East	112	104	111	108	8	22	149	229
Caribbean	50	54	56	57	7	7	30	48
Central America	39	51	47	49	14	0	20	35
In total	24178	25409	26491	27508	7124	3320	20123	29065

Source: CLIA, 2019, 2021, 2023; Cruise Market Watch.

Despite observing the restrictions guidance there were 3207 cases of the virus on 45 ships, of which 71 were fatal (Teberga, Merlotti, 2020). Media reporting on the pandemic provided information on the COVID-19 fatalities on cruises. This primarily involved commentary on the *Ruby Princess*, where, out of 852 infected, 22 people died (in addition to 6 people who died later in the US), and the *Diamond Princess*, on board which 712 tourists became infected and 14 died (Hollanda, Mazzarolb et al., 2021). The term “ship of death” emerged, which seriously altered the perception of maritime cruising to one of directly endangering tourists’ lives (Damousi, 2020). The collapse of the market in terms of the demand for cruise services had a significant effect, causing an extensive spreading of the crisis into other areas of the economy linked to maritime tourism, such as the shipbuilding industry, the maritime job market, sea ports (passenger terminals), subcontractors of various services and ship-handling companies (Yazır, Şahin et al., 2020; Espinet, Gassiot, 2021).

Several large companies dominate the supply of services for the maritime tourist industry. This was the situation in 2019 and it remains unchanged in 2024 (Table 2). The four largest enterprises operate in the form of holding companies and share-holding firms, and some of the dependent companies work with their own brand offering services for various customers. This allows for more variety in the market's offers, and the tailoring of services to the expectations of specific groups of clients, with suitably priced tours reflecting the standard and the time-span of cruises.

Table 2.

Market participation of cruise-operating companies in 2016 and 2024 (w %)

Company	Number of brands owned by the company	Market participation in % (acc. to passenger numbers)	
		2019	2024
Carnival Corporation	8	41.8	36.0
Royal Caribbean International Group	3	23.8	24.8
Norwegian Cruise Lines Holding	3	9	14.1
MSC Cruises	2	8.6	7.3
Others		16.8	17.8

Source: Dias, Albergarias, 2020; Cruise Market Watch, 2024.

The COVID-19 pandemic contributed to very serious losses for the tourist cruise companies and necessitated a series of radical decisions on the nature of economic operations at the time. During the two years of the crisis the maritime tourism market shrank dramatically from 27.5 million customers in 2019 to 7.1 million in 2020, and 3.32 million in 2021. Furthermore, the number of maritime tourist companies fell from 93 before the pandemic to 81. In the United States alone the loss of jobs amounted to 164 thousand (Smirnov, Smyaglikova et al., 2022). In 2020 and 2021 the largest cruise-operating companies experienced very large losses caused by the temporary suspension of operations and the drastic reduction in the number of cruises (Table 3).

Table 3.

Net income of selected cruise-operating companies in 2019-2022 (in mld USD)

Company	Income net in mld USD				
	2019	2020	2021	2022	2023
Carnival Corporation	2.61	-10.24	-9.5	-6.09	-0.07
Royal Caribbean International Group	1.9	-5.78	-5.26	-2.15	1.70
Norwegian Cruise Lines Holding	0.93	-4.01	-4.5	-2.27	0.16

Source: calculated on the basis of: Statista, Net income of Carnival Corporation...; Net income of Royal Caribbean Cruises...; Revenue of Norwegian Cruise....

A revival of the market took place at the end of 2021, when the operators decided to conduct limited tourist operations, and in 2022 the renaissance of demand for cruises began. It returned to the same level as before the pandemic in 2023 (27.5 million passengers in 2019 and 29 million in 2023), but during the three-year period (2020-2022) these enterprises did not turn any profit (Table 2).

3. Strategies employed by companies operating on the maritime tourism market

Maritime tourism facilitates a variety of services of tourist-focused products fulfilling consumers' needs. Cruise-ships can move around the world, offering tourist services and a variety of tourist attractions linked to a specific geographical region. Offers are constructed based on market segmentation, dependent on different factors, amongst which we should list (Gostomski, Nowosielski, 2019; Georgsdottir, Oskarsson, 2017; Gross, Lück, 2011; Miotke-Dzięgiel, 2002):

- organisation of sea tours – as regular cruises (touring lines) or irregular voyages (thematic, sightseeing, specialised, motivational and trekking),
- tailored to a specific type of client – selection of a form of services provided: mass, luxury, tourist, niche and specialist,
- competing strategies – ways to stand out from competitors, with most often employed strategies including: cost leadership, product superiority, market niche, differentiation based on innovation,
- methods of generating income – a pricing policy aimed at specific clients, methods of calculating costs for services: low-priced tours but high-priced onboard services, all-inclusive offers,
- geographical range of the tours – regional, national, international, inter-continental and global.

The mechanism of strategy selection by ship owners and operators depends on various factors and is usually connected to the identification of the end user and an understanding of the nature of the services to be provided. The motivation and needs declared by consumers give important information necessary in identifying the market segment which will offer suitably increased value, meaning a combination of numerous elements, such as the attractions provided during the cruise and the quality of the on-board hotel service (Gross, Lück, 2011; Akter, Valdez et al., 2021; Equifax). Improved tailoring of the offer to clients' expectations is possible by understanding such factors as the age group, demographic, marital state, individual preferences and disposable income (Figure 1).

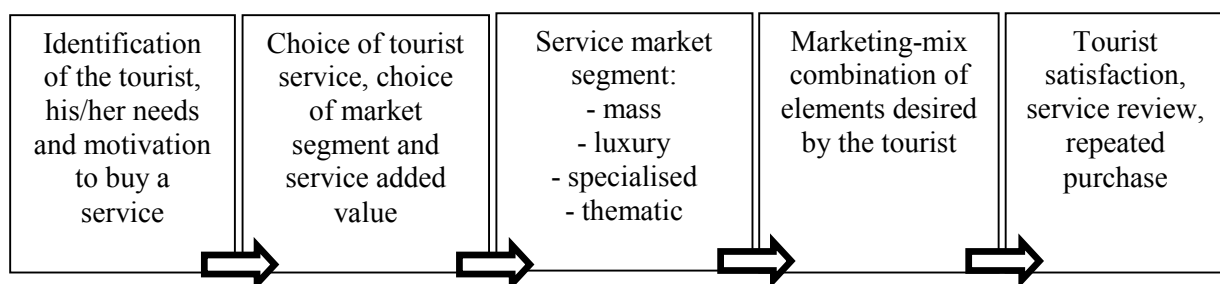


Figure 1. Model of identification and segmentation of tourists purchasing marine cruises.

Source: author's own analysis.

The majority of companies operating cruise ships employ a combination of various market strategies, allowing them to sell their products most effectively. The most frequently employed strategies include (Gracan, 2016; Altkorn, 2009; Miotke-Dzięgiel, 2002):

- market penetration, often employed by companies who own/operate cruise ships with a large passenger capacity and who are interested in the mass sale of cruises, often lasting not longer than a week (eg. on the Caribbean Sea, Mediterranean or Baltic),
- market development, where the companies use a strongly-developed international segmentation, often offering their services to clients from a country in which this kind of tourism has not been popular; the fundamental tool here could be a marketing-mix (e.g. the Polish market and offers in the media and online),
- product development, involving continuous improvement of the offer, implementing changes, with new cruise-ships and cruise programmes, to attract new, or retain old clients,
- diversification, linked to the introduction of technical and organisational innovations, the introduction of more attractive cruise vessels and new types of tours, combining different tourist attractions (eg. sea-land combined tours, around the world cruises, tours featuring well-known celebrities etc.).

In practice, the ship operators employ different strategies taking into account the end market and the tourist product, often combining various solutions to ensure success. The market offer is strongly differentiated, and for this reason different models of client-service-provider relations are being introduced (ECORYS, 2013; Pietras, 2001; Gracan, 2016). We can distinguish a mass model which is based on a price penetration strategy, ensuring the large-scale production and sale of tourist cruises. Ships with a large passenger capacity are used here, allowing for economy of scale. The model of high quality is based on a quick profit strategy, maximising high unit profit. The tourist receives a service of high quality and clearly discernible added value. The concept of niche operation is a model using a premium price strategy. Tourist services here are highly personalised and provide a high added value for the client, on small luxury vessels, and to destinations which are highly exotic and original. The low-cost model is linked to the low-supply, demand and limited marketing. These are cheap tours with a basic tourist profile, or aimed at particular clients with specialised interests (eg. anglers, sailors or scuba divers).

4. Strategies used by companies during and after the COVID-19 pandemic

The pandemic had caused a temporary suspension of tourist activities and the gradual removal of restrictions demanded the implementation of sanitary procedures and a limitation on the numbers of passengers transported on ships (EU HEALTHY GATEWAYS, 2020;

EMSA, 2020). This situation forced the operating/owning companies to change the operating model and introduce strategies to optimise spending costs, which included (Espinete, Gassiot et al., 2022; Bureau Veritas):

- reduction of the fleet by the selling and scrapping of the oldest ships and those with the highest running costs; in 2020-2022 as many as 35 cruise-ships were scrapped (Cruise Arabia & Africa),
- employment reduction,
- partial reduction of the cruise offer (simplifying programmes of the tours),
- limitation of mass marketing (because of pandemic restrictions),
- taking over of small operating companies by large tourist enterprises,
- setting in motion bankruptcy mechanisms in cases of companies incurring losses while lacking a vision to rescue their operations or arrange resale,
- introduction of flexible policies linked with Future Cruise Credit (FCC),
- delays in ordering new vessels and collection of those already constructed,
- implementation of crisis management.

For ship owning/operating businesses the time of the pandemic was extremely difficult and resulted in a reappraisal of previously accepted strategies. The specifics of the pandemic crisis limited the possibilities to employ such strategies as market penetration and economy of scale which led to serious losses for the largest operators owning big cruise-ships and incurring high operational costs (tab. 3).

One of the measures employed to remedy the situation was a flexible approach to the sale of services in terms of booking deadlines and cancellations. Various forms of credit were introduced for passengers: Future Cruise Credit, Future Cruise Deposit and Onboard Credit. These kinds of credits facilitate pre-sale, purchase of services on board, changing of dates and recompense from the service provider (Espinete, Gassiot, 2021; Chrusciel, 2020; Princess). Companies offering niche and luxury services were more able to react to pandemic restrictions. Because of lower operational costs they could reinstate the cruises quicker than the large operators.

The maritime tourism market recovered its pandemic-related losses relatively quickly, by 2023 reaching a figure of 29 million passengers, and it is envisaged that in subsequent years it will only continue to grow (Table1). The owning/operating companies used their crisis-time experiences to their advantage, adopting a new approach to their operations to heighten the experiential value and satisfaction of clients during cruises. This demanded a departure from the model of structuring services around a hotel-ship in favour of cruise-ships which became a platform offering numerous, varied experiences, supported by the latest available on-board technology (Espinete, Gassiot, 2021). In addition, measures were introduced aiming to decrease the flexibility of demand by employing price strategists and pre-sale systems including optimisation of mark-ups/margins and discount policies (price promotions). The pandemic also

contributed to a better understanding of the importance of the marketing message and the building of public relations online, and how it opens an equally valid channel of service-distribution enabling booking and payments.

At present, maritime tourism is criticised for causing very high pollution of the aquatic eco-system, which is linked to fuel emission, waste generation, discharging untreated bilge and ballast waters and a large amount of sewage. As new vessels are being built, guidance included in such Conventions as the International Convention for the Prevention of Pollution from Ships (MARPOL), Ballast Water Management (BWM) and International Convention for the Safety of Life at Sea (SOLAS) and regulations on energy efficiency should be taken into account.

5. Conclusion

Analysis of the operations of maritime tourism businesses in different periods of their activity demonstrates a high degree of flexibility in adopting marketing strategies which depend on given market situations. In the pre-pandemic period these companies employed market penetration and economy of scale strategies, which resulted in mass production of maritime tourist services (mainly the market of the Caribbean and the Mediterranean). The COVID-19 pandemic necessitated the adoption of strategies such as cost optimisation and survival. Presently, in the aftermath of the pandemic, companies are employing strategies of product development and diversification and flexible systems of pre-sale, strengthened by suitable media promotion. Analysing the strategies used in different periods, it can be noted that there is a constant necessity to tailor the strategic principles to the current state of the market. A suitable choice of strategy during the pandemic allowed the majority of the companies operating maritime cruises to survive. Improvement of the tourist product and distribution systems by the operating/owning companies ensures that demand for maritime cruises is constantly growing.

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INTELLIGENCE – EMOTIONAL VS. ARTIFICIAL INTELLIGENCE IN DECISION MAKING

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Purpose: The purpose of the article is to present the impact of emotional and artificial intelligence on the decision-making process. To check whether the decision-making process, despite the dynamic development of digitalization, is also based on emotions.

Methodology: The analysis of the topic was carried out based on a literature review and original research using the CAWI method.

Findings: Artificial and emotional intelligence complement each other in the context of decision-making. The hypothesis that the decision-making process, despite the dynamic development of digitalization, is also based on emotions was justified.

Research implications: The obtained results are a starting point for further research in the analyzed area. They do not generalize to the entire group of students, but show generational trends in the process of changes in decision-making, taking into account emotions and the development of artificial intelligence. The study should be conducted on a larger sample of respondents.

Practical implications: In the face of digital tools, it is important to encourage reflection on emotions that are difficult to capture in the algorithm. Combining emotions with the possibilities offered by artificial intelligence in the era of rapid decision-making is the right direction in the study of the relationship between emotional intelligence and artificial intelligence. In future studies, it is worth examining the role of AI and changes in the level of EI among the young generation, i.e. conscious use of emotions in life, their impact on mental state and functioning.

Social implications: Awareness of one's own emotions and control over them is a key element of the decision-making process. Although the dynamic development of artificial intelligence plays a role in decision-making, the synthesis of emotions (EI) with digitization (AI) can contribute to deeper reflections and better decisions. Therefore, it is worth educating the community about the development of both EI and AI.

Originality/value: The article reflects on the relationship between emotional and artificial intelligence in the domain of human intellect within the context of the decision-making process. It highlights the emerging interference of AI in human activities. It gives hope that human emotionality, through heuristics, will be an alternative to decisions suggested by AI, which all people should be aware of.

Keywords: Emotional Intelligence, Artificial Intelligence, Decision-making.

Category of the paper: Research paper.

1. Introduction

Interest in emotions is currently experiencing a renaissance, especially in the context of artificial intelligence development. Currently, the focus on emotions is not limited to psychology or sociology but also extends to scientific disciplines such as economics, management, and biological sciences. Emotions, analyzed as a significant element of personal, professional, and social life, are a subject of interest in the context of human activity – decision-making processes, interpersonal relationships, and functioning in the digital world. The combination of two variants – emotional and digital – seems to be very important today. Psychological research proves that humans have "two minds": rational – conscious, reflective, and emotional – fast, impulsive (Kahneman, 2012). Decision-making is based on the symbiosis of emotions and rationality. The dynamic progress of digitalization, along with the developing artificial intelligence, is becoming a daily occurrence in decision-making and problem-solving. AI can increase the efficiency of performed activities and significantly streamline the decision-making process. By analyzing large amounts of data, it plays an increasingly significant role in our lives, impacting the world and human functioning (Mosbah, 2020). It dominates and directs our actions – for example, which way to drive, what to buy, what music to listen to. It becomes a "prompter" of how to live, facilitating decision-making. The essence of human functioning is the awareness of its influence on life – consciously, emotionally verifying the content "suggested" by it.

The aim of this article is to attempt to present the impact of intelligence – emotional and artificial – in the decision-making process. The assumption of the work is to verify that the decision-making process, despite the dynamic development of digitalization, is also based on the emotional sphere. The analysis was conducted based on a literature review and original quantitative research. The pilot study was conducted on a group of students from the University of Warsaw, was anonymous, and conducted using the CAWI method.

The work is divided into subsections discussing both types of intelligence and presenting, in the context of original research, their impact on the decision-making process, understood as the ability to make effective choices leading to desired results.

2. Emotional Intelligence as Emotional Awareness

Emotions accompany us at every stage of life and in every situation. They are an element conditioning our behavior, social relations, and also the decisions we make. Although they are well-known, we can name and distinguish them, they are difficult to define. Among

psychologists, there is agreement that a clear definition of emotions is difficult, complex, associated with feelings or moods, and multifaceted (Dąbrowski, 2012).

The concept of "emotional intelligence" (EI) invariably arouses great interest. Despite the passage of time, it appears not only in scientific literature but also in popular magazines, guides, and daily press. Its fame is due to the popular publications of Daniel Goleman "Emotional Intelligence" and "Working with Emotional Intelligence" (Goleman, 1997, 1999), although its creators are Peter Salovey and John D. Mayer (Mayer, Salovey, 1999). The popularity of these works stems from the search for non-intellectual factors conditioning success in various areas of life.

Emotional intelligence, alongside other individual predispositions, can allow us to predict human functioning. Besides, even if emotional intelligence and related socio-emotional competencies did not determine life success, understanding oneself and accurately reading one's own emotions certainly facilitate coping in difficult situations (Jaworowska, Matczak, 2005). This understanding of emotional intelligence is adopted in this paper.

Researchers agree that emotions, accompanying us from birth, serve as an alarm system for all changes occurring in the individual and their environment, shape and support thinking, directing attention to what is important, and help to better understand what is happening within us (Mayer, Salovey, 1999).

Most generally, emotional intelligence is defined as a set of abilities conditioning the use of emotions in solving problems in social situations. It is the totality of abilities conditioning the effectiveness of processing emotional information (Jaworowska, Matczak, 2001). It is often identified with a set of dispositions including, in addition to abilities, motivation and perseverance in pursuing goals despite failures, regulating mood and not succumbing to worries that impair the ability to think, empathizing with the moods of others, and looking optimistically at the future (Goleman, 1997). Thus, it facilitates coping with stress, achieving set goals, and promotes experiencing life satisfaction (Mayer, Salovey, 1999). According to Bar-On, it constitutes a series of non-cognitive competencies and skills that enable coping with externally imposed demands (Jaworowska, Matczak, 2001).

The development of EI begins with mastering the most basic skills in the perception and expression of emotions and progresses towards reflective and conscious regulation. Characteristic of Salovey and Mayer's model is the treatment of acquiring emotional skills as a continuous process – lasting throughout life. It begins with learning to recognize one's own and others' emotional states and differentiating them. Next, the abilities to understand the relationship between thinking and emotions, to tolerate various emotional states and moods within oneself, and to use emotions as stimulants of thinking are developed. The next level concerns understanding and analyzing emotions and using knowledge about emotions, the ability to experience, accept, and understand them. The last, highest level refers to the awareness and reflectivity of emotion regulation to ensure emotional and intellectual development (Maruszewski, Ścigala, 1998).

An emotionally intelligent person is more susceptible to change, does not close themselves off in the world of their own views, can delegate powers, and trust colleagues. In the report published by PricewaterhouseCoopers (PWC) "Leadership of the future. Polish leader ready for change?" (PricewaterhouseCoopers, 2016), the characteristics of the leader of the future are presented. Alongside the necessity of keeping up with digital technologies, the key competencies of leaders are emphasized: openness and flexibility, using intuition based on knowledge and experience, supporting diversity – delegating powers, attentive communication, quality management, focusing on values such as knowledge, ethics, and interpersonal relations.

The concept of emotional intelligence also appears in the ManpowerGroup report (2017) as one of the desired traits in the labor market. The upcoming changes are described as a "skills revolution in the human age." Emotional intelligence also appears as one of the key skills in the World Economic Forum's The Future of Jobs Report (World Economic Forum, 2018). The opinions contained in the cited reports seem to confirm the validity of the assumption that emotional intelligence is worth being interested in not only in the area of personal life but also in the area of professional life.

3. Artificial Intelligence – The Non-Emotional Part of the Decision-Making Process

Artificial intelligence (AI) is finding increasingly widespread application in various areas of our lives. One of the originators of this term is considered to be John McCarthy, who presented the concept of artificial intelligence as a system consciously perceiving the environment, which reacts in a way that aims to maximize its own chances of success (Makowski, 2023). It is defined as a system that bases its operation on a machine and predicts, recommends, and also makes decisions for human-designed goals, thereby influencing the real or virtual environment (Osiej, 2022). AI is a term used to describe cognitive processes, such as learning, understanding, information processing, acquired by machines. It can take various forms, including technical infrastructure (i.e., algorithms), a part of a process, or a product for the end-user. This understanding of artificial intelligence has been adopted in this paper.

It is a field of computer science that deals with the creation of systems and technologies capable of performing tasks requiring human intelligence (Ziółkowska, 2023). Machine learning is a term that refers to an area of artificial intelligence related to algorithms that automatically improve through experience (Kłoczko, 2024). It is used to teach machines how to handle data more efficiently (Hui, 2023). Deep learning is considered a subcategory of machine learning and involves generating deep neural networks (Chassagnon et al., 2020).

Deep learning is based on training computers, using advanced algorithms, to learn independently by recognizing patterns using processing layers (Sas, 2024). In addition to machine learning, AI domains such as natural language processing, which enables machines to understand human speech and process and generate it, have been distinguished in the literature (Jurafsky, Martin, 2023). AI domains also include image processing through image recognition and machine vision (Kulp, 2023), enabling devices to identify and classify objects by understanding the visual world. AI techniques enable the transformation of large datasets into useful insights (Nakamoto, Takasugi, 2023), which are a source of valuable information and a basis for formulating forecasts (Sagiroglu, Sinanc, 2013).

4. AI and EI in the Decision-Making Process – From Theory to Everyday Life

In 1959, John McCarthy (McCarthy, 1959) proposed the concept of a machine that would advise humans in their life affairs, guided by so-called "common sense". Today, people seek answers to all their pressing questions in internet search engines and integrated chats, confirming the fact that artificial intelligence is verifying McCarthy's assumptions. This need for dynamism, ease, and speed in acquiring information is based on the current way of life. Research in the field of decision theory or computer-aided problem-solving was already introduced by Herbert A. Simon (Simon, 2000). In 1978, he received the Nobel Prize for groundbreaking research on the decision-making process in economic organizations and the theory of bounded rationality. In his considerations on decision-making, he concluded that human rationality is limited in two ways – internally (due to the imperfections of our minds) and externally (due to the environment and social interactions). Perception, cognitive operations, and learning to make decisions were significant in his considerations. The starting point was the assumption that an individual strives to maximize many goals, does not have complete information about possible alternatives, and the decision-maker does not have sufficient computing power to make appropriate comparisons. Due to limitations, the subject does not follow the principle of optimization but satisfaction. The idea of bounded rationality took into account the limited processing capabilities of the human mind. After all, people reason and act rationally within the boundaries set by finite search and calculation abilities. These simplifications are now artificial intelligence, through available digital tools (Meyer, 2007).

The decisions made determine the paths of further action. It is essential to make choices based on drawn conclusions and refer to recognized values and facts. Decision-making processes serve to solve problems that can be well-structured or unstructured. The difference lies in their good understanding, categorization, and consequences. Structured problems can be

quantified, their solution is possible using mathematical models, and the elements of the decision-making process can form an algorithm, conditioned by a logical sequence of actions. Unstructured problems can only be presented qualitatively, in the form of a verbal description, require creative thinking, and their solution cannot be subordinated to algorithms (Łabuz, 2019).

The decision-making process itself includes a logically related group of mental operations, arranged in the appropriate order, enabling the assessment of the decision situation and the selection of the most advantageous variant. The factor triggering decision-making processes is a problem situation.

The complexity of the decision cycle and the variety of possible situations make it impossible to unambiguously present a recommended course of action. In the literature, there are discrepancies regarding the number of phases of the decision-making process, but they always constitute a logical sequence of actions leading to the selection of the most advantageous solution. Due to decision uncertainty, the decision-making process is associated with the psychological conditions of management, prompting decision-makers to consider uncertainty and risk (Byczkowska, Kuciński, Trocka, 2022).

Creating ideas for problem solutions is an extremely difficult task and possible only when the decision problem is formulated correctly and the necessary amount of reliable information is collected. The methods used in the decision-making process depend on the nature of the problem. Well-structured ones are most often solved using methods from the field of operations research. Herbert Simon defined operations research as "systematized analytical methods, often using complex mathematical apparatus in the process of making decisions related to management" (Simon, 1982). In contemporary research, the use of operations research techniques is often simply identified with conducting quantitative analyses supporting decision-making. Although the possibilities of applying these methods are very large and constantly increasing, there is no indication that they can be used to solve all issues related to decision-making. In situations where the decision concerns issues of a purely qualitative nature, the above tools prove to be unreliable (Holska, 2016).

When searching for solutions to a decision problem, especially an unstructured one, the heuristic method is used. It is a practical rule of conduct, based on experience, used in decision-making, regulating the process of evaluating or solving problems without using an algorithm. It is recognized as a mental shortcut based on associations, experience, and recollections.

The difference in using the problem-solving method is based on the fact that an algorithm is an exact recipe for solving a task, and a heuristic is a useful hint, not defined by a rule, based on an intuitive assessment of reality (Nosal, 2011). The development of the solution itself is subject to valuation in the decision phases, and the best option is selected. The decision-making phase is associated with the act of will of the decision-maker, which is the starting point for specific actions, outlining the path to solving the problem situation. The decision becomes

a reality only when it is implemented. And its effectiveness is the result of the effectiveness of the action that brings it into effect (Holska, 2016). Thus, the decision-making process is the recognition and definition of the essence of the decision, the separation of various possibilities, the selection of the "best" of them, and its implementation (Szarfenberg, 2002). Decision-making is a process that concerns each of us and is an integral element in private and professional life (Łabuz, 2019).

Based on the above considerations, for the purposes of this paper, an original definition of the decision-making process was adopted: The decision-making process is a way of making decisions based on understanding the problem and subjectively selecting (according to the decision-maker) the optimal way to solve it.

Based on a literature review and the definition of terminology, an original quantitative study using the CAWI method was conducted among students of the University of Warsaw. It was anonymous and consisted of 7 closed questions. Through the University Student Service System (USOS), a link to the survey was sent to students. The respondents were informed about the purpose of the study, anonymity, and collective processing of results. The study was conducted from January 6 to 31, 2025. 109 students of the University of Warsaw, studying at the Faculty of Journalism, Information, and Book Studies, participated. Respondents represented full-time and part-time studies, first (bachelor's) and second (master's) degree. Participation in the study was voluntary. Students were sent a digital survey via the University Student Service System (USOS). A limitation during the study was the low activity of students in completing the survey form.

The study was pilot in nature, allowing attention to be paid to the way students make decisions. Conducting the study among WDIiB students was important, as they are people acquiring knowledge in the field of social communication and media science, which is significant in the area of the impact of emotions and digitalization on decisions made.

As a result of the study, women constituted the majority (67%). The 18-20 age group dominated (55.7%). The overall results are presented in Figure 1.

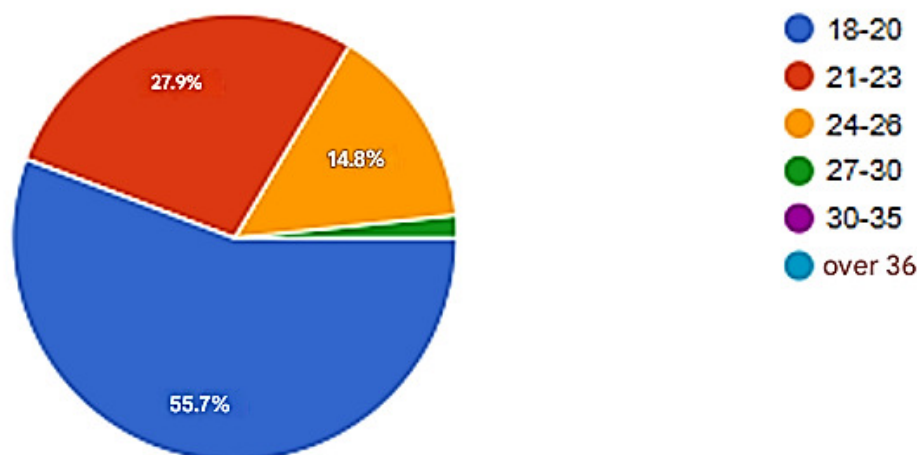


Figure 1. Age of respondents.

Source: own elaboration.

The aim of the study was to understand the respondents' attitudes towards decision-making, the significance of emotions, and rationality.

The first question, multiple-choice, concerned the respondents' subjective assessment of their decision-making. The following terms were included in the cafeteria: easy, difficult, stressful, emotional, rational, time-consuming, impulsive. The dominant term was decision-making as stressful (47.5%), followed by emotional (41%), rational and difficult (39.3%), time-consuming (31%), impulsive (21.3%), and easy (20%). From the obtained results, it can be inferred that the decision-making process is considered rather stressful and emotional, which would confirm the fact that emotional awareness is significant in this process. Thanks to it, we identify and name moods and manage emotions.

A follow-up to the previous question was to indicate the guiding factor when making decisions. Among the possible answers were: emotions, facts, both factors, and none of the above. The majority of respondents indicated facts and emotions as important for the decision-making process (82%). The overall results are presented in Figure 2.

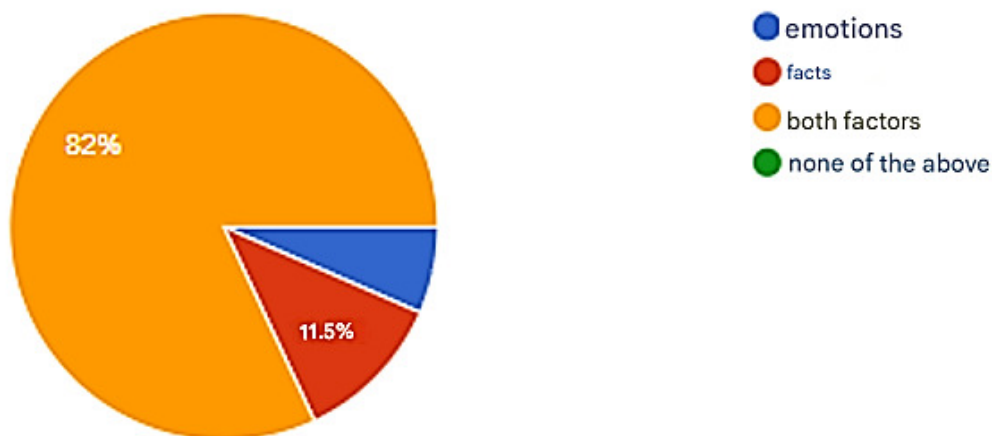


Figure 2. Factors influencing decision-making.

Source: own elaboration.

Considering decisions based on facts demonstrates human rationality, but emotions always accompany actions taken. This may prove the dual nature of the human mind (conscious and rational) as proclaimed by Kahneman.

To verify the impact of AI on the decision-making process, respondents were asked whether the development of AI has an impact on the speed of decision-making. 54.1% of respondents agreed with the affirmation. The overall results are confirmed by Figure 3.

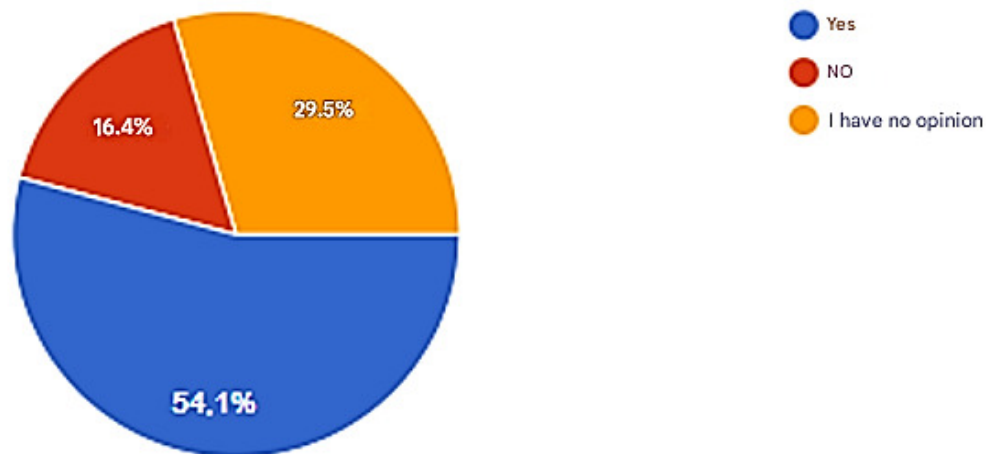


Figure 3. Impact of AI on the speed of decision-making.

Source: own elaboration.

The divided result may stem from the unconscious use of AI in the decision-making process. Young respondents treat AI tools as the primary source of information, often without considering the consequences of their impact on decisions.

Based on the above question, the possibility of making decisions without the involvement of emotions (Figure 4), solely relying on rationality, as well as the possibility of emotionality being dominated by rationality in the decision-making process (Figure 5) were verified. The aim was to verify the respondents' awareness of structured/unstructured decisions.

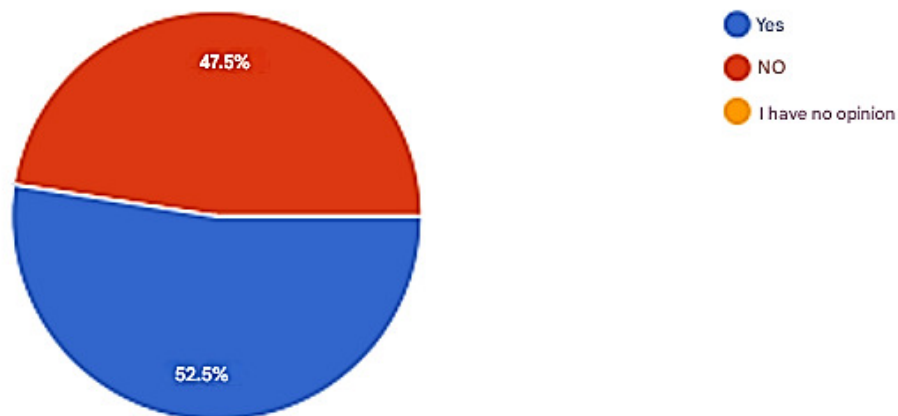


Figure 4. Making decisions without the involvement of emotions, based solely on rationality.

Source: own elaboration.

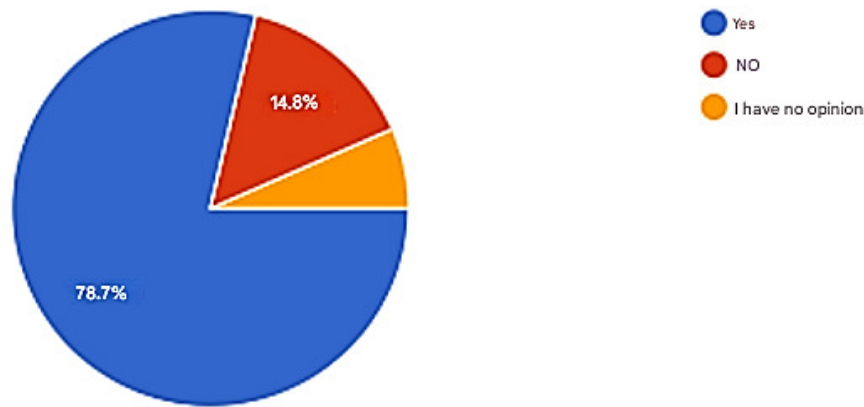


Figure 5. Dominance of rationality over emotionality in the decision-making process.

Source: own elaboration.

The respondents' answers indicate the dominance of rationality over emotions. This stance may result from experiencing easier and quicker actions based on AI. This is compatible with the results presented in Figure 2.

The question regarding the impact of AI-generated messages on the decision made aimed to draw attention to the content that respondents use when making decisions (its reliability and credibility).

The answers provided (Figure 6) were varied. The aspect of unconsciousness, speed in solving the problem, or self-sufficiency in decision-making processes probably had an impact.

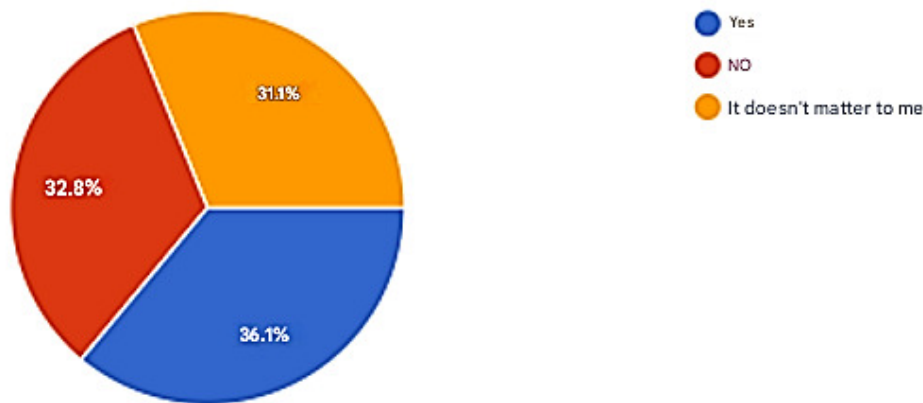


Figure 6. Impact of AI-generated messages on the decision made.

Source: own elaboration.

The last question concerned the influence of social relations on decision-making processes. In this regard, respondents were asked whether they rely on the opinions of others when making decisions. This was a counter-question to the previous one, regarding AI-generated content as a source of decision-making. A significant portion of respondents answered affirmatively (Figure 7), with 77%. This confirmed the importance of interpersonal relationships in the decision-making process.

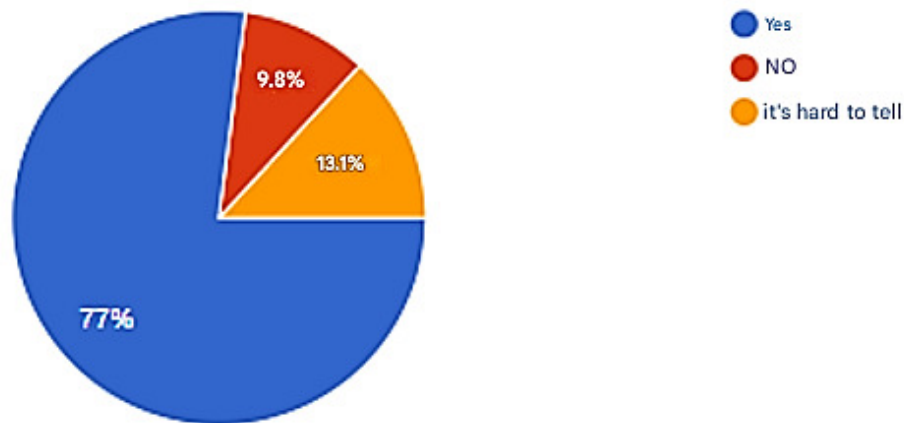


Figure 7. Opinions of others when making decisions.

Source: own elaboration.

The obtained results are not surprising, as a significant portion of respondents are digital natives. AI integrates into their daily activities, often automatically and unconsciously, minimizing heuristic methods. However, in accordance with the assumption adopted in the article, artificial and emotional intelligence complement each other in the context of decision-making. The hypothesis that the decision-making process, despite the dynamic development of digitalization, is also based on the emotional sphere has been justified.

The obtained results serve as a starting point for further research in the analyzed area. They do not represent a generalization for the entire group of students, but they do show generational tendencies in the process of change occurring in decision-making, taking into account emotions and the development of artificial intelligence. The study should be conducted on a larger sample of respondents.

5. Summary

Intelligence, until recently reserved exclusively for living and rational beings, now applies to digital entities and is realized in both technical and natural processes. Modern tools like GPT, Copilot, and Gemini allow the use of the potential of both human and digital intelligence. At the center of this phenomenon is the interaction of humans as emotional, rational beings with machines. The technological revolution is changing daily life, making digital tools indispensable companions of human existence. Artificial intelligence (AI) is entering the domain of content creation, challenging the traditional roles of human creators. In a time when convenience intertwines with the speed of actions, the decision-making process is undergoing changes. People give credence to machines to obtain ease of results and answers.

The aspects discussed in the article concern the changes taking place in the realm of emotions – rationality – decisions. Learning through algorithms, by recognizing patterns, increases the efficiency of AI messages. At the same time, it limits human cognitive abilities. The human mind has unlimited analytical capabilities; AI is a response to a programmed strategy. Artificial intelligence has no emotions, although it tries to learn them, but will these feelings be equivalent to human ones? Decision-making in the analyzed context is a reflection on the future of human independence from AI.

The article, which is a reflection on the relationship between emotional and artificial intelligence in the area of human intellect in the context of the decision-making process, draws attention to the emerging interference of AI in human actions. It gives hope that human emotionality, through heuristics, will be an alternative to the decisions indicated by AI.

In the face of digital tools, it is important to encourage reflection on interpersonal skills, where empathy and mutual relations are difficult to capture in an algorithm. Combining emotions with the possibilities offered by artificial intelligence in the era of rapid decision-making is the right direction in research on the relationship between emotional and artificial intelligence. In the perspective of further research, it would be necessary to focus on the issue of the place of artificial intelligence and changes in the level of emotional intelligence of the young generation, i.e., the conscious use of emotions in life, their impact on one's own state of mind and functioning.

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TRENDS IN EMPLOYEE BENEFIT PACKAGES WITHIN THE IT SECTOR

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Purpose: The paper explores trends in employee benefit packages within the IT sector, aiming to understand the evolving expectations of IT professionals and how companies adjust benefits to attract and retain talent.

Design/methodology/approach: To achieve the goal, a critical analysis of the literature and thematic analysis of existing materials such as reports on employee remuneration were carried out. It examines current trends in employee benefit packages within the IT sector, focusing on how companies adapt their offerings to meet evolving employee expectations.

Findings: The research results indicate that there are discrepancies between employee expectations and the benefits offered, which highlights the need to further optimise benefit packages.

Research limitations/implications: As the reports used in this study come from different years (2023 to 2025) and may not be fully comparable, this variation should be acknowledged as a limitation of the research.

Practical implications: Companies must tailor benefit packages to attract and retain IT talent. Flexible work arrangements and well-being initiatives should be prioritized. Failure to offer competitive benefits may lead to higher turnover and increased hiring costs. HR policies should adapt to changing employee expectations, integrating more personalized benefits.

Social implications: The research promotes better work-life balance and well-being for employees. The findings may influence labor policies to support flexible work arrangements across industries.

Originality/value: The paper provides insights into emerging trends in IT sector benefits, highlighting shifts in employee expectations. It offers practical recommendations for HR professionals, IT companies, and policymakers to enhance employee satisfaction and retention.

Keywords: employee benefits, salary packaging, IT sector, optimization of employee benefits.

Category of the paper: Literature review.

1. Introduction

Due to changes in the socio-economic environment, the benefits package has undergone many transformations over recent years. Emerging crises such as pandemics or wars have also strongly influenced the change in employee attitudes and preferences in this area, which is visible, among others, through phenomena such as quiet quitting or job cushioning. Today, employee benefits play a significant role in shaping desired employee behaviors. An ageing society, greater diversity of employee teams, changing socio-cultural patterns and different employee needs strongly determine the change in the approach to creating a benefits package by employers. And these become an important element of the total rewards package, which is becoming one of the main tools in the war for talents (Ford, Jong, 2024; Fulmer, Li, 2023).

The growing importance of benefits is observed especially among younger generations and also in some industries, such as IT. An attractive benefit's package currently constitutes an added value for an employee and is a significant argument for accepting a job offer or staying in the organisation. According to research, these non-financial components of remuneration may have an even greater impact on employee satisfaction and motivation than financial rewards (Mura et al., 2019). However, the literature on employee benefits is still relatively sparse (Ford, Jong, 2024; Fulmer, Li, 2024; Cotton, 2018; Murray, Dulebohn, 2021).

Hence, the aim of this article is to fill this literature gap and provide a preliminary understanding of how employee benefit packages are shaped in organisations from the IT sector. In a sector characterized by a high employment rate of younger generations who place significant importance on an attractive compensation package, including a comprehensive benefits package. To achieve the objective of the article, a critical analysis of the relevant literature was conducted, as well as, the content analysis of available salary reports from companies within the IT sector.

2. The nature of fringe benefits in the light of the literature review

Employee benefits are various non-financial supplements to remuneration, most often in the form of non-financial benefits for employees and their dependants, paid in whole or in part by the employer (Fulmer, Li, 2023). It is therefore one of the components of the total reward package offered to an employee for his or her work in the organization (Table 1). It extends beyond the employee's monthly financial salary (De Vos, Meganck, 2009), and the employer utilises it to balance and moderate the remuneration package (Casper, Buffardi, 2004), optimize costs (Cascio et al., 2019), and create added value for the employee (Fulmer, Li, 2023).

Table 1.*Model of Total Reward*

Type of ingredients	Component
Non-financial components	Employee benefits e.g. health care, multisport card, company car
Financial components	Long-term variable remuneration (LTI), e.g. profit sharing, stock options
	Short-term variable remuneration (Short-term incentives), e.g. bonuses and awards
	Base salary (Pay)

Source: own study.

Employers' motives for providing benefits have changed over the years (Casper, Buffardi, 2004; Martin, 2020). Initially, employee benefits did not have much motivating power, and employers mainly offered benefits supporting work performance, such as work clothes or equipment to facilitate work. However, employees quickly got used to them and considered them an integral part of their remuneration. Over time, employers have also appreciated the opportunities offered by using benefits as motivational instruments (Beck-Krala, Walczyk, 2010), and this was facilitated by changes observed in the labour market and emerging crises such as the COVID-19 pandemic (Shtembari et al., 2022).

From the employer's perspective, benefits support the human capital strategy which, integrated with the business strategy, achieves the organisation's goals (Cotton, 2013). The use of benefits helps employers increase the return on investment in employee remuneration as they contribute to the implementation of the remuneration function (Borkowska, 2021), being an important asset in the process of attracting candidates to work and retaining employees in the company (Martin, 2020). Research shows that nearly 51% of employees would consider switching employers if the rewards package did not include benefits that are important to them (Report Benefit Trendbook, 2025). They are therefore a key element in building an effective employer branding strategy (ETC, 2023) and in the war for talent (Herman, 2019; Carter, 2008), especially in an era of demographic decline. In addition, benefits support employee development and the process of skills upgrading (Borkowska, 2021). Nowadays, they are also perceived as an important motivational tool, especially when it comes to benefits related to financing employee development, broadly understood (Nemeckova, 2017). Benefits also influence employee motivation through perceptions of fair treatment and adherence to the principles of the 'psychological contract' and the delivery of previously promised benefits (Lucero, Allen, 1994). Research confirms that employees who perceive that the organisation cares about them through an attractive benefits package are more motivated to act (Dulebohn et al., 2009; Werner, Balkin, 2021). The positive impact of benefits on employee motivation and job satisfaction (especially those related to insurance and pension benefits) is confirmed by the work of Kozarevic et al. (2014). Satisfaction with the benefits package translates into employee loyalty and willingness to stay in the organisation because they know that the employer cares about their needs (Siyal, Garavan, 2020). This has a positive impact on employee engagement, which leads to improved job performance (Dugguh, Iliya, 2018) and hence organisational outcomes.

From the employees' point of view, they represent additional value that employees receive for their contribution to a particular organisation. In addition, the benefits offered help employees to fulfil their work and family commitments, meeting important needs and individual expectations (Casper et al., 2004; Beck-Krala, Walczyk, 2010). Since the pandemic, benefits have also been seen as a key tool for creating well-being at work and thus improving quality of life (Beck-Krala, 2022; Shtembari et al., 2022). Moreover, the use of benefits reflects the employer's application of the principles of social justice, which in the era of sustainable development is becoming an important tool of the Diversity, Equity and Inclusion (DEI) strategy.

To sum up, the literature on the subject indicates that benefits influence work outcomes, support changes in employee behavior, reinforce new values and business goals, and express and strengthen the changing organisational culture (Flannery et al., 1996; Shtembari et al., 2022).

3. Creating the benefits package

The importance of benefits has grown rapidly over the last decade, as evidenced by the systematic increase in benefits expenditure, which in some organisations has reached up to 40% of salary costs, for example in the public sector in the US (Fulmer, Li, 2023). Therefore, a strategic approach to building employee engagement through the ability to create a personalised benefits package seems necessary. It is also crucial to consciously use the benefits package to achieve long-term business and organisational goals, but also to strengthen the organisational culture and build a competitive advantage (Shtembari et al., 2022). What distinguishes benefits from other components is their supportive role and the mobilisation of employees to take important actions and initiatives. However, for this to be possible, the benefits package should be diversified and tailored to individual organisations (this is often sector-specific) and job groups (Merritt-Hawkins, 2020; Mosley, Miller, 2019). Only such an approach will help to create a competitive advantage (Werner, Balkin, 2021).

The right package will attract employees with specific attitudes, values and skills, in line with the so-called 'sorting effect' (Shaw, Gupta, 2015). Practitioners point to the need to know the so-called sectoral norms and customs related to the use of benefits (Werner, Balkin, 2021), which should be taken into account in the process of creating a benefits package. When designing a benefits strategy, important decisions are made about the flexibility of the package, the communication of the package, the platforms and the rights to use individual benefits. These decisions have an impact on the benefits and outcomes of the packages used and directly on employee and organisational outcomes.

The fundamental issue is dialogue with employees and research into the needs and expectations of a specific group of employees, which will help to indicate the most important benefits for employees of a given organisation that the employer should offer. In this context, it is worth taking a look at the classification of benefits and the different types of benefits (Table 2) that can be used by the employer. Benefits are the broadest group of remuneration components, which is why it is difficult to provide a uniform and exhaustive typology of benefits.

Taking into account their form and content, they can be divided into tangible and intangible benefits and traditional and non-traditional benefits (Muse, Wadsworth, 2012; Werner, Balkin, 2021). On the other hand, in terms of legal form, there are mandatory and non-mandatory benefits in every country (Beck-Krala, Walczyk 2010). A distinction is also made between universal benefits (offered to all employees) and selective benefits (offered only to certain groups of employees). A further distinction is made between benefits related to work input, employee performance and employee needs.

Table 2.
Division of additional benefits and their examples

Fringe benefits	
Category	Example
transport	company car, free parking,
residential	purchase of an apartment, payment of rent, company apartment, low-interest loans for the purchase or renovation of an apartment
recreational	access to sports facilities, multisport cards
travel	travel expenses for the employee and his family
professional development and education	conferences, training, mentoring programs, coaching sessions
health	medical packages
communication	Internet, work cell phone,
equipment	e.g. computer, additional monitor, headphones, keyboard, ergonomic chair and desk
financial and tax advice	free advice from, for example, a financial advisor
special checks	related to the change in the scope of responsibility in connection with a merger or acquisition, dismissal of a manager
social	health insurance, life insurance, childcare
office facilities	ergonomic furniture, office meals, common space for relaxation
work-life balance	legal advice, flexible forms of work, dependent care services
programs that create employee well-being	wellness programs, paid additional vacation days, educational and health promotion programs (including mindfulness), psychological support programs,

Source: own study based on literature.

Research shows that traditional benefits such as medical care or pension benefits (for retirees) are of little importance to employees and do not make them feel that their employer cares about them. However, the role of non-traditional and intangible benefits that give employees a sense of care and support from their employer is increasing (Muse and Wadsworth, 2012). Therefore, benefits that create a broadly understood sense of employee well-being are valued by employees, such as scholarships for education and higher education, employee support programmes in times of crisis and assistance in crisis situations (e.g. due to weather damage), or work-family programmes (Werner, Balkin, 2021).

Almost 98% of employees expect their employer to support their mental health (Milburn, 2022). In addition, work-family programmes are particularly important and valued by employees. These include flexible working arrangements, paid leave, wellness programmes and dependent care services. Flexible working arrangements (e.g. flexible working hours, shorter working weeks, part-time working, remote working) are particularly valued and important for employees in the IT sector and appear to contribute to higher productivity and job satisfaction, reduced stress and lower absenteeism (Werner, Balkin, 2021). It is also a sector in which they are not only valued, but more importantly, applicable and related to the characteristics of the sector. This is why IT companies often use benefits that attract a specific group of employees, such as younger ones, by using improvements and support during the working day, rather than life insurance, which is important for older employees.

4. Modifications in benefit packages within the IT sector

IT sector companies, due to operating in a highly competitive environment and high employee turnover (Arambepola, Munasinghe, 2021), attach great importance to an attractive benefits package. The aim of the research is therefore to analyse how employers in the IT sector design the benefits package. The following research questions were posed:

PB1. How do employees perceive benefits?

PB2. What recent changes have occurred in employee benefit packages?

PB3. What are employees' expectations of benefits and how has their role changed?

PB4. How do employers in the IT sector shape the benefits package?

The research was based on thematic analysis (Glinka, Czakon, 2021) of existing materials such as reports on employee remuneration. The study used six salary reports as noted in the table (Table 3).

Table 3.
Overview of Reports on Salaries and Employee Benefits

Consulting company	Report Title	Selection criteria met
CASK	Raport płacowy, Wynagrodzenia i benefity oferowane specjalistom i menedżerom	it pertains to both the existing non-wage benefits available in the market and the desired ones
ICAN INSTITUTE	Benefity przyszłości	it describes the recent changes in benefit packages
ETC (Enter The Code)	Raport benefitów pracowniczych 2023	data from the IT sector
Soda	Raport płacowy 2023	data from the IT sector
Nais and Enpulse	Raport Zaangażowanie i Benefity 2024	contains more detailed information about benefits
Pluxee Polska	Benefity Trendbook 2025	presents the perception and role of benefits, as well as employee expectations towards them

Source: own study.

The analysis of information contained in the reports was based on the following thematic categories: Employee perception of benefits (PB1), changes in packages (PB2), employee expectations and the role of benefits (PB3), differentiation of benefits for employee groups and IT-specific benefits (PB4).

Employee perception of benefits

Over the years, the benefits package has evolved along with employees' perceptions of the benefits. Initially, it included equipment needed for work and access to coffee and tea in the office. Today, 82% of employees surveyed see benefits as an integral part of the employer's offer and as a tool that allows them to take care of themselves and their loved ones (Pluxee Polska, 2024). In the IT sector, benefits are no longer seen as an extra, but as a standard expected by employees (ETC, 2023).

Changes in benefit packages

According to research conducted by Mercer, more than 60% of organisations have changed their benefit offerings since the pandemic to meet new challenges (Mercer, 2023). During the COVID-19 pandemic, employers focused particularly on employee health (ETC, 2023). Personalisation has also become key, i.e. tailoring benefits to different age groups and stages of an employee's life. The one-size-fits-all approach no longer works, as millennials and Generation Z are highly aware of their needs and the need to take care of their physical and mental health (Nais, Enpulse, 2024). In the IT sector, employers have recently increased the salaries of their employees, while the range of benefits has remained at a similar level (Antal, 2023).

The role of benefits

Employee benefits are now expected by employees (ETC, 2023) and play a key role in choosing an employer, which is why most job advertisements include information about the benefits package associated with employment. Research shows that 75% of people who apply to a company look at the benefits offered (ETC, 2023). At the same time, 44% of people rule out job offers that do not include information about available fringe benefits, indicating the need for effective communication and a detailed list of benefits in recruitment advertisements (Pluxee Polska, 2024). A distinctive benefits offer encourages candidates to apply and, by motivating employees, promotes their retention. Benefits not only serve as an attractive supplement to compensation but are also an effective tool for building employee engagement and loyalty. However, they are not a decisive factor for IT professionals when choosing a new employer (SoDA, 2023). Benefits are also designed to help employees balance work and family responsibilities.

Employee expectations

The main benefit that almost all employees expect is health care, which remains the most desired benefit among employees according to information contained in all reports. More and more employers want to ensure work-life balance by offering flexible working hours (4-day working week, 6-hour working day) (Pluxee Polska, 2024). Another solution that is becoming more common is to offer additional days of paid leave, previously known in higher education as sabbaticals. Currently, some companies, especially in the IT sector, offer similar opportunities to their best employees (White, 2024). These benefits are also linked to those that create employee wellbeing. Some companies have chosen to work with mental health specialists or set up telephone support lines for employees and their families. The possibility of using a company concierge or a home cleaning service are just a few examples of how you can support an employee in their daily tasks.

IT employers' approach to employee benefits

The benefits programmes offered should be based on the HR strategy, the financial possibilities of the employer and the preferences of the employees. According to the data analysed, awareness of the importance of adapting additional benefits to the expectations of employees is growing, as 69% of companies declare that they study the needs of employees in terms of benefits (Pluxee Polska, 2024). This demonstrates the proactive attitude of employers in the IT sector, who are trying to understand the different needs of their teams and take them into account when designing benefits packages. Despite this, employees' expectations of the benefits package differ from those offered by employers. Nearly 45% of employees believe that the benefits offered are outdated, and more than half of employees (53%) believe that their company's benefits are a "budget drain". As a result, 39% of employees want benefits to be better tailored to their needs (Pluxee Polska, 2024).

According to the information analysed from the reports, the additional benefits offered are composed in such a way as to be attractive to each social group. Data obtained by ICAN Research (2023) shows that employees in managerial positions are most likely to take advantage of the benefits offered, experts are slightly less likely, and manual workers are the least likely. According to ICAN Research (2023), the offer addressed to managers and experts is similar, but managers are more likely to have access to private medical care and a company car. For manual workers, the offer is more likely to include anniversary gifts and free transport to work than for other groups. It is worth noting, however, that 16% of the surveyed manual workers do not receive any additional benefits apart from salary. Employees are least likely to use the offer of consultations with a psychologist (20%), mental health support applications (38%) and study subsidies (42%).

Employee benefits are highly popular among workers, and in the IT sector, employers offer particularly attractive benefits to attract talent. According to the SoDA report (2023), recruitment of new employees remains a significant challenge in this sector. Despite a noticeable slowdown in the market, companies still face substantial staffing gaps in critical areas and specializations. Another major challenge is retaining employees (SoDA, 2023). Many benefits that have gained popularity aim to encourage employees to work on-site at the office. Over 83% of IT companies offer health-related benefits to their employees and collaborators, according to the SoDA Salary Report (2023). Additionally, companies provide veterinary care packages for employees' pets, subsidies for children's healthcare, and extra paid days off.

The limitation of the research conducted is the use of salary reports from different time periods. This is due to the small number of widely available reports that include an analysis of the benefits market. It would therefore be advisable in future to conduct research in collaboration with consultancies that have access to many companies and can compare data over time.

5. Conclusions

The issue of employee benefits within organisations has become increasingly important in recent times, with HR departments focusing a significant proportion of their efforts on strategic employee management - in particular, attracting, retaining and promoting engagement through benefit packages. The aim of this article was to provide a preliminary exploration of how employee benefit packages are structured within organisations in the IT sector. The research process enabled this objective to be achieved and provided answers to the research questions posed in the article.

Modern employee benefit packages have evolved from basic provisions to comprehensive offerings that include health, well-being and work flexibility. As a result, it is important to design packages that are tailored to the needs and preferences of specific employee groups. An analysis of salary reports shows that employers are currently prioritising wellbeing programs that focus on the physical and mental health of employees, which is particularly important in the IT industry. In this sector, benefits are a critical tool in the war for talent and are also used to support hybrid and remote working models. In addition to medical care packages, the use of flexible working arrangements has become a standard expected by employees in this sector. Development and skills enhancement benefits are also high on the list of expected offerings. Research shows that a key challenge is to better align benefits with the diverse needs of employees. This can be achieved through flexible cafeteria schemes, which the research suggests are not yet widespread in the IT industry. Employee dialogue and

transparent communication also play an important role in this process, both of which require continuous improvement.

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LOSS OF YOUNG MARINE SPECIALISTS: A BRIEF OVERVIEW OF REASONS TO LEAVE

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Purpose: The purpose of this paper is to highlight the urgent need for specialists in marine research and conservation, particularly due to the unprecedented pressures from human activities on marine biodiversity. The paper aims to address the complex challenges facing ocean ecosystems by emphasizing the importance of interdisciplinary approaches and diverse expertise for effective conservation and sustainable management of marine resources.

Design/methodology/approach: This paper presents the results of a systematic review of literature focused on the experiences of young marine scientists. The review aims to identify the reasons behind their departure from the profession, providing insights into the barriers present within the field. The scope of the paper includes a broad evaluation of various interdisciplinary approaches necessary for addressing marine conservation challenges.

Findings: The systematic review reveals that diverse problems and solutions in marine sciences require a workforce representing a variety of backgrounds, disciplines, and cultural perspectives. The findings indicate that specific issues need urgent resolution to prevent the loss of expertise and to remove barriers that hinder the development of the field.

Research limitations/implications: This study is limited by the availability of published literature focused on young marine scientists' experiences. Future research could involve empirical studies that include surveys and interviews to provide a more comprehensive understanding of the challenges faced by early-career marine researchers.

Practical implications: Understanding the reasons for young marine scientists leaving the field can inform policy changes, institutional practices, and mentorship programs aimed at retaining talent and promoting diversity within marine sciences.

Social implications: By addressing barriers within marine research and conservation, the findings can contribute to more effective conservation strategies, which have broader implications for biodiversity preservation, public awareness, and environmental policies.

Originality/value: This paper provides valuable insights into the challenges faced by young marine scientists, a relatively underexplored topic. The findings contribute to the broader discussion on improving retention, inclusivity, and diversity in marine sciences, which is essential for addressing complex marine ecosystem challenges.

Keywords: sustainable development, loss of personnel, oceanography, young scientists.

Category of the paper: Research paper.

1. Introduction

Like other aspects of nature, the marine environment is undergoing profound changes (Higgason, Brown, 2009). Given the importance of equitable and long-term access to ocean resources from an economic perspective, protecting marine ecosystems is becoming an environmental and political issue of great complexity (Barbier et al., 2018; Bax et al., 2021). At the same time, the well-being and human rights of marine scientists are disproportionately challenged by severe geographic, racial, and gender inequalities (Österblum et al., 2020; Giakoumi et al., 2021; Srinivasan, 2018; Thompson et al., 2011). According to UN Ocean Decade (UNOD), achieving marine sustainability requires a proactive commitment to developing the human capital that is key to the future. In this context, recognizing the importance of Early Career Researchers (ECRs) in marine science becomes essential, as they are expected to take on the role of next-generation scientific leaders in marine conservation and research, making them key in navigating the complexities associated with UNOD (Schadeberg et al., 2022). This paper aims to identify the main factors influencing the decisions of ECRs to leave the profession.

In context of environmental and social sustainability, we need to remember that young adults, who are starting their professional careers, play a key role in the labor market thanks to their skills, creativity, and enthusiasm for work. However, the global recession that began in 2008 has posed a significant challenge to the youth labor market, making it difficult to effectively use the potential of these people in competitive economies (europa.eu; Wei-Jun, Yi, 2020). In November 2022, comparative analyses of average unemployment rates across age groups revealed that in both the United States (US) and the EU, youth unemployment (aged 15-30) was as high as 19% (europa.eu). In 2021, the average share of young people who were neither in employment nor in education or training (NEET) in the EU was 13.1%. (Statistics on young people neither in employment nor in education or training (Statistics Explained: europa.eu; Youth unemployment: europa.eu). Yet, Schneider and Harknett (2023) prove that since early 2021, 51% of service sector young employees (ages 18 to 24) left their positions at least once between Spring 2020 and Spring 2022. This rate is considerably higher than the 25% of older service sector workers (aged 25 and above) who reported similar employment transitions during the same period. These findings are consistent with other recent studies comparing employment patterns between younger and older workers. This situation builds a question of motives for leaving job by young workers during despite high unemployment rates, especially in fields connected to sustainability.

This study examines the urgent need for young specialists in marine research and conservation, emphasizing the interdisciplinary approaches essential for addressing challenges posed by human impacts on marine biodiversity. It aims to identify reasons contributing to the departure of early-career researchers (ECRs) from marine sciences and arrange them according to Herzberg's Two-Factor Theory of Motivation.

2. Theoretical framework

In his theory Herzberg suggested that job satisfaction stems from motivational factors, when at the same time job dissatisfaction arises from hygiene factors like job insecurity and organizational policies (Herzberg., Mausner, Snyderman, 1959).

Table 1.
Herzberg's Hygiene-Motivation factors

Hygiene: Job Dissatisfaction	Motivation: Job Satisfaction
Company Policy and Administration	Achievement
Supervision	Recognition
Interpersonal Relations	Work itself
Working Conditions	Responsibility
Safety	Advancement
Status	Growth
Security	

Source: (Herzberg, Mausner, Snyderman, 1959).

Numerous studies have proven, that motivators such as recognition and career advancement significantly enhance job satisfaction, while hygiene factors like salary and working conditions primarily prevent dissatisfaction (Jaffar et al., 2024; Vijayakumar, Saxena, 2015).

If these factors are unmet, employees may leave companies to seek the environment that better matches their needs. (Byrne, 2006). Poor working conditions can lead to increased absenteeism and higher turnover rates, as employees leave jobs lacking in motivation and satisfaction. (Oliveira et al., 2023)

Yet, it is important to remember that job satisfaction and dissatisfaction are not opposites, because the opposite of satisfaction is lack of satisfaction, while the opposite of dissatisfaction is lack of dissatisfaction. This is why getting rid of dissatisfaction and its reasons will not create satisfaction. (Herzberg, Hamlin, 1961).

The connection between leaving a job and Herzberg's Two-Factor Theory is significant, as it highlights how job satisfaction influences employees' intent to quit. Herzberg's theory distinguishes between hygiene factors, which prevent dissatisfaction, and motivators, which enhance satisfaction. Understanding this relationship can help organizations improve retention rates. (Mitsakis, Galanski, 2022) have found in their study that the lack of Herzberg's hygiene factors, such as working conditions and supervisor feedback, contributes to increased employee turnover. Conversely, strong motivational factors like recognition and achievement enhance job satisfaction, reducing the likelihood of leaving a job (Mitsakis, Galanski, 2022).

Similar findings have been shown by (Nyame-Mireku, 2012), who have proven that higher satisfaction correlates with lower turnover intentions among hospital pharmacists (Nyame-Mireku, 2012).

3. Research Method and Results

Three research procedures were selected to achieve the research objective:

- 1) document review, triangulation of sources (Eurostat, EMIS database, global indices, others),
- 2) literature review: literature review using Boolean logic and the Denyer, Transfield, Smart (2003) procedure (modified, see Table 1); analysis of original research papers, case studies and points of view using the search engine on the Scopus platform,
- 3) factors highlighted in document and literature review were matched with Herzberg Theory.

The literature review process involved four search rounds to gather relevant sources related to young marine scientists and early career researchers (ECRs) within marine and ocean sciences. The search criteria were systematically defined to maximize coverage and relevance of the literature. The phrases used in each search round were as follows:

- Round 1: "marine"; "ecr".
- Round 2: "ocean"; "ecr".
- Round 3: "marine"; "early career researcher".
- Round 4: "ocean"; "early career researcher".

The initial search yielded a total of 154 literature sources in Round 1 (Table 2), 149 in Round 2, 95 in Round 3, and 51 in Round 4. After eliminating duplicate entries, 134 unique sources remained. Subsequent verification of abstracts reduced the number of relevant studies to 92. Further in-depth text analysis led to the final inclusion of 52 literature sources for comprehensive review.

The systematic approach adopted ensures that the most pertinent studies were included while minimizing redundancy and enhancing the accuracy of the review. This methodological rigor provides a robust foundation for analyzing the experiences and challenges faced by young marine scientists.

Table 2.
Search criteria

Search criteria	Search round no.			
	1	2	3	4
No. of literature sources	154	149	95	51
After removing duplicates	134			
After abstract verification	92			
After text analysis	52			

Phrases in search round: TITLE-ABS-KEY: 1. ("marine"; "ecr"); 2. ("ocean"; "ecr"); 3. ("marine"; "early career researcher"); 4. ("ocean"; "early career researcher").

Source: own work.

The in-depth analysis of 52 pieces of literature gave author the possibility to name 13 factors of ECRs retention, that have occurred during literature review:

Factor #1: Being Unpaid - Internships Many ECR employees begin their careers in unpaid internships, which create financial burdens and limit diversity in recruitment. People from disadvantaged backgrounds are disproportionately affected (Satterthwaite et al., 2022; Cavaleri et al., 2024). ECRs not only volunteer for some projects where accommodation and living costs are covered, but also participate in pay-to-volunteer projects. (De Vos et al., 2023). Between 2000 and 2021, the number of entry-level jobs that were described as unpaid, voluntary, requiring entry fees, with stipends or paying below minimum wage in marine sciences ranged between 33% and 55% (Osiecka et al., 2021; Whitaker, 2003; Jensen et al., 2021). Such practices can lead to underestimating the work and undervaluing the project (Kreuser, Bishop, Meyer-Gutbrod, 2023).

Factor #2: Workload and Stress - The demanding nature of marine research, combined with competition for funding, publication pressures and interdisciplinary work, contribute to significant stress and burnout (Andrews, et al., 2020).

Factor #3: Workplace Environment - Discrimination, abuse, and exclusivity in the workplace negatively impact job satisfaction. Women and non-binary individuals report higher levels of dissatisfaction (Osiecka et al., 2022). Christian et al. (2020) list factors that influence workplace culture that also affect job satisfaction and research quality. These factors may include job insecurity, workplace culture, mentoring, and questionable research practices (Christian, 2020).

Factor #4: Career Advancement Challenges - Limited career opportunities and lack of integration into research workflows discourage ECRs. The transient nature of postdoctoral positions and perceived career stagnation contribute to dissatisfaction. On the other hand, the faction assumes that the adversities faced by ECRs can shape a workforce that is both more resilient and innovative, because those who persevere may be more committed to fixing the systemic challenges common to the discipline (Constable, 2014; Brasier, 2020; Conroy 2020).

Factor #5: Limited Funding and Job Insecurity - Securing sustainable funding is a pervasive struggle for ECRs. The competitive nature of grant systems requires significant time and effort, often drawing away from real research activities. This environment fosters job insecurity, as positions are often dependent on short-term grants. The study found that almost half of the researchers surveyed left academia within ten years of their first publication, with both men and women showing similar rates of attrition (Coddington, 2024).

Factor #6: Lack of Institutional Support and Mentorship - Inadequate institutional support for personal and professional development, and limited mentoring. An imbalance between personal and professional commitments can increase stress and hinder career development, for example by affecting research progress and personal well-being (Andrews et al., 2020).

Factor #7: Competitive and Restrictive Funding Systems - The overwhelming focus on obtaining grants often distracts researchers from conducting meaningful research. This disconnect can lead to frustration and decreased motivation. The highly competitive nature of grant funding systems requires ECRs to invest significant time in proposal writing, often at the expense of conducting research. This environment can distract from original research questions to more funded topics, leading to frustration and a sense of disconnect from personal research interests. Instead, ECRs should work with Indigenous knowledge keepers, economists and sociologists on a platform that promotes equality, diversity and inclusion, from student recruitment to research chairs (Duke et al., 2023; Meyer-Gutbrod, Pierson, Behl, 2023).

Factor #8: Mental Health Challenges - The aforementioned challenges, such as inadequate institutional support and frequent relocations, can contribute to isolation and mental health problems. (Gushulak et al., 2023). The pressures of academia significantly impact mental health. ECRs often struggle with stressors such as funding uncertainty, publication pressure, and job instability. These factors contribute to elevated levels of anxiety and depression among researchers. Notably, postdoctoral researchers face unique challenges, including limited institutional support and frequent relocations, which can exacerbate feelings of isolation and stress (Cale et al., 2023).

Factor #9: Work-Life Balance and Personal Well-being - Achieving a healthy work-life balance is particularly challenging in marine sciences, where fieldwork demands can be extensive. Long periods away from home and irregular work hours disrupt personal life, leading to burnout. The transient nature of academic positions further complicates personal commitments, making long-term planning difficult (Cale et al., 2023).

Factor #10: Gender Inequities and Harassment - Female ECRs often face additional challenges, including unfair recruitment practices and harassment by those in management positions. Other reports cite not only harassment but also discrimination and/or abuse in the workplace. These issues contribute to job dissatisfaction and can lead talented researchers to seek careers outside academia (Conroy, 2020; Johannesen et al., 2023; Maia et al., 2024; Isma, 2023; Kaikkonen et al., 2024).

Factor #11: Social and Economic Barriers - Economic strain, unpaid work, and workplace discrimination are prevalent issues. Unpaid work often does not lead to career advancement and is associated with workplace abuse. These factors contribute to high dissatisfaction and burnout rates, particularly among women and non-binary individuals (Osiecka et al., 2022; Schadeberg et al., 2022). Limited support for balancing personal and professional commitments and ineffective supervisory support further exacerbate these issues. The steep learning curve in interdisciplinary research adds to the pressure (Andrews et al., 2020; Akram, Young, 2020).

Factor #12: Attraction to Industry Roles - Some ECRs pursue industry roles for enhanced remuneration, stability, and opportunities for practical skill application. Positions in industry may provide more tangible applications of research and development, which can be more

appealing compared to the theoretical emphasis often found in academia (Ro, 2023). Early-career female researchers may depart from academia due to structural and cultural dynamics, underscoring the necessity for adaptive decision-making in academic career trajectories (Nielsen, 2017).

Factor #13: Impact of COVID-19 - The pandemic has exacerbated pre-existing challenges faced by marine ECRs, including social isolation, job insecurity, and increased work demands. It has disrupted critical activities such as networking, acquiring practical experience, and publishing, which are essential for career progression. (Schadeberg et al., 2022; Pardo, 2020; Osiecka et al., 2022).

Table 3.
Research results

Factor #	Factor Description	Herzberg Hygiene-Moti Category	Effect
1	Being Unpaid	Company Policy, Security, Status	Higher dissatisfaction
2	Workload and Stress	Working Conditions, Safety	Higher dissatisfaction
3	Workplace Environment	Interpersonal Relations, Supervision, Safety	Higher dissatisfaction
4	Career Advancement Challenges	Achievement, recognition	Lower satisfaction
5	Limited Funding and Job Insecurity	Security, Company Policy	Higher dissatisfaction
6	Lack of Institutional Support and Mentorship	Supervision, Interpersonal Relations	Higher dissatisfaction
7	Competitive & Restrictive Funding Systems	Company Policy	Higher dissatisfaction
8	Mental Health Challenges	Safety	Higher dissatisfaction
9	Work-Life Balance and Personal Well-being	Working Conditions	Higher dissatisfaction
10	Gender Inequities and Harassment	Safety, Interpersonal Relations, Status	Higher dissatisfaction
11	Social and Economic Barriers	Status, Security, Working Conditions	Higher dissatisfaction
12	Attraction to Industry Roles	Achievement, recognition	Lower satisfaction
13	Impact of COVID-19	Safety, Interpersonal Relations	Higher dissatisfaction

Source: own work.

The table 3 categorizes literature-review-based factors affecting employee retention using Herzberg's framework. The majority of 11 out of 13 factors are linked to higher dissatisfaction, all corresponding to deficiencies in hygiene factors. Only two factors (Career Advancement Challenges and Attraction to Industry Roles) are related to lower satisfaction, reflecting a lack of motivators (achievement, recognition). This suggests that young professionals leave more often due to dissatisfaction caused by safety concern, poor working conditions, policy issues, lack of support, than simply due to unmet aspirations. Safety (6 factors), Company Policy (4 factors), and Interpersonal Relations (4 factors) dominate, showing young staff are highly sensitive to psychological and physical safety and bureaucratic or relational failures.

4. Discussion

The role of young professionals in the modern economy cannot be overestimated, as their contribution to innovation, entrepreneurship, and overall economic growth (e.g. job creation and economic resilience) is significant. Their education equips them with the necessary skills to manage and develop in a knowledge-based economy, making them key to future economic development (Kurtanidze, 2022). Education strengthens the ability to critically evaluate economic phenomena, supporting sustainable business practices (Brătășanu, 2020; Firsova et al., 2021). Young professionals are the driving force of economic growth of cities by attracting investments and innovations (Manuel, 2004).

There are many factors that can influence the decision of young researchers (ECRs) to leave their jobs, such as financial, relational, and organizational factors. A negative workplace climate, including poor relationships with superiors and colleagues, has a significant impact on decisions to leave (Bartczak, Szymankowska, 2019; Queiri, Dwaikat, 2016). In particular, the COVID-19 pandemic has drawn attention to work culture and work ethics, with many young workers beginning to prioritize these aspects over material benefits (Kuzior et al., 2022). Other factors, such as insufficient training, lack of career planning, and lack of opportunities for professional empowerment, lead to a sense of stagnation (Queiri, Dwaikat, 2016). Many young workers indicate that insufficient remuneration is the main reason for leaving their positions. They also emphasize that remuneration affects job satisfaction and employee retention (Bartczak, Szymankowska, 2019; Szymankowska, Bartczak, 2020). High turnover among young scientists may also be caused by factors such as burnout, lack of work-life balance, mental health problems, job dissatisfaction and the attractiveness of remote work (Yavuz et al., 2023). Understanding these causes is crucial to retain talented young employees in the competitive labor market (Bartczak, Szymankowska, 2019; Szymankowska, Bartczak, 2020).

Rational work organization, including workload management and a supportive environment, is crucial. This can reduce work-related stress and promote work-life balance (Petrova, 2023). Implementing practices such as team mindfulness, promoting physical health and self-esteem through well-being programs can increase emotional resilience, enable young professionals to better cope with stress, and reduce the feeling of isolation among young employees (Nash, 2023; Petrova, 2023). The organizational culture of the company should value relaxation and teach employees that personal time is essential to maintaining emotional capacities, especially in demanding positions (Wigdortz, 2022). To prevent burnout among young scientists, companies should focus on personal aspects such as psychological support, physical well-being, self-esteem, and stress management, as well as on optimizing work organization to achieve a balanced approach (Petrova et al., 2024).

5. Summary

This study investigates the departure of early-career researchers (ECRs) from marine science, a pressing issue given the pivotal role these individuals play in advancing marine conservation and fulfilling the goals of the UN Ocean Decade (UNOD). Drawing on Herzberg's Two-Factor Theory of Motivation, the research identifies and categorizes the factors contributing to this trend, aiming to better understand and address the systemic barriers that threaten the retention of young talent in marine academia.

The analysis reveals a complex interplay of interrelated challenges driving ECRs away from marine science. These include limited and unstable funding opportunities, job insecurity, and the long-term impact of the 2008 global recession and the COVID-19 pandemic. Additionally, the burden of heavy workloads, inadequate compensation, and the inability to maintain a healthy work-life balance were found to be key contributors. Mental health concerns, lack of career advancement opportunities, and experiences of workplace discrimination—often shaped by gender, race, and geography—further exacerbate the issue.

This research also places the marine ECR crisis within a broader socio-economic context, noting that youth unemployment remains high globally despite the recognized potential of young workers to drive innovation in sustainability-related sectors. The study underscores the urgent need for targeted support mechanisms and systemic reforms that ensure equitable, stable, and inclusive career pathways for young marine scientists. Only by addressing these economic, structural, and social barriers can we create a sustainable and resilient research environment that fully harnesses the potential of the next generation of marine professionals.

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THE LEADER'S LONELINESS IN THE ORGANIZATIONAL ECOSYSTEM: IDENTIFYING THE INFLUENCE OF PSYCHOSOCIAL AND ORGANIZATIONAL FACTORS

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Purpose: The aim of the article is to analyze psychosocial and organizational predictors of loneliness among individuals in managerial roles. The author identifies the factors contributing to leader isolation and its consequences for organizational effectiveness.

Methodology: The study was based on empirical data collected from 150 managers in the Świętokrzyskie Voivodeship using an original survey questionnaire. A correlation analysis was conducted between psychosocial and organizational variables and the levels of emotional and social loneliness.

Findings: The quality of interpersonal relationships, emotional support, self-esteem, and organizational culture are significant predictors of leader loneliness. This confirms the multidimensional nature of the phenomenon and the need for comprehensive solutions. Leadership loneliness appears not only as a psychological category but also as an indicator of organizational dysfunction, manifested in the absence of affective recognition channels, insufficient psychological safety, and relational fragmentation of support structures.

Research limitations: The study was cross-sectional and regional in scope. Self-assessment bias is possible. Future studies should include broader research samples and a mixed-methods approach combining quantitative and qualitative tools.

Practical implications: Leader loneliness—as a systemic variable—may indirectly influence organizational climate, team engagement, employee turnover, and decision-making efficiency. Preventing the psychosocial isolation of managerial staff contributes to building sustainable human capital, reduces the risk of organizational losses, and strengthens the resilience of work systems during crises.

Social implications: Reducing leader loneliness supports psychological well-being and a healthy work environment, contributing to the development of more conscious leadership models in society. Chronic isolation of leaders can deepen social trust deficits, erode relational capital, and undermine the culture of dialogue and shared responsibility. This phenomenon is particularly significant in the public sector, where leadership style directly translates into the quality of public services and the sense of institutional justice.

Originality/Value: This article represents one of the few empirical analyses of leader loneliness in Poland, combining psychological and organizational perspectives with practical recommendations. The empirical examination of psychosocial mechanisms affecting leadership effectiveness enriches contemporary management science discourse with an affective-relational dimension, often marginalized in quantitative studies.

Keywords: organizational loneliness, relational leadership, leader's social capital, relational dimension of leadership, psychosocial predictors of managerial isolation.

Category of the paper: research paper.

1. Introduction

Leader loneliness is not a new phenomenon, but its intensification in recent decades stems from various structural and cultural conditions. The position of power and responsibility that leaders occupy generates certain behavioral norms—including self-sufficiency, rationality, and independence—which can limit the ability to express emotional needs and hinder access to genuine social support. As Goffee and Jones (2006) note, leaders are often “lonely at the top” not because no one is around them, but because they have no one with whom they can share doubts, fears, and emotions without risking their authority or professional credibility.

In an organizational culture that promotes efficiency, control, and constant availability, emotional transparency is often penalized, and admitting weakness is treated as a sign of incompetence. These observations already indicate that studying leader loneliness requires an interdisciplinary approach, often highlighted in the literature, which considers both psychological factors such as attachment and the need for belonging, and social factors relating to organizational culture, leadership styles, and power dynamics.

Interest in loneliness—understood as a subjective, unpleasant experience of social disconnection (Cacioppo, Cacioppo, 2018; Wright, Silard, 2020; Lam et al., 2024)—has significantly increased in recent years among both researchers and practitioners (Cacioppo, Cacioppo, 2018; Hou, Cai, 2024). Some scholars have even referred to our era as the “age of loneliness” (Waltz et al., 2024). The rise in loneliness is alarming, as it is toxic to individuals and harmful to their well-being, contributing to depression and cardiovascular diseases (Holt-Lunstad et al., 2015). Given these adverse consequences, a deep understanding of how loneliness arises seems essential. Surprisingly, although leaders spend many hours each week at work, very little research has focused on workplace loneliness.

So far, this negative phenomenon has mainly been studied in connection with individual health (Holt-Lunstad et al., 2015; Holt-Lunstad, 2018), overall functioning (Heinrich, Gullone, 2006), and interpersonal relationships (Qualter et al., 2015). Interestingly, workplace loneliness, including that of leaders, has received little attention from management scholars. However, even the limited studies that exist (Waltz et al., 2024) have shown that this phenomenon has serious negative consequences for engagement and work outcomes (Anand, Mishra, 2021).

In recent years—especially during the COVID-19 pandemic (Andel et al., 2021)—interest in this issue has also grown within the field of management sciences (Lam et al., 2024). Recently conducted studies provide arguments that loneliness is a central and practically

relevant topic for the future of work (Kniffin et al., 2021), and that leaders—whose actions are context-dependent—seem particularly vulnerable to experiencing loneliness (Wright, Silard, 2021).

Leadership, as the process of influencing a group to achieve a specific goal (Fischer et al., 2017), involves shaping strategic directions, making decisions at the team or organizational level, and leading change within organizations (Lam et al., 2024). These actions create a context with loneliness triggers that are distinct from those encountered in personal life. Taking the above into account, the aim of this article is to identify the level of emotional and social loneliness among leaders in enterprises. In this light, the study aims to provide arguments that will help answer the following question: How do psychosocial and organizational factors influence the level of emotional and social loneliness among leaders, and which of these factors serve as predictors and buffers of psychosocial isolation?

The foundation for carrying out this research objective was the results of original empirical studies. The study was quantitative and cross-sectional in nature, based on a proprietary survey questionnaire constructed using a 5-point Likert scale. The questionnaire included 30 questions measuring the level of leader loneliness (dependent variable), as well as seven domains reflecting the characteristics of the leader's social and organizational environment (independent variables), which included: quality of professional relationships, emotional support, work and communication style, work-life balance, self-esteem and role perception, organizational culture, and emotional and social loneliness. The study involved 190 individuals holding managerial positions in both public and private sector organizations located in the Świętokrzyskie Voivodeship.

2. Relational and institutional factors influencing the phenomenon of loneliness: justification for the selection of variables

Leader loneliness, as a multidimensional phenomenon, requires a transdisciplinary approach that integrates microsocial and macrosocial perspectives. On one hand, we are dealing with a psychological construct—emotional and social loneliness—which, as demonstrated by Cacioppo and Patrick (2008), is the subjective experience of lacking deep, satisfying interpersonal relationships. On the other hand, leader loneliness cannot be considered in isolation from the cultural and institutional context in which the leader operates—organizational culture, leadership style, and communication norms serve as carriers of meanings and mechanisms that can either reinforce or weaken the sense of isolation (Schein, 2010; Edmondson, 1999).

Attachment theory also plays a crucial role here, according to which individuals develop specific styles of social functioning based on the emotional availability of their environment (Mikulincer, Shaver, 2007). When a leader lacks a relational “secure base”, they may regress to avoidance or disorganized relationship strategies, leading to social withdrawal and deepening loneliness. The theory of psychological safety (Edmondson, 1999) complements this picture by emphasizing that individuals in environments lacking acceptance and trust are not inclined to express emotions authentically or take relational risks.

This approach to the issue of loneliness adopted in the present study also draws from the theory of authentic leadership (Avolio, Gardner, 2005), which stresses the importance of the leader’s self-awareness, identity coherence, and ability to be genuine in relationships with others. In light of these theories, variables such as self-esteem, relationship quality, or communication style are not merely personality traits but integral components of the relational dimension of leadership that directly determine the leader’s ability to resist loneliness in their role.

Contemporary studies on leader loneliness clearly indicate that there is no single dominant cause of the phenomenon; rather, it is the result of a synergistic effect of multiple psychosocial and institutional factors. Research conducted by Ozcelik and Barsade (2018) among corporate leaders revealed that a lack of deep, supportive interpersonal relationships correlates with reduced team engagement, lower efficiency, and weakened organizational cohesion.

Studies by Dutton and Heaphy (2003) as well as Carmeli and Gittell (2009) show that the quality of professional relationships—measured by indicators such as trust, reciprocity, and psychological accessibility—is one of the most important predictors of employees’ psychological well-being. In particular, for leaders who are inherently exposed to structural isolation, the presence of high-quality relationships serves as a vital buffer against the effects of loneliness. Mikulincer and Shaver (2007) also demonstrated that individuals lacking relational anchoring exhibit increased avoidance behaviors, which intensify social alienation.

Additional variables such as emotional support, work-life balance, and communication style are justified by the research of Greenhaus and Allen (2011), Kreiner (2006), and Ashkanasy and Daus (2005). These studies show that role overload, lack of clear boundaries between life domains, and dominance of a task-oriented management style are significantly correlated with burnout, withdrawal, and managerial isolation. It is worth noting that these conclusions have also been confirmed in meta-analyses by Chiaburu and Harrison (2008) and Halbesleben (2006), which demonstrated that relational and organizational psychosocial resources are the strongest predictors of job satisfaction, well-being, and a sense of community in the workplace.

Relevant in this context are also the findings by Yang, H., Lin, Z., Chen, X., & Peng, J. (2021), describing the relationship between leaders’ perceived loneliness and team performance and employee engagement. Their research shows how workplace loneliness leads to ego depletion, which in turn can result in negative behaviors such as cyberloafing. The selection of independent variables was guided by methodological premises to ensure measurement validity,

logical consistency of the model, and its applicability to management practice. First, variables were operationalized solely based on measurable indicators included in the survey questionnaire using a 5-point Likert scale. This approach allows for data standardization, quantitative analysis, and comparability of results between groups.

The second important criterion was the “intervention potential” of the variables—each was selected based on its potential to be modified through organizational actions. This means that the variables can serve as a foundation for designing psychological interventions, development programs, or structural changes within organizations (e.g., promoting a culture of openness, communication training, mentoring). This selection aligns with the assumptions of applied research, where indicators should not only describe reality but also make it possible to change it.

The third condition was minimizing collinearity and ensuring high diagnostic value of each variable. The selection was based on literature review and logical analysis of the relationships between variables. Consequently, variables with limited predictive value or those secondary to the construct of loneliness—such as job satisfaction, organizational commitment, demographic traits, or unchangeable personality traits—were deliberately excluded. Although these often appear in organizational studies, they do not meet the criterion of causality, since their relationship with loneliness may be consequential rather than etiological.

3. Methodology of the study

The research methodology was designed based on a positivist paradigm, which assumes the possibility of objectively measuring psychosocial phenomena using quantitative tools. The main goal of the study was to empirically determine the impact of selected psychosocial and organizational variables on the level of perceived loneliness among leaders.

A quantitative research strategy was adopted, employing a cross-sectional model that allows for capturing relationships between variables at a given moment in time, while also enabling data collection from a diverse sample of respondents. This approach was justified by the nature of the phenomenon—leader loneliness as a relational and contextual issue—which is best diagnosed by measuring multiple co-occurring variables.

The sample was selected using purposive sampling, based on the criterion of holding a managerial position (middle or senior level) within organizational structures comprising more than 10 employees. Both the public sector (local government administration, cultural institutions, education) and the private sector (companies supported by decisions from the Starachowice Special Economic Zone) were included. The research was conducted between July and September 2024 in the Świętokrzyskie Voivodeship. Invitations and questionnaires were distributed electronically to 190 leaders. Some completed questionnaires were returned in

paper form. The combined response rate was 87.3%, and after excluding incomplete or logically inconsistent surveys, 150 cases were qualified for analysis.

The research instrument was a proprietary survey questionnaire developed according to the principles of operationalizing variables in quantitative research (Babbie, 2020). The tool contained 30 items rated on a five-point Likert scale (1 – strongly disagree, 5 – strongly agree) and a demographic section with control variables (age, gender, sector, managerial level, industry, organizational form). Each questionnaire item was linked to one of seven categories of independent variables: (1) Emotional and social loneliness, (2) Quality of professional relationships, (3) Availability of emotional support, (4) Work-life balance, (5) Work and communication style, (6) Self-esteem and role perception, (7) Organizational culture supporting wellbeing.

The questionnaire was developed based on a literature review and existing scales, such as the UCLA Loneliness Scale, the Leader Authenticity Inventory (Avolio, Gardner, 2005), the Organizational Climate Measure, and adult attachment scales by Mikulincer and Shaver (2007). The tool underwent content validation. As part of the pretest, a pilot study was conducted with 10 respondents, confirming the clarity and comprehensibility of the items and enabling the standardization of completion time.

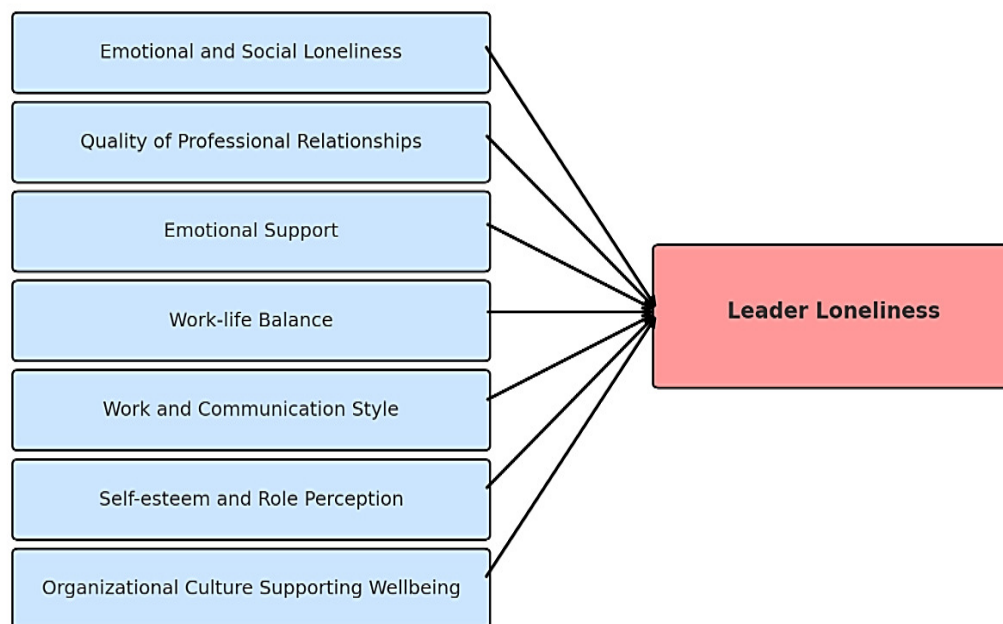


Figure 1. Block diagram of the research model: predictors of leader loneliness.

Source: Author's own elaboration.

The present study employed a variable structure consistent with the classical model of causal relationship analysis in social research. The dependent variable was defined as the level of leader loneliness—operationalized as the sum or average of responses to questions about feelings of alienation, emotional isolation, and lack of belonging. It served as a measure of the psychological effect caused by various psychosocial and organizational factors.

The independent variables represented the characteristics of the leader's social and organizational environment. These reflected seven theoretical domains: emotional and social loneliness, quality of professional relationships, emotional support, work-life balance, communication and work style, self-esteem and role perception, and organizational culture.

In statistical analyses, each independent variable was compared to the level of loneliness, and Pearson's linear correlation coefficient (r) was used to assess the strength and direction of the linear relationships between quantitative variables. The Pearson correlation coefficient ranges from -1 to +1. A positive value indicates a direct proportional relationship (an increase in one variable leads to an increase in the other), while a negative value indicates an inverse relationship (Stanisz, 2006).

Only statistically significant correlations at $p < 0.01$ were included in the study. Correlations with $|r| \geq 0.50$ were interpreted as moderate to strong. All observed correlations were statistically significant at the $p < 0.01$ level, meaning the probability that they occurred by chance is less than 1%.

The study was conducted in accordance with APA (2020) ethical guidelines and GDPR regulations. Participants were informed about the purpose of the research, how the data would be used, and were guaranteed the right to withdraw at any stage. Data were stored in encrypted form, and respondent identification was not possible at any stage of the analysis.

4. Analysis of research results

In the context of the cross-sectional and quantitative study conducted, special attention was given to identifying the relationships between independent variables—such as the quality of professional relationships, emotional support, communication style, self-esteem, organizational culture, and work-life balance—and the dependent variable: the level of experienced emotional and social loneliness.

The aim of the study was not only to determine the strength and direction of these associations but also to identify which of the analyzed factors serve as significant predictors or buffers influencing the psychological well-being of individuals in managerial positions.

Table 1.

Correlation coefficients and loneliness means for groups with low and high levels of the independent variable

Independent Variable	Correlation (r)	Mean Loneliness (Low Level)	Mean Loneliness (High Level)
Emotional and Social Loneliness	0.67	2.1	4.0
Quality of Professional Relationships	-0.58	3.9	2.3
Emotional Support	-0.60	4.1	2.2
Work-life Balance	0.54	2.5	3.7

Cont. table 1.

Work and Communication Style	0.49	2.2	3.9
Self-esteem and Role Perception	-0.61	4.2	2.3
Organizational Culture and Wellbeing	-0.55	3.8	2.4

Source: Author's own elaboration.

Correlation analysis for high and low levels of the independent variables:

- **Emotional and Social Loneliness ($r = 0.67$):** One of the strongest positive correlations in the study. It indicates that the absence of trust-based relationships in the workplace is linked to a higher declared level of loneliness. Statistically, this means that 45% of the variance in loneliness levels is explained by trust relationships ($r^2 \approx 0.45$). In organizational practice, this suggests that the lack of a safe space to share feelings and experiences is a critical predictor of leadership loneliness.
- **Quality of Professional Relationships ($r = -0.58$):** A strong negative correlation indicates that higher quality relationships (measured by satisfaction, reciprocity, openness) are associated with lower levels of loneliness. Statistically, this accounts for about 33% of the variance in loneliness ($r^2 \approx 0.34$). This strongly confirms the role of social and relational capital in shaping leaders' well-being.
- **Emotional and Psychological Support ($r = -0.60$):** A strong and negative correlation, suggesting that emotional support plays a significant protective role. $r^2 \approx 0.36$, meaning over one-third of loneliness variability can be explained by the availability of support. The absence of such psychological resources poses a high risk for managers' emotional state.
- **Work-life Balance ($r = 0.54$):** A moderately strong positive correlation. Leaders who perceive their work-life balance as disrupted report significantly higher loneliness. Statistically, $r^2 \approx 0.29$. This underscores the importance of recovery, free time, and non-professional autonomy in preventing psychosocial exhaustion.
- **Work Style and Communication ($r = 0.49$):** A borderline moderate-to-strong correlation. It shows that a task-oriented work style with a low relational component is linked to increased loneliness. With $r^2 \approx 0.24$, nearly 25% of loneliness variance can be explained by the leader's dominant communication style.
- **Self-esteem and Role Perception ($r = -0.61$):** A very strong negative correlation. Statistically, 37% of loneliness variance is explained by a lack of congruence with one's professional role and low self-esteem. Psychologically, this highlights the crucial role of self-awareness and authenticity in minimizing emotional isolation.
- **Organizational Culture and Wellbeing ($r = -0.55$):** A strong negative correlation shows that workplaces supporting inclusiveness, wellbeing, and psychological openness effectively combat loneliness. $r^2 \approx 0.30$, indicating that 30% of loneliness variability can be attributed to organizational culture quality. This supports the hypothesis that systemic environments impact leaders' psychological condition.

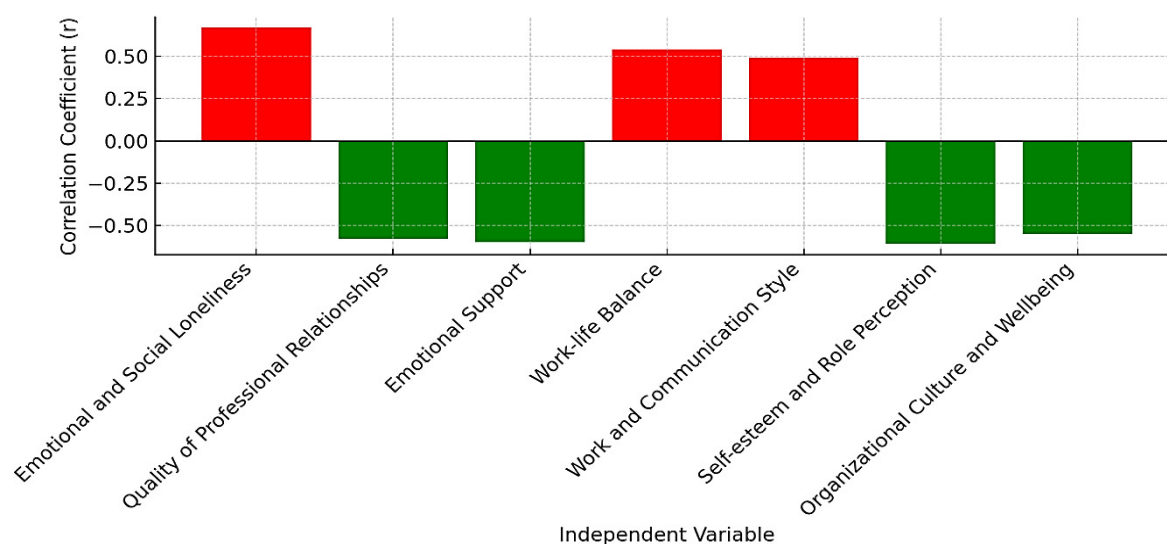


Figure 2. Strength and direction of correlation between variables and leader loneliness.

Source: Author's own elaboration.

- Red – positive correlation: increase in the independent variable corresponds to increased loneliness.
- Green – negative correlation: increase in the factor (e.g., relationship quality) corresponds to lower loneliness.

The analysis reveals strong associations between psychological and organizational dimensions and leaders' loneliness levels. Particularly significant correlations relate to interpersonal relationship quality, perceived emotional support, and managerial self-esteem. Empirical data support hypotheses derived from literature, especially regarding the influence of leadership style, organizational values, and psychological safety.

It is noteworthy that emotional support and relationship quality have nearly equivalent effects on reducing loneliness, suggesting the need to combine HR interventions with the development of leaders' emotional intelligence. The high correlation between low self-esteem and loneliness emphasizes that leaders lacking internal self-worth operate in a relational void regardless of formal organizational structures.

The study also demonstrated that communication style—usually treated as an instrumental skill—turned out to be a key predictor of loneliness. This indicates the need to sensitize managers to the relational, not just strategic, aspect of their roles.

From an organizational management perspective, leader loneliness can be interpreted as a symptom of a relational deficit in the system—not merely as an individual trait but as an indicator of weakness in structures that integrate leadership with the organizational community. Lack of trust, emotional feedback deficits, low transparency, and an overemphasis on task-oriented communication styles contribute to the erosion of relational capital, which modern management theory (Uhl-Bien, 2023) regards as a key resource for leadership effectiveness.

The identified correlation patterns confirm that leader functioning cannot be analyzed in isolation from the systemic context: the role they fulfill is embedded in a web of cultural, normative, and communicative dependencies that shape individual experience. Thus, leader loneliness should be understood as an emergent construct—a result of interactions between formal leadership responsibility and the relational conditions in which this responsibility is exercised.

5. Discussion of empirical research findings

Despite the theoretical and statistical coherence of the results, several important limitations of this study must be acknowledged. The research was conducted as a one-time, cross-sectional assessment. In order to confirm any causal relationships, the study should be replicated. Although the correlations are statistically significant, they do not determine the direction of influence between variables.

The research sample consisted of 150 managers/leaders operating in their environments in the Świętokrzyskie Voivodeship. While this number is sufficient for basic statistical analysis, it may not be representative of the leader population in other regions of Poland or sectors of the economy. A local context effect may occur (e.g., regional organizational culture, availability of support resources, dominant management styles).

Respondents' answers were based on self-assessment, which may be subject to cognitive biases (e.g., social desirability effect, problem underreporting, self-censorship in evaluating one's loneliness). The analysis was based solely on quantitative data, thus omitting individual narratives, cultural contexts, and the subjective meanings that leaders may attribute to loneliness.

Despite these limitations, the presented results reveal relationships between psychosocial determinants and loneliness among individuals in managerial roles. Based on the empirical findings, five main directions for future research can be proposed.

Table 2.
Suggested directions for research on leader loneliness

Research Direction	Description	Research Hypothesis
1. Leader loneliness and team effectiveness	Analysis of the impact of leader loneliness on team performance and employee engagement	Leader loneliness reduces team effectiveness and employee engagement
2. Cultural and organizational context	Study of how leadership style and organizational culture affect leader relational isolation	Organizational culture and leadership style influence leaders' loneliness levels
3. Professional and personal identity	Evaluation of whether alignment between professional and personal identity protects against chronic loneliness	Identity alignment reduces the risk of leader loneliness
4. Interventions to counter loneliness	Designing and testing support programs	Support programs reduce loneliness and improve leader well-being

Source: Author's own elaboration.

The proposed directions for future research correspond with current trends in management sciences—such as the development of sustainable leadership, the integration of psychological well-being into organizational strategies, and the creation of environments based on relational responsibility, empathy, and inclusivity.

6. Summary

The analysis of research findings on loneliness among managerial staff allows for the formulation of several key theoretical, diagnostic, and practical conclusions.

First, leader loneliness is not a marginal phenomenon but one deeply embedded in organizational, cultural, and psychological structures. It therefore requires not only individual but also systemic interventions—including redefining leadership roles, the quality of relationships, and organizational culture. The hypothesis proposed by Peng, Chen, Xia, and Ran (2016), which posits a negative impact of managerial loneliness on leadership quality and group dynamics, aligns with a growing body of research examining how the psychological well-being of management affects an organization's human capital.

Second, leadership loneliness manifests in emotional and social dimensions, with consequences that concern both the psychological functioning of leaders and overall organizational effectiveness.

Third, institutional responsibility for the mental well-being of individuals in leadership positions should be integrated into HR strategies and organizational sustainability policies.

Fourth, it is appropriate to design and evaluate intervention programs aimed at counteracting loneliness among leaders, such as coaching, mentoring, reflection groups, or leader support networks (Chughtai, 2025). Combating leader loneliness cannot rely solely on individual responsibility—it must be embedded in a conscious, proactive, and supportive organizational policy.

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CONSUMPTION IN LARGE HOUSEHOLDS

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Purpose: The aim of the article is to identify the level and structure of consumption in Polish households with at least three dependent children and to divide them into groups according to consumption patterns and, on this basis, to assess their standard of living.

Design/methodology/approach: The CSO database was used to examine the consumption patterns of large households. Households were divided into three groups using the Ward cluster method.

Findings: Households with many children are in the most difficult financial situation. Identified consumption patterns are: Cluster I: the lowest standard of living due to limited income, low propensity to consume and focus on basic needs; cluster II: the highest standard of living thanks to high income, high flexibility in spending and better development opportunities; Cluster III is characterized by an average standard of living, but with financial challenges related to the high costs of housing.

Research limitations/implications: A limitation of the research process is the exclusion of clusters containing a small number of cases, which may lead to the loss of potentially valuable information. In the future, it may be possible to examine how consumption is shaped in large households of biologically incomplete families.

Practical implications: The clusters created may constitute market segments for entrepreneurs. For cluster I, they should target inexpensive, basic products, especially in the food and non-alcoholic beverage categories; for cluster II - luxury goods and offers related to recreation and culture, for cluster III - products and services related to the use of housing, water, electricity, gas and other fuels.

Social implications: Households from cluster I should be the object of interest of social welfare units. Policies should focus on improving access to education, nutritional support and programs that equalize children's development opportunities.

Originality/value: The article conducted new research presenting the difficult financial situation of large households and their consumption patterns. It is of value to social policy and entrepreneurs. Policies should focus on improving the living standards of the households discussed in the article. In turn, entrepreneurs can create products and services tailored to the specific needs of specific consumer groups that have been identified.

Keywords: large households, expenses, cluster analysis, Ward's method, consumption patterns, standard of living.

Category of the paper: Research paper.

1. Introduction

Consumption is considered a way of meeting human needs through the use of goods and services (Bywalec, 2010). Sojkin (1994) clarifies that it is "not only a direct act of consumption that meets individual needs, but a complex process of attitudes, actions and decisions, reflected in the consumption behavior of individuals, groups and societies". Currently, consumption is becoming one of the most important categories in economics, management and socio-economic policy (Sobocińska, 2021). Consumer behavior is influenced by various factors, which, according to one classification, can be assigned to four groups: social (reference groups, family), cultural (culture, social class), psychological (beliefs, attitudes) and personal (gender, age) (Kotler, 2005).

The level and structure of consumption is also determined by the size and composition of the family and the biological connections between household members. Due to this criterion, there are households without dependent children, households with dependent children (one, two or three or more) and households of single parents (Laskowski, Piekut, 2018). In this study, attention was paid to households consisting of at least three children.

The issue of large families, i.e. families with at least 3 dependent children, remains relatively marginal in economists' research (Kośny, 2021). In the scientific literature, the category of large families appears in studies on living conditions and quality of life (Bebel, 2012; Bonisławska, 2008, 2010; Kołaczek, 2009; Szostek, 2014). As a rule, analyzes of living conditions in large families are the background for further considerations about poverty and social exclusion, where large families are sometimes described as particularly vulnerable to these phenomena, especially in the context of limited income in relation to the high expenses related to raising children (Deskur, 2005; Jędrzejczak, 2013; Kaźmierczak-Kałużna, 2015; Zasępa, 2016). The issue of the standard of living in large families also appears in the aspect of unemployment. These studies analyze the impact of instability in the labor market on the financial situation of large families (Balcerzak-Paradowska, 1997a).

Large families are a special type of household. They are characterized by the fact that they consist of a large number of people and there are relatively few individuals earning income, which is the reason for their more difficult financial situation than other households (Bebel, 2012). According to research by Prokopowicz (2017), in Poland it has been observed for many years that the relatively lowest income is obtained by families with at least three dependent children. The situation is similar in the case of the housing situation and the equipment of households with durable goods. According to the above-mentioned author, the "Family 500 plus" program has reduced the size of this phenomenon (Prokopowicz, 2017). It was introduced because in recent decades, large families were most at risk of poverty, especially extreme poverty. This is a phenomenon that causes exclusion from socio-cultural life. Households in which poverty occurs have limited opportunities to use social institutions and services,

the consumption market, work, cultural institutions or health care (Kaźmierczak-Kałużna, 2019; Kapela 2018). In 2023, large families at risk of extreme poverty (consumption below the subsistence level) constituted 6.9% of households. Compared to 2022, this percentage increased by 0.9 percentage points. The greater the number of dependent children in a household, the greater the extent of extreme poverty (Central Statistical Office, 2024). In households of large families, difficulties in meeting cultural and recreational needs are indicated. These families struggle with financial constraints, which translate into limited access to culture, recreation and education (Balcerzak-Paradowska, 2004; Bebel, 2013; Kopeć, 2020; Piekut 2014). Large families are one of the main beneficiaries of support programs in the context of family and social policy, and they are also presented as victims of their imperfections (Balcerzak-Paradowska, 2004; Bebel, 2012).

The aim of the article is to identify the level and structure of consumption in Polish households with at least three dependent children and to divide them into groups according to consumption patterns and, on this basis, to assess their standard of living.

2. Research material and research methodology

The information basis was data from the household budget survey of the Central Statistics (CS) for the years 2006-2022 and from individual (source) data from household budget surveys for 2022. The subject of the survey were Polish households with at least three children to support. The analysis covered thirteen or twelve categories of consumer spending.

To examine consumption patterns in households, only households of biologically complete families, married couples with three or more children to support were selected. 892 cases were selected from the Central Statistical Office database and then grouped using the Ward cluster method. The most effective division included 8 groups. Among these groups, the clusters included the following number of cases: 434, 315, 98, 36, 6 and three groups were single-element. It was decided that the first three clusters with the largest number of cases would be qualified for further analysis. The remaining five clusters containing 1 to 36 cases were excluded from the analysis due to the small number of cases.

Cluster Analysis Using Ward's Method

Cluster analysis is a statistical technique used to group objects based on their similarity. Ward's method, developed by Joe Ward in 1963, is one of the hierarchical algorithms applied to identify natural clusters within a dataset. It minimizes the total within-cluster variance, making it particularly effective for forming homogenous groups (Piekut 2014a).

Ward's method employs an agglomerative approach, where each observation starts as an individual cluster. Clusters are iteratively merged in pairs, minimizing the increase in within-cluster variance. The process continues until all observations are combined into a single cluster.

Advantages of Ward's Method are: a) creates clusters with similar sizes and high homogeneity, which is crucial in many applications; b) minimizes within-cluster variance, facilitating the interpretability of results; c) relatively robust to outliers compared to other methods.

Disadvantages of Ward's Method are: a) high computational complexity, making it challenging for large datasets and b) sensitive to the choice of distance metric, with Euclidean distance being the most commonly used but not always optimal.

In our own analysis, the square of the Euclidean distance was chosen as the distance measure. The most effective number of clusters was selected based on a tree diagram of binding distances versus binding stages. In the place where the tree's branches became noticeably longer, it was decided to cut the tree.

The analysis was performed using Excel and Statistica 13.3.

3. Results

3.1. Expenditures on consumer goods and services - comparative analysis

This part presents the share of individual categories of consumption expenditure (for food and non-alcoholic beverages; alcoholic beverages, tobacco products and drugs; housing, water, electricity, gas and other fuels; clothing and footwear; education; recreation and culture; home furnishings and household management; transport; health; restaurants and hotels; pocket money and other services and consumer goods) in relation to total expenses, excluding other expenses, which include:

- some taxes,
- gifts given,
- income tax advances and social security contributions paid by the taxpayer,
- other non-consumer expenses.

The division of expenditure on consumer goods and services is based on the classification according to the purpose of consumption COICOP (Central Statistics, 2024).

Analyzing households divided according to their biological type, it was observed that in 2022 the highest average income (PLN 2937.35) and expenses (PLN 1938.53) per person were recorded for married couples without children. In turn, the lowest income (PLN 1646.93) and expenses (PLN 1086.16) were recorded by married couples with at least three children (Table 1).

The structure of expenditure on consumer goods and services indicates that the highest share in each group of households was spent on food and non-alcoholic beverages. Households of married couples with at least three dependent children were most burdened with these expenses, accounting for 27.5%. This proves the least favorable financial situation of the households mentioned, because, according to Engel's law, the higher the share of food expenses in total expenses, the worse the financial situation.

In second place were expenses related to the housing, water, electricity, gas and other fuels. For large families, they were among the lowest and amounted to PLN 173 per person, or 16% of total expenses. A smaller share was observed only among married couples with two dependent children (15.8%), although the amount was higher and amounted to PLN 225 per person. This situation may be related to the scale effect of management. The greater the number of household members, the lower the unit expenses (Gutkowska, Piekut, 2014).

Moving on to home furnishings and household maintenance, it was observed that compared to other types of households, the share of this category of expenses was the highest in large families (6%). Due to having children, the apartment must be properly equipped, which involves incurring additional costs. Clothing and footwear (5.4%, or approximately PLN 60) and education (3%, or approximately PLN 32) also had an equally high share in consumer spending. Having children determines the incurring of higher educational expenses. Large families came second in terms of meeting recreational and cultural needs, which are higher-order needs. They accounted for 7.7% of total expenses, i.e. PLN 83 per person on average.

The lowest share among large households compared to other groups was spent on health (4.2%, i.e. approx. PLN 46 per person). Compared to households of married couples without children, where this percentage amounted to 7% (PLN 136), it was a share lower by 3.8 percentage points. This is due to the demographic structure, because members of households in large families are usually young people whose health condition is relatively better (Gutkowska, Piekut, 2014).

Table 1.

The level of expenditure and the structure of consumption expenditure in Polish households according to the biological type of the family in 2022

Specification	Married couple with no dependent children	Married couple with 1 child to support	Married couple with 2 children to support	Married couple with 3 or more children to support	Mother or father with dependent children
Disposable income	2937.35	2538.38	2147.63	1646.93	1845.43
Total expenses	1938.53	1712.49	1427.72	1086.16	1615.44
Food and non-alcoholic beverages	26.4	24.2	24.4	27.5	24.0
Tobacco products, alcoholic beverages and drugs	2.8	2.4	2.0	1.8	1.8
Housing, water, electricity, gas and other fuels	20.8	17.0	15.8	16.0	19.3

Cont. table 1.

Furnishings, household equipment and routine maintenance of the house	5.2	5.4	5.5	6.0	4.6
Clothing and footwear	3.3	4.9	5.4	5.4	5.5
Health	7.0	4.6	4.8	4.2	4.3
Communications	4.2	4.4	4.1	4.3	4.4
Transport	9.7	11.5	10.7	9.5	12.2
Education	0.1	1.9	2.8	3.0	2.6
Recreation and culture	5.4	7.0	8.6	7.7	6.7
Restaurants and hotels	3.9	5.8	5.7	5.6	5.8
Miscellaneous goods and services	5.8	6.8	6.4	6.0	5.9
Pocket-money	0.3	0.7	0.6	0.7	0.5

Source: own study based on Central Statistical Office (2023). *Household budgets in 2022*. Warsaw.

3.2. Expenditures on consumer goods and services of large households in 2006-2022

Moving on to the analysis of consumption expenditure in households with at least three dependent children, it was observed that the food and non-alcoholic beverages category in total expenditure had the highest share in 2006, which accounted for almost 1/3 of total expenditure (approx. PLN 147 per person). In the years 2012-2018, there was a decrease in the share of food expenditure, while in 2020 it increased again (by 4.8 percentage points compared to 2018). The year 2020 is a time after the outbreak of the COVID-19 pandemic and high inflation, which brought negative economic consequences that affected household budgets. In 2022, there was a reduction in the share of food expenses, which then amounted to 27.5% (approx. PLN 299 per person in large households) (Table 2).

The second important item among consumer expenditures was housing, water, electricity, gas and other fuels. Households with at least three dependent children spent on average approximately 16.9% for this purpose in the analyzed years. The category of expenses related to housing maintenance has shown a decreasing trend in recent years of the analysis. This could be due to the government's support for families through, among others, impact on the prices of gas and electricity or the introduction of allowances for households: coal, electric, protective and other aid activities (Karwowska, 2024).

Transport is also an important category of expenditure in household budgets. During the analyzed period, this category fluctuated significantly. The highest share was recorded in 2012, when large households allocated 11.8% (approx. PLN 78 per person) of their expenses for this purpose. As a result of the COVID-19 pandemic, 2020 was characterized by the lowest share of transport expenses, amounting to PLN 74 per person, or 8.3% of total expenses (Piekut, K., Piekut, M., 2022).

The share of expenditure on health, as well as expenditure on education and expenditure on home furnishings and household maintenance, increased in the analyzed years. In poor families, educational expenses are usually lower, but their increasing share indicates an improvement in the financial situation of households. The increase in income related to the "Family 500 plus"

program could have influenced this category of expenses, because poorer families had a greater opportunity to meet the educational needs of their children, and not only elementary needs (Każmierczak-Kałużna, 2019).

Large households spent on recreation and culture from 7.2% (PLN 64) in 2020 to 9.8% (PLN 65) in 2012. A better financial situation made it possible to meet higher-level needs to a greater extent.

Table 2.

Expenditures on consumer goods and services of households of married couples with at least three dependent children in selected years 2006-2022

Specification	2006	2012	2014	2016	2018	2020	2022
Disposable income	499.46	756.98	806.5	1050.97	1259.83	1365.23	1646.93
Total expenses	454.78	660.25	687.21	789.31	917.17	890.87	1086.16
Food and non-alcoholic beverages	32.3%	28.8%	28.0%	25.6%	24.4%	29.2%	27.5%
Tobacco products, alcoholic beverages and drugs	2.2%	1.9%	2.0%	1.7%	1.6%	2.1%	1.8%
Housing, water, electricity, gas and other fuels	17.2%	17.4%	17.6%	17.2%	16.4%	16.4%	16.0%
Furnishings, household equipment and routine maintenance of the house	5.3%	4.5%	4.5%	5.9%	6.0%	6.2%	6.0%
Clothing and footwear	6.3%	5.8%	6.4%	7.2%	6.3%	5.1%	5.4%
Health	2.9%	3.1%	3.2%	3.8%	3.8%	3.8%	4.2%
Communications	5.0%	4.1%	5.1%	4.9%	3.8%	5.0%	4.3%
Transport	9.9%	11.8%	9.9%	8.5%	10.9%	8.3%	9.5%
Education	1.7%	1.7%	1.8%	1.9%	2.9%	2.7%	3.0%
Recreation and culture	7.7%	9.8%	8.0%	9.1%	8.0%	7.2%	7.7%
Restaurants and hotels	2.2%	3.2%	4.6%	5.7%	6.4%	4.7%	5.6%
Miscellaneous goods and services	4.7%	4.7%	5.7%	5.6%	6.3%	5.9%	6.0%
Pocket-money	0.8%	1.1%	1.0%	0.8%	0.6%	0.9%	0.7%

Source: Own study based on Central Statistical Office (2007-2023). *Household budgets in 2006-2022*. Warsaw.

The analysis concerned selected years from 2006 to 2022. During this period, the "Family 500 plus" program was introduced (in 2016), under which benefits of PLN 500 were initially paid for the second and subsequent children. Currently, the benefit amount has been increased to PLN 800. Therefore, large households obtained an additional source of income, so their situation improved (Prokopowicz, 2017). In 2016 and 2018, the lowest shares of expenditure on food and non-alcoholic beverages in relation to total expenditure were observed, while the category of restaurants and hotels accounted for the highest share. Recreational and cultural needs were also met to a greater extent compared to most of the analyzed years. This means that large households could allocate a larger percentage of their expenses to higher-level needs.

Another factor affecting the situation of households was the outbreak of the COVID-19 pandemic. The years 2020-2022 indicate a deterioration in the financial condition of families with at least three dependent children, due to the growing share of food and housing expenses. This period also reduced the possibilities of meeting recreational and cultural needs, using hotel and catering services, and also resulted in lower expenditure on clothing and footwear.

On the other hand, education expenditure has been systematically increasing and has not decreased in 2020-2022. Due to the fact that large households, compared to other types of households, are most at risk of poverty, by providing children with good education they gain a chance to escape the cycle of poverty.

3.3. Consumption patterns in households with 3 or more dependent children

The use of cluster analysis to group large households according to expenditure on consumer goods and services made it possible to identify the consumption patterns of these households. Cluster I, the largest, covering 48.7% of all analyzed households, was characterized by the lowest disposable income per person and the lowest expenditure on almost all categories of consumer goods and services (expenditures on alcoholic beverages and tobacco products as well as on clothing and footwear in cluster I were slightly higher than in cluster III) (Table 3). These households were also characterized by the lowest propensity to consume - nearly 56% of disposable income (in the remaining clusters 61% and 70%) was spent on consumption expenses. In the disposable income in cluster I, what is noteworthy is the relatively highest share of expenditure on food and non-alcoholic beverages (approx. 21% compared to other clusters 17-18%). The shares of expenditure in disposable income on alcoholic beverages and tobacco products and on communications are also higher compared to other clusters. This cluster more often than the others recorded a larger number of dependent children. There were 45% of households of married couples with 4 or more children compared to 28-32% in other clusters. People representing cluster I had a lower level of education compared to other clusters (Table 4). Over 6% of people representing cluster I had at most secondary school education, and slightly over 23% had higher education. These households were slightly more often located in villages, i.e. nearly 49% compared to 41-43% in other clusters. In turn, in the largest cities, i.e. 200 thousand inhabitants and more, there were about 11%, while in other clusters it was over 21% and 36%. To sum up, in cluster I the lowest standard of living is observed due to limited income, low propensity to consume and focus on basic needs.

Cluster II, covering 35.3% of all households, was characterized by the highest disposable income and, with the exception of the category of expenditure on housing, water, electricity, gas and other fuels the highest expenditure on consumer goods and services. In disposable income, there were relatively high shares of expenditure on clothing and footwear - 4.7% compared to 1.6% and 2.7% in other clusters, and on recreation and culture - 7.6% compared to 2.5-2.7%. The share of expenditure on housing and energy in disposable income was the

lowest of all clusters (approx. 9% compared to approx. 10% and 22%). A characteristic feature of the analyzed cluster was the highest percentage of households represented by people with higher education, i.e. nearly 56%. Cluster II is characterized by the highest standard of living thanks to high income, high flexibility in spending and better development opportunities.

A characteristic feature of cluster III, which included 11.0% of large households, was the highest percentage of expenses on housing and energy in disposable income – 22%. These households were characterized by the highest propensity to consume (the share of consumption expenditure in disposable income was over 70%). Households from cluster III were more often than others located in large cities with 200,000 inhabitants and more – 36%. To sum up, cluster III is characterized by an average standard of living, but with financial challenges related to the high costs of housing.

Table 3.

The level of expenses and their share in disposable income in households of married couples with 3 or more children to support

Specification	Level of expenditures			Share expenditures in income		
	1st cluster	2nd cluster	3rd cluster	1st cluster	2nd cluster	3rd cluster
Food and non-alcoholic beverages	264	353	306	20.6	17.6	16.5
Tobacco products, alcoholic beverages and drugs	18	25	17	1.4	1.2	0.9
Clothing and footwear	35	94	29	2.7	4.7	1.6
Housing, water, electricity, gas and other fuels	125	171	411	9.7	8.5	22.1
Furnishings, household equipment and routine maintenance of the house	36	80	38	2.8	4.0	2.1
Health	26	78	31	2.0	3.9	1.7
Transport	53	173	70	4.1	8.6	3.8
Communications	45	49	48	3.5	2.4	2.6
Recreation and culture	32	152	49	2.5	7.6	2.7
Education	12	61	22	0.9	3.0	1.2
Restaurants and hotels	26	64	41	2.0	3.2	2.2
Miscellaneous goods and services	43	112	64	3.3	5.6	3.4
Amount of disposable income/consumption expenses in income	1283	2004	1857	55.5	60.7	70.4

Source: own study based on: individual data from the Central Statistical Office household budget survey, 2023.

Table 4.

Characteristics of types of large households

Household types	1st cluster	2nd cluster	3rd cluster
Households of married couples with 3 dependent children	55.4	72.1	67.9
Households of married couples with 4 or more children to support	45.0	27.9	32.0
average number of people in the household	5.7	5.4	5.4
average age of the household representative	40.6	41.9	41.4
Households with a representative with higher education	23.4	55.7	39.2
Households with a representative with secondary education	35.7	23.2	31.7
Households with a representative with basic vocational education	34.7	18.6	26.7
Households with a representative with at most secondary school education	6.3	2.5	2.5

Cont. table 4.

Households located in:			
cities: 500 and more inhabitants	6.4	12.1	23.8
cities: 200-499 thousand inhabitants	4.3	9.4	12.4
cities: 100-199 thousand inhabitants	7.2	5.1	5.6
cities: 20-99 thousand inhabitants	17.7	18.0	9.4
cities: under 20 thousand inhabitants	15.9	14.4	5.7
Village	48.6	41.0	43.2

Source: own study based on: individual data from the Central Statistical Office household budget survey, 2023.

4. Discussion of the results

Consumption in large households is subject to significant changes as a result of the decreasing number of such families and economic pressures. Despite the decline in the number of large-child households, those that exist face challenges related to the need to optimize expenses and cope with limited resources (Beaumont, 2011).

In cluster I, the low level of disposable income may negatively affect the development of children from these households. Cooper and Stewart (2021), focusing on the impact of household income on various child outcomes, including cognitive, social-behavioral and health development, showed that higher income contributed to better educational outcomes, social and behavioral development, as well as the health (especially in the context of low birth weight) of children. Large households were often in a more difficult financial situation, which meant that their children were more vulnerable to the negative effects of low income. The so-called mediating mechanisms in this area were indicated. Income improves mothers' mental health, which has a positive impact on parenting and the atmosphere at home. More financial resources enable the purchase of better educational materials and a healthy diet, which supports children's development. In particular, income growth had the greatest impact on outcomes for children from the poorest households. It was pointed out that income support policies, such as cash transfers, can be an effective tool for improving the living conditions of children from large and poor households. As indicated by the authors of the cited study (Cooper, Stewart, 2021), the introduction of financial support can significantly improve the situation of children in such families by: reducing the economic stress of parents, improving the quality of life and access to education, supporting the physical and mental health of children and parents. In cluster II, higher disposable income in large households resulted in greater expenditure on education, recreation and culture and other higher-level services, which can probably be associated with a beneficial impact on the cognitive and socio-behavioral development of children from these households.

5. Conclusions

The study identified the level and share of consumption expenditure in households with at least three dependent children and identified consumption patterns in the types of these households. The analyzes carried out enabled the implementation of the research goal specified at the beginning of the article.

It was found that large households, compared to other groups divided based on their biological type, were characterized by the lowest or one of the lower shares in terms of expenditure on: housing and energy, health, transport, tobacco products, alcoholic beverages and drugs. At the same time, one of the highest or highest shares was recorded for expenditure on: food and non-alcoholic beverages, home furnishings and household maintenance, clothing and footwear, education, recreation and culture, and pocket money. Due to the lowest disposable income and the highest share of food expenses in total expenses, large families are in the most difficult financial situation, which may indicate a low standard of living in these households.

It should be noted that consumption in households with at least three dependent children has fluctuated significantly over the years. In 2006, households met mainly basic needs. Food expenses then accounted for 1/3 of total expenses. The best situation for the analyzed households was 2016-2018. This was due to, among others, from the introduction of the Family 500 plus program. Then, the years 2020-2022 related to the COVID-19 pandemic resulted in the deterioration of the financial situation of large households.

Summarizing the conducted clustering research, three clusters of households of married couples with at least 3 dependent children with different living standards were distinguished, the lowest in cluster I and the highest in cluster II. These clusters may also constitute market segments for entrepreneurs. Companies can create products and services tailored to the specific needs of particular groups. For cluster I, these should be inexpensive, basic products, especially in the food and non-alcoholic beverage categories; for cluster II - luxury goods and offers related to recreation and culture, and for cluster III - products and services related to the use of housing and energy carriers. These clusters differ in location (e.g. villages vs. large cities), which allows advertising activities to be directed to appropriate geographical areas.

Households from cluster I, characterized by the lowest income and low propensity to consume, should also be the object of interest of social welfare units. These farms should be recipients of special social programs. Policies should focus on improving access to education, nutritional support and programs that equalize children's development opportunities. For households from cluster I, which are more often located in villages, it is also worth planning the development of educational, transport and communication infrastructure to support the availability of services. In turn, for cluster III, located mainly in large cities, it is advisable to increase the availability of housing and efficient energy systems.

In cluster I, where the share of people with at most lower secondary education is the highest, training programs and educational initiatives can be implemented aimed at improving professional qualifications.

In cluster III, where the share of expenditure on housing and energy carriers is the highest, energy efficiency improvement programs can be developed and energy saving products can be offered.

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THE IMPACT OF MANAGEMENT CONCEPTS ON ORGANISATIONAL DEVELOPMENT: A CASE STUDY ANALYSIS

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Purpose: This article aimed to analyse the concept of management as a tool for enhancing the efficiency of modern organisations.

Design/methodology/approach: The article analyses the application of management concepts in Polish organisations in 2025. This is achieved through the use of the triangulation method (observation, analysis and interviews), as well as a case study of an organisation.

Findings: Analyses, material research and interviews with entrepreneurs have shown that applying management concepts improves organisation by optimising costs and time, improving customer service quality, implementing development and knowledge transfer mechanisms, and applying innovations.

Research limitations/implications: The article presents of case studies of organisations that have incorporated various management concepts into their business practices. Future research will examine the impact of management concepts on business development, with a view to introducing operational improvements and innovations. Limitation of the research process was the difficulty of obtaining a satisfactory sample for the study.

Practical implications: The introduction of management concepts increases enterprises' competitiveness by optimising costs and time, improving quality, and providing access to knowledge and innovation. This contributes to the improvement of their operations.

Social implications: Analysis into the application of management concepts in organisations benefits local communities by building the competitiveness of businesses through openness to interorganisational relations, introducing modern technical and technological solutions, and improving the efficiency of organisations. Thanks to management concepts, new industries can replace old and overcome problems such as seasonal sales and a lack of mineral resources. They can also ensure the development of industries with high intellectual capital, influencing the implementation of technical and technological. Implementing the management concept will contribute to the creation of interorganisational cooperation, as well as increasing the importance of knowledge for the activities of enterprises.

Originality/value: The article presents an original approach to applying management concepts in organisations introducing new methods and techniques to improve their operations through technical and technological changes, organisational changes, better customer service, and innovation by 2025.

Keywords: Management concepts; organisational competitiveness; business improvement.

Category of the paper: General overview; study.

1. Introduction

In today's world, managing an organisation in a globally competitive environment requires the conscious application of concepts, methods, strategies, and techniques. These tools are designed to streamline management processes, encourage competition, and establish robust standards, thereby strengthening the company's position as a global market leader. These objectives are achieved by optimising costs, time, quality, efficiency, productivity, and innovation within enterprises. Many foreign and Polish authors have described classic concepts for improving organisation, such as: M.E. Porter (1998), J. Brilman (2002), A. Chauvet (1997), R.S. Kaplan, D.P. Norton (2010, 2011), G. Gierszewska (2000), M. Romanowska, P. Wachowiak (2006), Z. Mikołajczyk (2001), M.J. Stankiewicz (2007), A. Noga (2009), R. Borowiecki, A. Jaki (2014), A. Jaki, J. Konecki, T. Bojek (2011), A. Bitkowska, E. Weiss (2015), M. Czerska, A. Szpitter (2010), A. Werenowska, K. Michalski (2023), W. Sroka, J. Dzieńdziora (2014), K. Zimniewicz (2009), A. Tomaszewski (2013). Changes in global organisations are characterised by foreign literature. The focus of Polish literature is on the application of management concepts following the system transformation and enterprise restructuring of the 1990s. Research is needed to improve the operations of Polish SMEs by using management concepts described in Polish and foreign literature.

This article aimed to analyse the role and significance of management in the practical activities of contemporary Polish organisations. This article assesses the usefulness of well-known management concepts for improving organisational operations in Poland. It seeks to evaluate how useful these concepts are for managing contemporary organisations in Poland. The introduced improvements were aimed at increasing competitiveness and efficiency, optimising costs and time, improving customer service quality, and promoting technical and technological innovation. The article addresses a research gap in the characterisation of management concepts applied to the activities of modern enterprises, with the aim of improving management by 2025. Modern companies can improve their operations by applying management concepts, gaining flexibility, innovation, cost reduction and global reach. To meet global challenges and reduce business risks, modern companies should implement global work organisation methods, create partnerships and cooperate with other companies, and compete on the global market.

2. Applying management concepts to improve mBank S.A.'s operations in practice

Both Polish and foreign literature characterises management concepts such as lean management, time-based management, total quality management (TQM), outsourcing, reengineering, benchmarking, learning organisations and network organisations. These concepts influence changes in technological production and work organisation.

Management concepts have been described extensively in the works of pioneers of change management. These include: J. Brilman (2002), Z. Mikołajczyk (2001), W. Saabeel et al. (2002), P.M. Senge (2012), M.J. Stankiewicz (2007), K. Zimniewicz (2009). The concept of intelligent organisations has been described by foreign authors in the literature, such as: O. Laasch (2024), P. Kong, T. Miller, K. Bittner, R. Ripley (2023), R. MacIntosh, D. MacLean, C. (2023), L. Lominé, M. Muchena, R.A. Pierce (2023). Analysis of the concepts described reveals a knowledge gap in the research concerning the impact of these concepts on contemporary Polish organisations by 2025. The article describes the improvements implemented by these organisations, consisting of technical and technological innovations, as well as changes to the organisation of work. The following authors describe learning organisations that are influenced by management concepts: P. Massingham (2019), Samuel C. Certo, S. Trevis Certo (2018), R. David Fred, R. David Forest (2016).

mBank S.A. was the first bank in Poland to introduce online banking in 1997, and now offers a full range of financial services, from personal accounts to services for large companies. By implementing management concepts such as lean management, time-based management and reengineering, mBank S.A. is optimising costs, time, and customer service quality. The company is also introducing technological changes such as internet services, management process technologies, remote working, technological innovations, artificial intelligence and process automation (O mBanku, 2025). The focus of TQM management concepts is improving work organisation. To this end, mBank enables remote working and has introduced a flexible hybrid working model. mBank's strategies are influenced by improvements in customer service quality, focusing on the development of mobile applications and digital services that make banking more accessible to customers anytime, anywhere. Management concepts optimise costs and operating times. This is why mBank uses cloud platforms such as Google Cloud and Microsoft 365 for data storage and to enable remote access to documents. Organisational improvements focus on the use of tools for remote working: Microsoft Teams (communication platform for video conferencing and team meetings), Zoom (online meetings with customers and colleagues), Jira and Trello (project and task management). Applying network organisation management concepts to improve mBank's operations brings the following benefits: increased flexibility in the way people work, high availability of online services (internet and mobile banking) and the ability to work in distributed teams. These improvements make it easier to

implement projects and business processes. A key element of applying the reengineering management concept is making technical and technological changes to streamline the management of organisational structures. The technologies supporting mBank's operations (O mBanku, 2025) include a mobile app, AI and machine learning, and anti-fraud system. New technologies such as the internet, cloud computing and mobile applications are changing the way work is organised by enabling effective collaboration between teams in different locations. An analysis of the impact of lean management, time-based management, and total quality management, TQM concepts on organisational development in Poland shows that changes to work organisation are the most frequently implemented. The new work organisation is based on the following: geographically dispersed teams (employees can work from different locations around the world), the absence of traditional offices (companies operate without the need for central offices), the use of technology (work is based on cloud applications, e.g. Google Drive and Office 365), the implementation of communication platforms (e.g. Slack, Microsoft Teams), the implementation of project management systems (e.g. Trello, Jira), flexibility (employees can adjust their working hours to suit their own rhythm) (Cf. Davidow, Malone, 1992). mBank S.A. implements concepts of network organisation management. These are consistent with changes in work organisation described in foreign literature (Saabeel, 2002). This concept proposes a structural model in which an organisation is treated as a network of independent entities, which may include companies, individuals, or project teams. Geographical barriers are eliminated and operating costs are reduced by the Internet and global networks. The strategy of mBank S.A. (O mBanku, 2025) is a case in point: as a leader in digital banking, it has focused its strategy on improving customer service by creating Internet and mobile banking. The mBank structure is based on project teams and the concepts of learning organisation management (empowerment and coaching). Teams are spread across different regions and functional areas: IT, customer service, marketing, risk management. mBank uses Agile project management, which enables flexibility and a quick response to changes. The bank's implementation of the concept of managing learning organisations involves changes aimed at improving work organisation by introducing hybrid working (mBank employees can perform their duties both in the office and remotely, with flexible working hours). The management concepts introduced by mBank have influenced changes in the techniques used to improve process management. mBank uses the following tools to support the organisation of work: Google Meet and Zoom, which streamline the planning and conduct of online meetings with customers and teams; and Google Drive and OneDrive, which are used for storing and sharing documents. An analysis of how management concepts are applied at mBank has led to the conclusion that the changes introduced have brought many benefits, including reduced operating costs (as there is no need to maintain an extensive branch network), greater convenience for customers (who have 24/7 access to services from any location) and increased reach (as the bank is able to serve customers from different regions of Poland and around the world). An analysis of the implementation of management concepts aimed at

improving the organisation's operations has shown that mBank is a forward-thinking organisation that is committed to continuous development and improvement. It builds strategies that can meet the challenges of modern competition, such as enabling employees to work remotely or in a hybrid mode, which gives them flexibility in organising their working day. The organisation also introduces the latest technologies, such as advanced cloud technologies and communication tools like Slack, Zoom and Google Cloud. Furthermore, it focuses its strategy on international reach, operating globally with teams in different parts of the world. mBank's strategy, which focuses on the use of management concepts, influences technological changes and improvements in work organisation. This promotes competitiveness and helps the organisation to develop.

3. The practical application of organisational management concepts in a case study of CD Projekt RED S.A.

Management concepts require technological and technical changes, as well as network cooperation and communication. This promotes the development of modern, competitive strategies. The concepts described in foreign literature are evolving towards the ideas of learning organisations, networks, and intelligent organisations. Management concepts influence the implementation of new organisational improvement models, as demonstrated by CD Projekt RED S.A. (CD Projekt, 2025). The outsourcing management concept is a model often used by companies that base their operations on cooperation with suppliers, subcontractors, and business partners, as well as those that delegate parts of their operations to external partners. Management concepts based on benchmarking and outsourcing influence the development of network cooperation models. These models see a company use a network of business partners, suppliers, and other entities to increase operational efficiency and flexibility. Peter Drucker's organisational management concepts, promoted in the 1990s, advocated replacing traditional hierarchical structures with more flexible cooperation networks. This became possible thanks to the rapid development of technologies such as the internet. CD Projekt RED S.A. is an example of a Polish company that has implemented organisational improvements based on the concepts of a learning, networked organisation and TQM (CD Projekt, 2025). The organisation is a Polish computer game developer which has been operating since 2002. It has gained worldwide recognition thanks to its work on the Witcher series and Cyberpunk 2077. The company specialises in developing AAA games with deep storylines, high-quality graphics, and extensive virtual worlds that stand out from the crowd. The organisation has demonstrated remarkable flexibility in adapting its offerings to meet the needs of modern customers. Its target group consists of global players, particularly fans of role-playing games (RPGs). CD Projekt RED S.A. is part of the CD Projekt Group. The Group also distributes games through the GOG.com platform. The key management concept was outsourcing

implementation (CD Projekt, 2025). The company collaborates with external studios specialising in animation, dubbing, music and special effects. It implements a network-based approach to cooperation, forming global partnerships with distributors such as Bandai Namco in Europe and Warner Bros. in the USA. Another element of the concept of a network organisation is an ecosystem of developers, such as a network of independent creators who support game development. The final element is marketing and public relations (PR), which involves collaborating with international advertising agencies to promote products. This model enables CD Projekt RED S.A. to concentrate on its core competencies, such as designing game worlds and telling stories through gameplay. Implementing the concepts of learning organisation management influences changes to the organisational structure. CD Projekt RED is organised into project teams, each focused on specific tasks related to game development. Management concepts based on the ideas of the learning organisation and networking can improve an organisation by introducing changes within the company. These changes include interdisciplinarity, where programmers, graphic designers, designers and scriptwriters work together on various aspects of the game; cooperation with partners, where external contractors are integrated into the production process; and flexibility, where the structure allows for quick changes to be made to the project at every stage of its implementation. CD Projekt RED S.A. uses the principles of a learning organisation to gain a competitive advantage, working with a network of trusted partners including technology providers, distributors, and creative partners. Using the concept of the learning organisation promotes interorganisational cooperation within a network model, which brings many benefits to CD Projekt RED S.A. The company has achieved success in the global market by reducing costs (through outsourcing and partnerships), gaining access to specialists (by cooperating with experts around the world), becoming more flexible (by being able to scale resources according to project needs) and leveraging its global reach (thanks to its network of distributors, CD Projekt RED S.A. can reach players on all continents). The management concepts implemented by the company have contributed to improvements in the organisational structure. CD Projekt RED S.A.'s project structure is focused on video game development and places a strong emphasis on production teams. Changes to the organisation of work allow for collaboration with creative and technological partners from outside the organisation. An analysis of improvements implemented in line with management concepts (reengineering) reveals how technology is used at CD Projekt RED S.A. This includes the development of advanced gaming technologies (e.g. the REDengine engine) and the use of technology for storytelling and virtual world design. Implementing the concept of a networked, learning organisation supports interorganisational cooperation. Despite having its headquarters and production facilities in Poland, CD Projekt RED S.A. operates on a global scale. Management concepts affect customers because games attract players from a variety of different markets. The application of the concept of intelligent organisational management has an impact on changes to work organisation and the development of interorganisational relations. CD Projekt RED S.A. relies on cooperation with independent studios, marketing partners and distributors

to build strong, long-term relationships within the gaming industry. The organisation's network structure ensures it can adapt to market changes. CD Projekt RED is adapting to new industry trends (e.g. online gaming and VR). CD Projekt RED S.A.'s competitive strategies focus on adapting the concept of a network organisation as the primary operating model. This approach enables the achievement of several key objectives: needs analysis (identifying areas that can be automated or outsourced), network building (establishing relationships with strategic partners), investment in technology (developing tools to support collaboration and data management), organisational culture (promoting openness and teamwork), phased implementation (testing selected cooperation models).

CD Projekt RED is also adapting to new industry trends (e.g. online games and VR). Applying various management concepts to the analysed case study led to improvements and organisational development, achieved through changes in work organisation, the implementation of new technologies, and the development of interorganisational cooperation. These factors contributed to the success of CD Projekt RED S.A.'s competitive strategy in the global market.

4. Summary

Analysis of modern organisations has revealed a growing interest in the practical application of management concepts. Management concepts will have a significant impact on the development of contemporary Polish organisations after 2025, influencing their competitiveness in a global context. Implementing the management concept ensures organisational flexibility, enabling survival and development in uncertain conditions. Thanks to technological advances, companies are streamlining their operations and facilitating global collaboration and innovation on an unprecedented scale. Management concepts influence changes within companies, enabling them to respond to market needs and actively shape their future. The competitiveness strategies of modern organisations are based on the following: the use of local resources, such as cooperation with Polish technology companies and specialists, expansion into global markets, such as building a network of international partners and customers, education and training, such as developing digital competencies within organisations, interorganisational cooperation, such as using programmes that support innovation and export, Leadership inspiration, such as encouraging leaders of change, innovation, and technology. Inspired by management concepts, the changes introduced influence the development of enterprises and ensure sustainable growth in the global market. This is achieved through technical and technological innovations, changes in work organisation, cost and time optimisation, and improvements in quality and customer service.

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DIRECTIONS FOR IMPROVEMENT OF KNOWLEDGE TRANSFER PROCESSES IN MUNICIPAL ORGANIZATIONS

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Purpose: In available studies on the transfer of knowledge in the organization there is no practical verification of the development of knowledge transfer processes in municipal organizations, and therefore it was decided to undertake empirical research in this field. As a result, the basic objectives of the empirical part of this study are to indicate the conditions of knowledge transfer in municipal enterprises as well as to identify directions (strategies) of knowledge transfer development, which are recommended for use in municipal enterprises. The goals were achieved in 2025 by in-depth interviews, which were an extension of the research initiated in 2017.

Design/methodology/approach: The initial goal of the study is to synthesize the literature output dedicated to the transfer of knowledge as a sub-process of knowledge management. Using the literature on the subject, the method of critical analysis was used, focusing on conducting a thorough scientific discussion aimed at identifying the determinants of the optimal organizational and social knowledge environment, and applying knowledge strategies contributing to the evolution/changes of the organizational culture towards the promotion and development of knowledge transfer processes.

Findings: These objectives were accomplished through surveys extended to include in-depth interviews at Municipal Water and Sewage Company – Krakow Waterworks. It was found that in this organization there are suitable conditions for the development of knowledge transfer, and it was recommended to focus on acquiring knowledge from outside of the enterprise, especially through the implementation of the strategy of creation through cooperation and the strategy of absorption as well as sharing knowledge as a consequence of the implementation of the strategy of internal expansion and the strategy of internal creation.

Originality/value: This article is intended to inspire the implementation of practices enabling the development of knowledge transfer processes in municipal organizations.

Keywords: knowledge transfer, knowledge sharing, municipal organizations, determinants of the flow of knowledge.

Category of the paper: Research paper.

1. Introduction

With the emergence of the knowledge economy, its basic distinguishing features are globality, networking and concentration on such sources of competitive advantage as: rarity, difficulty of imitating and non-substitution. These features are attributed to the intangible resources of the organization, among which knowledge plays the main role, holding the attribute of domination. The current generation refers to the idea of knowledge redundancy in terms of generating knowledge for the future. Accordingly, efforts should be made towards the democratization of knowledge, paying attention to the distribution of knowledge, which enables evolutionary development. It is based on the creation of common contexts, and interdependence, context, content and level of abstraction are the key to knowledge transfer as the most important process involving it.

The rules of the new economy began to be defined as the knowledge-based economy, and the implementation of the concept of knowledge management in organizational practice became the main challenge for modern enterprises. It was clearly and unequivocally emphasized that access to information and knowledge determines today the success of a company operating in the knowledge society (Skrzypek, 2013, p. 1; Nowak, 2024, p. 143).

Consequently, it is assumed that the concept of knowledge management has several phases of development. The present stage takes into account the "knowledge for the future" and there is a valid conviction of the need for the democratization of knowledge. Attention is drawn to the distribution of knowledge enabling its evolutionary development based on creating common contexts. In turn, interdependence, context, content and level of abstraction are treated as necessary conditions for the transfer of knowledge (Fic, 2012, pp. 371-383). Within the exploration of the concept of knowledge management, one can observe a clear trend to see knowledge as a relationship rather than a resource. Thus, there appears the need to refocus from the resource approach to the relational approach as a reference theory.

2. Background of knowledge transfer

In management sciences, considerations regarding knowledge management are most often carried out in the light of the management approach. Initially, the discourse was of a theoretical nature, and as the concept developed, these theses were presented in greater depth and were subjected to empirical verification. In addition, the issues raised began to be analyzed in more and more detail. One began to consider specific problems concerning in particular the formulation and implementation of knowledge strategy and knowledge management, implementation of operational functions of knowledge management (including knowledge

transfer) or building knowledge management systems. A part of the studies is dedicated to the management of knowledge workers, professionals or specialists, with particular emphasis on building the optimal zone of their comfort and analyzing and diagnosing their preferences. Some other researchers focus on issues related to the organizational culture that supports the effectiveness of knowledge management (e.g. culture of knowledge, trust or quality culture). The latest increasingly strong trend within the exploration of the concept of knowledge management requires knowledge to be seen as a relationship rather than a resource. Thus it points to the need to refocus from the resource approach to the relational approach as a reference theory. Opponents of the resource approach prove that knowledge is only the result of thinking processes, initiated and modeled through activities requiring interpersonal contacts. Interpersonal relationships are therefore not only a carrier of knowledge, but above all contribute to its creation because knowledge, especially tacit, reveals itself and arises in action, intense contacts, free and informal discussions. The essence of the creation of contemporary creative solutions, which are now the basis of competition, is therefore personal, unique knowledge of key employees and the organization's abilities to combine this knowledge with new, qualitatively different, more advanced intellectually resources. Therefore, the interpersonal relations of intellectual employees constitute the basis for success (Morawski, 2017, pp. 26-29). Hence, it can be presumed that a new paradigm emerges as a result of the evolution of views in the area of knowledge management. According to its assumptions, knowledge is a social process and not a resource, the dominant strategy should be personalization and concentration on tacit knowledge, and the subject of in-depth scientific discourse - above all - creating and sharing knowledge with the participation of employees as well as the social environment of processes involving knowledge. In the initial explorations focusing on the transfer of knowledge, the epistemological tendency seemed to dominate. Then with time, one began to undertake practical explorations of the problems under consideration, applying them accordingly to the relevant economies (Dziadkiewicz, Nieżurawska-Zajac, Duarte, Dryl, Dryl, Nieżurawski, Sofia, Pereira, Santos, Ferreira Lopes, 2017, pp. 49-61), regions (Sagan, Zalewa, Gorganiuk, Jóźwik, 2011, pp. 85-98), sectors (Kania, Drygas, Kutkowska, Kalinowski, 2010, pp. 22-28; Dee, Leisyte, 2017, pp. 355-365), types of enterprises (Ratajczak, 2006, pp. 113-120) or even organizational units in specific enterprises (Midor, Zasadzień, Szczęśniak, 2015, pp. 135-144). In available studies dedicated to the transfer of knowledge, one did not meet with the practical verification of the fundamental problems of knowledge transfer on the example of municipal organizations. It was decided to concentrate on this process with the participation of knowledge in the context of the functioning of these companies. The more so that the issue of the transfer of knowledge in the municipal sector corresponds with each of the stages of the development of knowledge management concept.

Within the current generation, this in particular refers to the knowledge transfer among agents of this process, i.e. municipal enterprises and the society. It also refers to various aspects of learning with the use of sharing tacit knowledge as well as the conditions and instruments of the effective realization of the knowledge transfer based on the idea of the democratization of knowledge in the municipal economy.

The basic objective of the study is to synthesize the literature output dedicated to the processes involving knowledge with the concentration on the transfer of knowledge as a strategy of managing it and identifying the determinants of knowledge transfer in the organization. In addition, the following research challenges were proposed: indication of the directions of the knowledge transfer development in municipal enterprises on the example of Miejskie Przedsiębiorstwo Wodociągów i Kanalizacji S.A. (*Municipal Water and Sewage Company – Krakow Waterworks*), identification of knowledge transfer strategies used during their implementation, identifying knowledge transfer principles recommended for use in municipal enterprises. The analyses of the conducted explorations will complete the real picture of the social and technical context of the knowledge transfer taking place in municipal enterprises.

3. Theoretical background of knowledge transfer development

Among the most advantageous knowledge management strategies are those based on the creation of new knowledge and its transfer: internal creation strategy, creation strategy through cooperation, internal expansion strategy and absorption strategy. A modern business-oriented enterprise must acquire new knowledge, stimulate its diffusion throughout the organization, and finally convert it into new solutions.

The flow of knowledge in creating the value of the organization was already emphasized by K.E. Sveiby (2005, pp. 49-52), who identified the effect of leverage of value creation by controlling the diffusion of knowledge in ten dimensions - knowledge flows between individuals, between individuals and the external structure, from the external structure to units in the company, from individuals to the internal structure, from the internal structure to individuals, within the external structure, from the external to internal structure and vice versa, and within the scope of the internal structure. These activities should result in a fully coordinated holistic approach that guarantees the maximization of value creation based on knowledge transfer. As a result, knowledge transfer, as a process with its participation, is today most often treated as a catalyst for effective management of the organization (Sinell, Iffländer, Muschner, 2017, p. 1460) and the determinant of the level of innovation of the enterprise (Tworki, Walecka-Jankowska, Martan, 2016, p. 352; Luo, Lui, Kim, 2017, p. 2), which determines its dynamic development. In addition, the theory of organizational knowledge

leads to the conclusion that the current organization must be seen primarily as a system of knowledge distribution (Nogalski, Karpacz, Karpacz-Wojcik, 2014, p. 168). Ultimately, the transfer of knowledge is considered to be the driving force of the modern economy (Michalak, Zagórowski, 2017, p. 300) on all its levels - global, state and enterprise.

In the first place, knowledge transfer is considered as one of the key processes involving knowledge that fits into the operational functions of knowledge management (Intezari, Taskin, Puleen, 2017, pp. 492-515; Kumar, Ganesh, 2009, pp. 161-174). Additionally, it is analyzed in terms of the levels at which it takes place - within the organization (individual and team) (Nakauchi, Washburn, Klein, 2017, pp. 766-782; Bendkowski, 2016, pp. 11-23) and inter-organizational (bilateral and within the inter-organizational network) (Wang, Xi, Xie, Zhao, 2017). Furthermore, determinants and obstacles to the transfer of knowledge are identified (Ishihara, Zolkiewski, 2017, pp. 813-824; Mariano, Awazu, 2017, pp. 779-795; Joia, Lemos, 2010, pp. 410-427), model views of the process of its distribution are verified in practice (Štrach, Everett, 2006, pp. 55-68; Narteh, 2008, pp. 78-91; Hutzschenreuter, Horstkotte, 2010, pp. 428-448) or the focus is placed on tools supporting knowledge transfer (Kuciapski, 2017, pp. 1053-1076). The transfer of knowledge is most often recognized as a dynamic process which constitutes the basis for the effective implementation of organizational learning (Dziadkiewicz, Nieżurawska-Hare, Duarte, Dryl, Dryl, Nieżurawski, Sofia Pereira Santos Ferreira Lopes, 2017, p. 49). This is the main process involving knowledge, which determines knowledge gathering, compiling and implementing. It is a key element of many strategies used in the management of knowledge (Skrzypek, 2013, p. 2). Sharing knowledge consisting in the recovery and discovery, and the subsequent transfer and explanation of knowledge possessed by individual members of the community is also the first stage of the cycle of creation of community knowledge by M. Kodama (Kodama, 2009, pp. 236-237).

It should be emphasized that the transfer constitutes a bridge connecting those who create knowledge and information with those who need them (Janczewska, 2016, p. 166). Depending on the context, it can mean either a centrally steered process of spreading knowledge within a given group of employees or the transfer of knowledge between individuals or teams of employees. It may take place outside formal structures and without significant participation of managers. It takes place continuously during the performance of daily tasks, while providing information, and it is an integral part of the organization's life (Jędry, 2016, p. 18).

According to the Western and Japanese approaches to knowledge, it should be perceived from the perspective of the way knowledge is understood and the type of knowledge under consideration. Based on the Western approach, it is not knowledge that is transferable, but information which is transformed into knowledge through the thinking process. The transfer of knowledge is made as a result of data transfer, which is an element of knowledge. In the case of the Japanese approach, information is the carrier of knowledge in the process of knowledge transfer. It evolves into knowledge when, as a result of interpretation, it provides context and "anchors" in human beliefs and engagement (Mikula, 2011, p. 62).

Literature abounds with many proposals for the classification of types of knowledge transfer. Various criteria are assumed as premises for the division. For example, focusing on the type of knowledge being distributed, one identifies the transfer of tacit and explicit knowledge. Referring to the criterion of the range of knowledge flows, one examines the transfer of knowledge within the enterprise and the one obtained from the outside. Analyzing the agents of knowledge, one indicates a transfer at the individual, group, organizational and inter-organizational levels (see. Kumar, Ganesh, 2009, p. 165). Active and passive knowledge transfers are also considered. An active knowledge transfer occurs when the actor voluntarily shares knowledge and information (voluntary knowledge transfer) and a passive one takes place only under pressure. It is forced and far from voluntary (Bendkowski, 2016, p. 19). Apart from the diffusion of knowledge, the most often mentioned groups of factors determining the effectiveness of knowledge transfer development in the organization are (Luo, Lui, Kim, 2017, pp. 3-4; Dee, Leisyte, 2017, p. 357): the level of the enterprise organizational learning ability, the strength of the dependence between the sender and the receiver of knowledge, the characteristics of knowledge as a special resource (viscosity, ambiguity), the level of social and technological development of the knowledge environment infrastructure.

4. Factors for improving knowledge transfer

Taking into account the conditions for implementing the transfer of knowledge one should identify specific factors which determine the development of the diffusion of knowledge in the organization. They can be identified with reference to the organizational structure, people and management methods (see Gruszczyńska-Malec, Rutkowska, 2013, p. 59). In the case of the organizational structure, an important factor impeding the circulation of knowledge is its rigidity affecting the lack of flexibility and autonomy, which leads to the fragmentation of the organization and the separation of functional divisions. This results in the dominance of top-down communication as well as the lack or minimal use of teamwork, which is due to the lack of grassroots initiatives. As far as people are concerned, the most common attitudes and actions that constitute barriers in the transfer of knowledge are: resistance to change, lack of civic attitudes, lack of motivation to share knowledge, to cooperate and to form partnerships. Additionally, a weak emphasis on the process of introducing new employees, staff turnover or lack of time may be a serious problem. In the aspect of management methods, the most common obstacles preventing the free flow of knowledge in the organization are: fear of losing power by delegating responsibilities, resistance to questioning the way the organization functions, inability to shape the atmosphere of free exchange of ideas and building teamwork principles as well as relationships based on trust and a sense of community, and also lack of promotion of communication favoring the exchange of knowledge. The essence of the circulation of

knowledge is to deliver it to those places where it is most needed (Jędrych, 2016, p. 18), and the transfer of knowledge itself requires "knowledge about how to transfer knowledge" (Liyanage, Elhang, Ballal, Li, 2009, p. 124).

5. Conditions for functioning of municipal economy

In various aspects of the functioning of the municipal economy, one should look at issues related to tasks completed as part of activities undertaken in the area of public utilities. Their goal is to provide ongoing and uninterrupted satisfaction of the collective needs of the local government community by providing universally available services (Kołos-Trębaczewicz, Osuch Pajdzinska, 2015, p. 9; Kozłowski, 2015, p. 11). Therefore, the commune's own tasks include, among others, ensuring (Act of March 8, 1990 on local government, Kołos-Trębaczewicz, Osuch Pajdzinska, 2015, p. 9): spatial order, real estate management, protection of environment, nature and municipal economy, communal roads, streets, bridges, squares and traffic organizations, water supply, sewage system, municipal sewage disposal and treatment, cleanliness and order as well as sanitary facilities, landfills and disposal of municipal waste, electricity and heat supply as well as gas, local public transportation, public education, supporting the dissemination of the local government idea, cooperation with and activities for non-governmental organizations, cooperation with local and regional communities of other countries. Due to the specific attributes of the municipal economy in the form of: high capital intensity of the investment cycle, simultaneity of production, supply and consumption, high maintenance costs or organizational and management complexity and diversity (Kozłowski, 2015, p. 11), one of the challenges facing the managers of these organizations is the use of modern technologies and innovative management methods. In addition, the requirements for survival and development present in the economic dimension of the functioning of these organizations also force in their case an orientation to knowledge, and in particular its transfer, if only in the form of technology transfer or good management practices. After all, municipal enterprises are not free from concern about increasing value, improving competitiveness, ensuring the highest quality of services, building key competencies. Obviously, knowledge transfer, both inter- and intra-organizational, is aimed at such activities.

Taking into account these specific conditions of the activities of municipal enterprises, the factors determining the effectiveness of knowledge transfer therefore become particularly important. The issue of knowledge transfer in the municipal sector corresponds to each of the developmental stages of the knowledge management concept. Within the current generation, it particularly concerns the diffusion of knowledge between the agents of this process in the form of municipal companies and the society. It also refers to various aspects of learning with

the sharing of tacit knowledge, as well as the conditions and instruments for the effective implementation of knowledge transfer embedded in the idea of knowledge democratization in the municipal economy. Thus, the leading services provided by municipal companies are water and sewerage, heating, public transportation, and waste removal and disposal (Bachor, 2009, p. 7). Thus, they are peculiar organizations with distinctive characteristics that arise from the need to integrate the public interest with economic efficiency and operation in the context of the municipal economy.

6. Research results

The respondents of the research conducted at the Municipal Water Supply and Sewerage Company SA were people in middle management positions (9 people). The research was conducted in the year 2025. The selection of the sample was conducted with the purpose of involving those who have experience (seniority), have gone through several levels or positions in their career so far, and are intermediaries in the transfer of knowledge and information between employees of the strategic management level and the operational level. In view of the results of the explorations made, the attitudes of openness and cooperation of the respondents come to the foreground. The interviews confirmed and allowed to elaborate on the problems signaled in the surveys, that the management supports team forms of work or allows freedom in this regard and encourages knowledge sharing. Steps are being taken to shape an organizational culture based on mutual trust, geared to promote and support transfer, including knowledge sharing.

Employees of the company under review cooperate voluntarily, are positive about change and are convinced of the importance of innovation. In addition, they are involved in creative activities by the management, which uses their ideas while implementing an internal creation strategy. From the indicated most frequently used sources of information and knowledge, it appears that the employees prefer direct contacts. In this regard, remote work which is now increasing the reach/opportunity for cooperation is less preferred. The focus should therefore be on developing social processes for improving knowledge transfer. The determination of management and employees to acquire the tacit knowledge of retiring employees was confirmed in interviews. Its evidence can be seen in the common and consistent practice in the organization of creating the so-called “shadow cabinets” (49% of indications). Several months before an employee retires, another employee is appointed to replace him. Through observation and participation in the work, he or she prepares to take over the function, thus being a participant in the entire SECI process, and especially externalization and socialization. An additional method used to retain as much knowledge as possible held by retiring employees is to hire them on a part-time basis to help their successors to learn their job.

Management, in its daily organizational behavior and actual attitudes, seems to adhere to norms and values aimed at team-oriented forms of work organization, creating an atmosphere of support, respecting the principle of reciprocity, promoting an altruistic attitude in knowledge sharing that builds a positive employee reputation. Undeniably, a sense of job security and average seniority catalyze these phenomena in the analyzed organization.

The obtained responses suggest a limited focus on acquiring knowledge, including explicit knowledge, and little determination to seek it outside the organization. The enterprise appears as a hermetic entity, firmly rooted in the specifics of its own activity, limited only to the interior of the organization, which prevents the realization of the strategy of creation through interaction and the strategy of absorption of knowledge. The lack of interaction with other organizations in the industry, with the scientific community and close cooperation with local communities significantly affect the lack of new solutions that could enrich the municipal sector as a result of such cooperatives. We are talking about the municipal sector because this tendency is present in all entities in the municipal sector.

During the in-depth interviews, respondents confirmed that there is a clear difficulty in accessing knowledge regarding, for example, the interpretation of dynamically changing legal acts and the detailed regulations implementing them. Most often, such knowledge is made available during individual and direct contacts often even taking the form of tacit knowledge.

The dominant medium used to disseminate knowledge is the Internet. This is followed by specialized publications and product advertising as well as appearances at seminars, symposia or conferences. Industry trade fairs, peer-to-peer contacts, discussions, and the company newspaper are the most frequently indicated responses.

Referring to the results of the conducted studies and suggesting directions for improvement, it should be emphasized that one of the primary objectives of knowledge management in the analyzed units should be the creation of a knowledge sharing system. Managers should be aware that in order for knowledge sharing to be effective at the organizational level, it is necessary first of all to determine the effects to be achieved, which will be the starting point for selecting the desired knowledge management strategies and the right attitudes and behaviors taken towards knowledge sharing. Subsequently, depending on the preferred activities, conditions should be created to stimulate individuals to share knowledge. A sound social and technical infrastructure of the knowledge environment should also be built. At the same time, the technological conditions stimulating knowledge sharing should be secondary to the social ones.

Significantly, according to the theory of knowledge sharing, it is a process rooted in face-to-face contacts, often informal, and essentially targeting tacit knowledge. It can be concluded that both the individual and organizational levels deserve additional development - the more we plan to share tacit knowledge, the more extensive it should be. In the case of the individual dimension, efforts should be focused on building trust and triggering attitudes of altruism,

embedding activities in a properly designed incentive system, and efforts should be made to make greater use of mentoring and coaching or quality circles.

Intensive efforts are required to expand the organizational level of knowledge sharing - here support can be sought in technical solutions, obviously leaving the context of the motivational system and organizational culture.

7. Conclusions

Knowledge transfer is conditioned in an organization through (Skrzypek, 2013, p. 3): increased awareness of the need for development, participation and collaboration, continuous learning, creativity, mutual trust, shared goals and interests, the need to think, the desire to explore and create, and the awareness that a place on the market is determined by intellectual wealth. The research was carried out in 2025 through in-depth interviews, which complemented and developed the questionnaire research conducted at the Municipal Water and Sewage Company S.A. in Krakow in 2017. It was found that suitable conditions for improving knowledge transfer processes existed in the analyzed organization, pointing to the acquisition of knowledge through the use of the strategy of creation through interaction and the strategy of absorption, as well as the strategy of internal creation and the strategy of internal extension. These four strategies were indicated as key in responding to the challenges facing the municipal sector. However, the lack of a systemic approach to the implementation of the identified knowledge strategies accounts for the lack of access to certain resources. Excessive focus on internal processes and lack of cooperation with external entities is a significant barrier to the development of municipal organizations. The analyzed results should be taken only as an overview, as they have clear limitations due to the size of the research sample and the levels of management represented by most of the respondents. The research should be seen only as pilot considerations and may entitle proper multidimensional scientific explorations regarding, for example:

- the directions of the various sub-processes of knowledge transfer, with the identification of which sub-processes are based on internal knowledge and which ones come from outside the organization,
- the role, functions and tasks of the knowledge transfer coordinator as a knowledge broker,
- the identification of the dimensions of organizational knowledge culture with indication of the ones specific to municipal enterprises,
- the analysis of knowledge transfer in the context of the impact of all stakeholders of municipal enterprises,

- functioning in network structures in the form of existing municipal holding companies,
- the development of a set of guidelines for the operation of good practices for the management of municipal organizations.

Companies should therefore strive to create and provide employees with such a functioning environment that would stimulate knowledge diffusion. Leaving aside the technological aspects that complement the knowledge transfer space, it is recommended that it should be based mainly on the formation of an appropriate organizational culture and the creation of the right context for the implementation of this process involving knowledge. It is desirable for the existing organizational culture to evolve into a culture that promotes knowledge, including, among other things, continuous training and further education of employees, informal ways of communication, evenly distributed responsibility, expert authority, multifunctional teams (see Latusek, 2008, p. 180; Intezari, Taskin, Pauleen, 2017, p. 504), with the use of appropriate tools to influence the relevant elements of knowledge culture (see Glinska-Neweś, 2007, p. 256).

Based on the results of the study, conclusions were formulated setting the directions of activities that will allow to improve knowledge transfer processes: striving for an open system, sharing knowledge as a feature of a committed employee, developing common models of thought, openness, targeted protection of knowledge, communication and mutual interaction, personal high positive involvement, leaving the space of events, actions and behavior spontaneous, informal, intensifying direct contacts, reducing the degree of formalization.

To sum up, pointing out the directions for improving the knowledge transfer process in municipal organizations, it is first necessary to create a comprehensive knowledge transfer system as a subsystem of the knowledge management system, taking into account both the social and technological dimensions of the process, which:

- makes it possible to analyze and diagnose the extent of implementation of the knowledge transfer process, including the ability to examine the degree of openness in knowledge sharing at the level of the individual, group, organization, sector,
- intensifies knowledge acquisition, especially from outside the organization,
- makes it possible to strengthen cooperation with the company's external stakeholders (especially the society) and other companies that make up the holding company,
- makes it possible to expose pro-environmental and pro-social activities and shape a positive image of the organization as a public benefit institution,
- identifies barriers to knowledge sharing and eliminates them,
- shapes optimal conditions for the implementation of the knowledge sharing sub-process,
- takes into account the creation of a climate conducive to knowledge transfer, especially knowledge sharing, and ultimately the formation of the knowledge culture.

8. Summary

In summary, indicating the directions of improving the knowledge transfer process in municipal organizations, one must first create a comprehensive system of knowledge transfer as a subsystem of a knowledge management system, taking into account both the social dimension and the technological process that:

- enables analysis and diagnosis of the scope of the knowledge transfer process, including the ability to examine the degree of openness in sharing knowledge at the level of an individual, group, organization, sector,
- intensifies the acquisition of knowledge, especially from outside the organization,
- enables closer cooperation with external stakeholders of the enterprise (in particular the society) and other holding companies,
- makes it possible to display pro-ecological and pro-social activities and to shape a positive image of the organization as a public benefit institution,
- identifies barriers in sharing knowledge and reduces them,
- shapes the optimal conditions for the implementation of the knowledge sharing sub-process,
- takes into account the creation of a climate conducive to the transfer of knowledge, especially sharing it and, ultimately, shaping the culture of knowledge.

According to the assumptions, knowledge is a social process and not a resource, the dominant strategy should be personalization and concentration on tacit knowledge and the subject of in-depth scientific discourse, above all, creating and sharing knowledge with the participation of employees and the social environment of processes involving knowledge.

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EXPLORING THE ACCEPTANCE OF THE CHATGPT ARTIFICIAL INTELLIGENCE TOOL IN TEACHING PROGRAMMING

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Purpose: This article presents the results of an acceptance study of artificial intelligence, in the form of the ChatGPT tool in programming education. The purpose of this study was to identify factors influencing the acceptance of AI technology in the form of ChatGPT in programming education among students. The study involved 383 pupils and students learning programming in educational classes.

Design/methodology/approach: Data obtained through a survey questionnaire were analysed, which measured the impact of constructs such as performance expectancy, effort expectancy, innovation characteristics, social influence, psychological needs and trust on acceptance. Questions defining each construct were prepared according to previous studies. The subjective degree of feeling was given by the user on a seven-point Likert scale (1 - strongly agree, 7 - strongly disagree). The seven-point scale has also been used in many other works on similar topics. Correlation studies were carried out using the partial least squares (PLS) method. Calculations were performed using Excel, SPSS, and the SmartPLSv3 application.

Findings: The results indicated that the most significant influence on acceptance was expected effort and expected performance. Trust in the technology appeared to be next. On the other hand, psychological needs, social influence and innovation characteristics although present, have a less significant impact on respondents' decision to accept the ChatGPT tool.

Research limitations/implications: Future research should focus on continuous improvement of measurement models and adaptation to the studied environment.

Practical implications: The results obtained may have practical implications for staff creating and managing the education process and for software developers.

Social implications: Building awareness of the impact of various factors on the behaviour of users of information systems.

Originality/value: The paper analyses the factors influencing software acceptance, which is of relevance to management and quality sciences.

Keywords: ChatGPT, technology acceptance, artificial intelligence in education, TAM, UTAUT, programming education.

Category of the paper: Research paper.

1. Introduction

Modelling technology acceptance is a key aspect of research into the¹ factors that determine users' choice of IT tools. Research on the acceptance of artificial intelligence (AI) in education, management, economics can bring tangible social and financial benefits. First of all, the acceptance of AI technology by pupils and students is crucial for the very process of its implementation in education and for the full exploitation of AI's potential in the learning process. On the other hand, knowledge of the determinants of acceptance of the ChatGPT tool, can influence the management of the educational process, as well as the evaluation of curricula in educational institutions. Several relevant theories of technology acceptance can be distinguished in the literature.

One of the first models used in technology acceptance research was the theory of reasoned action (TRA). Developed by Fishbein and Ajzen (1980), it indicates that both attitudes², and social norms³, are crucial in shaping behavioural intentions. Behavioural intentions, in turn, directly influence users' behaviour, creating a predictable relationship between attitudes and behaviour. The next step in technology acceptance research was the development of the theory of planned behaviour (TPB), which added another construct, perceived behavioural control (PBC). According to Ajzen (1985), a sense of control over a given action influences both users' intentions and behaviour, allowing better prediction of users' decisions in situations where there are technical or psychological constraints (Ajzen 1985). Other theories that have influenced current models of technology acceptance include innovation diffusion theory (IDT) (Wani, Ali, 2015; Rogers, 2003) and self-determination theory (SDT) (Ryan, Deci, 2013; Berkowitz, Bier, McCauley, 2017).

One of the most important, widely used and cited technology acceptance models is the technology acceptance model (TAM) proposed by Davis (1989). In the TAM model, two key factors, perceived usefulness (PU) and perceived ease of use (PEOU), influence user attitudes and intentions to use technology (Davis, 1989). Research based on TAM indicates that high levels of usability and ease of use increase the acceptance and effectiveness of technological tools in education.

An extension of this model is the unified theory of acceptance and use of technology (UTAUT), developed by Venkatesh et al. (2003). UTAUT combines elements from several previous theories, including TRA, TPB and TAM, introducing four main constructs: performance expectancy, effort expectancy, social influence and facilitating conditions. The UTAUT model also takes into account moderating variables such as: age, gender, and experience, making it a comprehensive tool for analysing technology acceptance across

¹ The work also uses the concept of construct as a component of the model.

² Reflecting on positive or negative evaluations of a given behaviour.

³ Other people's expectations and willingness to meet them.

different demographic groups (Venkatesh et al., 2003). Subsequent extensions such as UTAUT 2 and UTAUT 3 introduced new constructs such as: hedonic motivation, value for money and habit, which are particularly useful in consumer technology research (Venkatesh et al., 2003). UTAUT 3 also adds the element of personal innovation in technology use as a factor that supports the acceptance of new IT solutions (Farooq et al., 2017).

In fact, each new study implies new constructs from previous models in order to even better predict user behaviour (Blunt, Chong, Tsigna, Zayyad, Tsigna, Venkatesh, 2022; Radomski, 2017). Also, the construct of trust in a technology has long been analysed in many technology acceptance studies (Alharbi, 2014; Rajasingham, Premarathne, 2018; Chen, Fan, Azam, 2024). Constructs such as: performance expectancy, effort expectancy, social influence, characteristics of the innovation, psychological needs or trust are key to understanding the reasons for technology acceptance.

2. Acceptance of AI tools in education

Current research on the use of the ChatGPT tool and other artificial intelligence (AI) systems in education, provides important insights into the potential benefits and challenges affecting their acceptance. The analyses mentioned below present the possibility of combining factors from different models, which in many cases expands the possibilities for prediction.

Almogren and Aljammaz's (2022) study, based on the technology acceptance model (TAM) and social cognitive theory (SCT) (Bandura, 1986), showed that the integration of SCT and TAM models is effective in identifying predictors that identify students' attitudes and intentions towards m-learning. The study used the popular SPSS and Smart-PLS software for analysis. In contrast, Adel, Ahsan and Davison (2024) analysed the complexity of the challenges posed to education using generative AI. The authors suggest that the use of ChatGPT in education can be useful in the learning process, especially by tailoring educational content to individual student needs and abilities.

Another example of recent research is the work, by Almogren, Al-Rahmi and Dahri (2024). The results of the analyses showed that perceived ease of use and perceived usefulness⁴, are significant predictors of user attitudes towards the ChatGPT tool in smart education. Predictors such as user attitudes and behavioural intentions also have a significant impact on the acceptance of ChatGPT in education. In contrast, Dempere, Modugu, Hesham and Ramasamy (2023) provide perspectives on the potential of ChatGPT in education. Among the important benefits, they included: research support, the possibility of automated assessment and improved human-computer interaction.

⁴ In UTAUT as expected effort, expected outcome.

In conclusion, artificial intelligence, in the form of ChatGPT, has the potential to significantly transform education, provided that appropriate ethical and legal standards are met and the educational process is properly organised. To ensure the safe and effective use of AI, the authors of many publications suggest the development of specific guidelines and tools to support the responsible use of these technologies in the teaching process.

3. Research model

By combining theories and models from the fields of technology acceptance, education and psychology, a comprehensive research framework model can be developed (Ofosu-Ampong, Acheampong, Kevor, Amankwah-Sarfo, 2023). The proposed model distinguishes six key constructs⁵ relevant to the analysis of students' acceptance of AI (ChatGPT) in programming education:

- performance expectancy (PE) - *this construct is derived from the TAM and UTAUT models and emphasises the importance of students' and pupils' feelings about the usefulness of artificial intelligence (AI)-based tools in programming education (Davis, Glikson, Woolley, 2020). These perceptions play a key role in shaping the acceptance of AI in educational contexts;*
- effort expectancy (EE) - *a construct defined as the level of perceived difficulty of mastering a given system. Derived from the UTAUT model, it is often used in studies of the acceptance of learning tools;*
- social influence (SI) - *a construct derived from UTAUT theory; emphasises the influence of social factors (the influence of peers, mentors and environment on an individual's behaviour), on the acceptance of AI in education (Sahu, Padhy, Dhir, 2020);*
- innovation characteristics (IC) - *this construct is derived from innovation diffusion theory (IDT) (Wani, Ali, 2015) and emphasises the characteristics of the AI innovation itself (Rogers, 2003), communication channels and the role of opinion leaders and social networks in the diffusion and acceptance of AI in education (Ofosu-Ampong, Acheampong, Kevor, Amankwah-Sarfo, 2023);*
- psychological needs (PN) - *a construct derived from self-determination theory (SDT), identifies the intrinsic motivation, autonomy and competence of individuals in accepting AI in education (Ryan, Deci, 2013; Berkowitz, Bier, McCauley, 2017). This construct recognises the importance of supporting students' and pupils' psychological needs for autonomy and competence in order to stimulate acceptance;*

⁵ Constructs that explain user behaviour.

- *trust (TR)* - a construct that was among the first to be used by Cody-Allen and Kishore (2006). In this paper, trust is defined as the degree to which a user feels that an AI solution is safe, is not afraid of AI algorithms and the risks of using the system.

Based on the above six factors and the acceptance of AI, six research hypotheses were proposed as shown in the figure below.

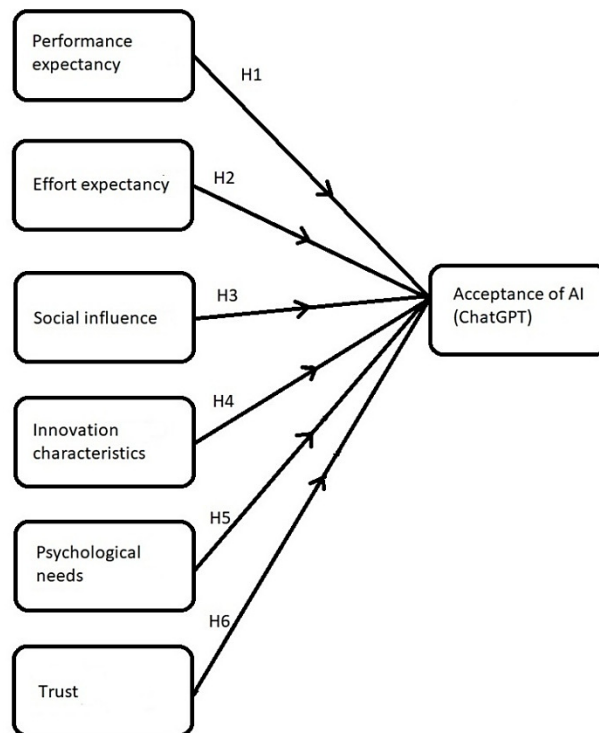


Figure 1. Research model.

Source: own study.

4. Description of the research procedure and design of the questionnaire

Questions defining each construct were prepared according to previous studies (Davis, 1989; Rogers, 2003; Ofosu-Ampong, Acheampong, Kevor, Amankwah-Sarfo, 2023). The subjective degree of feeling was given by the user on a seven-point Likert scale (1 - strongly agree, 7 - strongly disagree). The seven-point scale has also been used in many other works on similar topics (Venkatesh, Morris, Davis, Davis, 2003).

Correlation studies were carried out using the partial least squares (PLS) method. Calculations were performed using Excel, SPSS, and the SmartPLSv3 application.

Descriptive statistics were used to describe the sociodemographic characteristics of the students, while PLS was used to evaluate the measurement model to assess the reliability and correlation between the constructs and their indicators.

The study population consisted of pupils and students from four secondary schools (high school and technical high school) and three higher education institutions in the Pomeranian Voivodeship who participated in programming classes. The research was conducted over a two-week period in October 2024 using an online questionnaire among the class participants. The selection of the group was made at random.

The designed questionnaire consisted of 27 questions divided into two blocks. The first block consisted of questions on basic information about the interviewee. The variables investigated were: gender, age, employment, education level, feelings about using ChatGPT for programming.

The second block of the questionnaire asked respondents to indicate their feelings about the research model. The questions (indicators) in this block were divided into seven groups reflecting the other variables of the research model. The first three questions related to the expected outcome (PE) variable, with a further three reflecting expected effort (EE). Further groups of three questions were related to social influence (AI), innovation characteristics (IC), psychological needs (PN) and trust (TR), respectively. Two indicators were prepared for the acceptance factor AI (AA).

5. Findings

A total of 384 pupils and students completed the survey questionnaire. Of these, more than half ($n = 194$, 50.5%) were aged between 15 and 18 years and there were 173 respondents (45%) in the 19 to 25 age range. Over 25 years old were 17 respondents (4.5%). The majority of respondents were male ($n = 200$, 53.6%), but the prevalence was slight. Greater acceptance of the AI tool (in the form of ChatGPT) in programming was shown by a slightly higher percentage of men ($n = 174$, 87%), compared to women ($n = 157$, 85%). In terms of employment status, 63 (16.4%) students were employed - these were part-time students. The vast majority of students used ChatGPT in their programming studies ($n = 331$, 86.2%). Furthermore, the majority of them ($n = 300$, 66.1%) reported positive feelings in using the chatbot analysed.

Of the 384 students who took part in the survey, the vast majority ($n = 308$, 77.6%) expressed acceptance of AI and a desire to continue using it in education, while a small group of respondents ($n = 4$, 8.9%) indicated a lack of acceptance of AI (Table 1). This is a small percentage, mainly due to a lack of knowledge regarding AI, concerns arising from previous experiences.

Table 1.
Demographic profile of respondents

Variable	Category	n (%)	Acceptance of AI		p-value
			No n (%)	Yes n (%)	
Gender	Woman	184 (46.4)	27 (15.0)	157 (85.0)	0.217
	Male	200 (53.6)	26 (13.0)	174 (87.0)	
Age (years)	15-18	194 (50.5)	24 (12.4)	170 (87.6)	0.015**
	19-25	173 (45.0)	25 (14.4)	148 (85.6)	
	>25	17 (4.5)	4 (23.5)	13 (76.4)	
Employment	Unemployed	321 (83.6)	33 (10.3)	288 (89.7)	0.237
	Employed	63 (16.4)	20 (31.7)	43 (68.3)	
Level of education	Secondary school	199 (51.8)	31 (15.6)	168 (84.4)	0.029**
	College	185 (48.2)	22 (11.9)	163 (88.1)	
Using ChatGPT in programming	Yes	331 (86.2)	0(0)	331 (100)	0.141
	Not	53 (13.8)	53 (100)	0 (0)	
Feelings about using ChatGPT	Positive	300 (66.1)	0 (0)	300 (100)	0.211
	Indifferent	26 (25.0)	0 (0)	76 (100)	
	Negative	5 (8.9)	4(100)	1(0)	
Declaration of ChatGPT reuse in programming	Yes	308 (77.6)	0(0)	308(100)	0.234
	Maybe	19 (13.5)	2 (16.0)	17 (84.0)	
	Not	4 (8.9)	4 (100)	0 (0)	

*p < 1; ** p < 0.05.

Source: the authors' own development.

Due to the model's assumptions, further analysis used data from 331 surveys of pupils and students who used artificial intelligence in the form of ChatGPT in programming education.

6. Evaluation of the measurement model

In order to determine the factors influencing acceptance of AI (ChatGPT), reliability and relevance tests were conducted for each model relationship. As shown in Table 2, all coefficients of composite construct reliability (CR) and Cronbach's alpha (CrA) were above the recommended minimum threshold of 0.7 (ranging from 0.812 to 0.976). This indicates good internal consistency between the measurement elements in the model design. In addition, Table 2 shows the mean response value for all questions included in the model constructs, ranging from 0.234 to 0.41.

Table 2.
Structural equation modelling

Construct	Question	Average	CrA	CR
Performance expectancy	PE1	0.345	0.812	0.976
	PE2	0.393		
	PE3	0.421		
Effort expectancy	EE1	0.467	0.832	0.936
	EE2	0.543		
	EE3	0.456		

Cont. table 2.

Social influence	SI1	0.478	0.935	0.912
	SI2	0.234		
	SI3	0.454		
Innovation characteristics	IC1	0.431	0.876	0.934
	IC2	0.382		
	IC3	0.456		
Psychological needs	PN1	0.434	0.867	0.945
	PN2	0.325		
	PN3	0.393		
Trust	TR1	0.318	0.834	0.918
	TR2	0.367		
	TR3	0.345		
Acceptance of AI	AA1	0.234	0.821	0.965
	AA2	0.470		

Source: the authors' own development.

7. Evaluation of the conceptual model

The next step was to evaluate the structural model using the path coefficient. Table 3 shows the results of the PLS-SEM analysis performed using SmartPLSv3. The main indicator is the path coefficient, which determines the 'strength' of the effect of one construct on another as shown in Figure 1. In addition, the variance inflation factor (VIF) was estimated to assess the issue of collinearity. As shown in Table 3, the VIF values ranged from 1.381 to 3.873. All coefficients were therefore below the recommended threshold of 5, indicating that there was no collinearity issue in this study. The results presented in Table 3 indicate that each of the six hypotheses is statistically significant. This is evidenced by the path coefficient values, as well as the T-statistic and p-values below 0.05.

Table 3.

Evaluation of the structural model

Hypothesis	Model relationships	Path coefficient	VIF	T statistics	p-value
H1	PE → AA	0.789	3.347	3.123	0.02
H2	EE → AA	0.834	2.875	4.357	0.00
H3	SI → AA	0.688	3.873	2.689	0.01
H4	IC → AA	0.679	1.381	2.235	0.03
H5	PN → AA	0.567	2.745	1.732	0.03
H6	TR → AA	0.776	3.014	3.345	0.04

Source: the authors' own development.

Very strong associations, expressed by the path coefficient, were observed for effort expectancy (EE) with acceptance (AA) - (0.834), performance expectancy (PE) with acceptance (AA) - (0.789), and trust (TR) with acceptance (AA) - (0.776). The lowest path coefficient value was observed for hypothesis H5 (0.567), i.e. the association of psychological needs (PN) with acceptance (AA).

8. Summary

The research conducted on the acceptance of the ChatGPT tool in programming education, presents great potential for AI in transforming the learning process. The analysis results obtained for all hypotheses are statistically significant. The research shows that effort expectancy (EE) and performance expectancy (PE) are key factors influencing students' and pupils' acceptance of the ChatGPT tool. This thesis is also supported by a large number of previous studies. A very high path coefficient was also obtained in the TR→AA relationship (H6), showing that trust (TR) in the new technology plays an increasingly important role in its acceptance. Social influence (SI) and innovation characteristics (IC) also play an important role showing that peers' opinions and willingness to experiment with new technologies are important in the implementation of AI in programming learning. Hypothesis H5 is also statistically significant, although the effect of psychological needs (PN) on acceptance (AA) is not as clear as for the other relationships of the model. This may suggest that pupils and some students, due to their young age, lack sufficient intrinsic motivation, autonomy and sufficient competence. Research indicates that the technology serves and can serve both as a tool to support individual learning and as an element to build interactivity and engagement in the teaching process. Tools such as ChatGPT can support the solving of programming problems, the translation of complex concepts and the generation of task ideas, providing important support for both students and teachers. AI in the management of programming education offers opportunities for personalisation, efficiency and scalability of education.

In the future, it would be worth conducting a study with a larger research sample to increase the possibility of generalising conclusions, which is one of the key limitations of this type of research. A further step could be to include variables such as the level of knowledge about AI and the level of sophistication in programming. It would also be worth focusing on the trust factor, which in the study had a large impact on the acceptance of the chatbot under analysis - despite the fact that it is a relatively new technology. This could allow a more precise identification of the factors influencing the acceptance of the ChatGPT tool by different user groups in the programming education process. Understanding the research questions can also be a limitation. Inappropriate wording of survey questions can lead to errors of interpretation, which will affect the quality of the data obtained.

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SELECTED ASPECTS OF SUSTAINABLE HUMAN RESOURCE MANAGEMENT AS PERCEIVED BY MANAGERS

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Purpose: The purpose of this article is to explore managers' views on their role in shaping the impact of Sustainable Human Resource Management (SHRM) on personnel risk, with a particular focus on the importance of the psychological contract.

Design/methodology/approach: The study is based on qualitative in-depth interviews conducted among a group of 35 managers from various industries and sectors, including IT, finance, higher education.

Findings: The results indicate diverse approaches to the implementation of SHRM practices in the context of personnel risk mitigation. Managers emphasized their special role in promoting organizational stability and long-term development of human resources through their awareness and competence. The analysis revealed the significant impact of the psychological contract on building trust in teams, fostering innovation, and minimizing employee risks.

Research limitations/implications: The study is limited by its qualitative nature and the specific sample of 35 managers, which may not be representative of all industries and sectors.

Practical implications: The data obtained from this study can be used to design effective solutions for SHRM, taking into account both the factors conducive to the implementation of the psychological contract and the multifaceted determinants of personnel risk. The findings highlight the importance of managerial awareness and competence in promoting organizational stability and long-term development of human resources.

Social implications: The research underscores the importance of the psychological contract in building trust within teams and fostering innovation, which can have a positive impact on organizational culture and employee well-being.

Originality/value: This paper provides new insights into the role of managers in shaping the impact of SHRM on personnel risk, with a particular focus on the psychological contract. It contributes to the existing literature by highlighting the diverse approaches to SHRM practices and their implications for personnel risk mitigation.

Keywords: Sustainable Human Resource Management (SHRM), psychological contract, personnel risk, human resource management practices, managerial awareness, employee engagement, professional development, organizational stability, employee retention, operational efficiency.

Category of the paper: Research paper.

1. Introduction

Human resource management in the knowledge economy requires practices that combine economic, social and environmental objectives (Chams, García-Blandón, 2019; Macke, Genari, 2019). Sustainable human resource management (SHRM) contributes to the simultaneous improvement of corporate performance and employee well-being, which fosters sustainable competitive advantage (Amrutha, Geetha, 2020). At the same time, managing personnel risks, such as excessive turnover or declining employee engagement, remains a challenge (Bochniarz, Gugala, 2005; Sjöberg, 2003).

Although there is a growing body of analysis pointing to the positive impact of HRM on mitigating personnel risks, the perspective of managers implementing these assumptions in daily practice is still under-researched (Liang et al., 2024). To date, the focus has mainly been on theoretical concepts and quantitative performance indicators (Cohen et al., 2012; Macke, Genari, 2019), leaving out a thorough analysis of decision-making determinants and organizational culture. In response to this gap, it was assumed that the degree of knowledge and understanding of HRM principles among managers has a significant impact on the long-term health of the company, including employment stability, competence development and the level of employee engagement (Macke, Genari, 2019; Liang et al., 2024).

The purpose of the article is therefore:

1. Determine the degree of awareness of managers with regard to the key principles and goals of sustainable HRM.
2. Examine how managers understand and incorporate personnel risk into team management (Sjöberg, 2003; Barrera-Animas et al., 2017).
3. Identifying key challenges and barriers to implementing sustainable HRM practices from a managerial perspective (Barrera-Animas et al., 2017).

The analysis was based on qualitative research, involving in-depth interviews with managers at various levels, representing companies of varying sizes and business characteristics. This approach allows us to look at attitudes and beliefs in a way that would not be possible using quantitative methods alone (Chams, García-Blandón, 2019). It makes it possible to understand how leaders define HR risks and what actions they take to minimize them while balancing financial goals and responsibility to employees (Macke, Genari, 2019; Obłój, 2020). Empirical analysis reveals both factors that favor the integration of HRM into practice and barriers that hinder the implementation of the concept (Tannenbaum, Salas, 2020). The following sections of the paper present research findings and recommendations for practitioners and researchers interested in implementing a sustainable approach in human resource management.

2. Theoretical background

Sustainable human resource management (SHRM) combines business, social and environmental objectives, which in practice can translate into reducing personnel risks associated with excessive turnover, loss of knowledge or declining commitment (Macke, Genari, 2019; Chams, García-Blandón, 2019). The psychological contract, defined as an informal set of mutual expectations and commitments between employee and employer, plays a special role in this process (Rousseau, 1995). Violation of these rules can lead to a weakening of trust, increased turnover and destabilization of the team (Bochniarz, Gugala, 2005), while maintaining them - supported by transparent communication and equal treatment - strengthens employee motivation (Rogozińska-Pawelczyk, Wiktorowicz, 2023).

In periods of crisis or with sudden market changes, HRM can help a company not only survive difficult times, but also use them to build a long-term competitive advantage (Obłój, 2020; Mohiuddin et al., 2022). Openly informing the team about the condition of the company, jointly developing development plans and promoting cooperation based on shared values strengthen the organizational culture, while stabilizing relationships between employees. This approach reduces personnel risks associated with, for example, inconsistent goals or insufficient communication.

Actions that foster trust within the team, clearly define tasks and create conditions conducive to dialogue promote the strengthening of the psychological contract (Rousseau, 1995). This makes employee relations more predictable and resistant to crisis situations. Collaborative problem-solving, systematic review of findings, and consistent fulfillment of promises create an environment in which financial success coexists with a sense of security for employees (Macke, Genari, 2019; Barrera-Animas et al., 2017). Managers guided by this understanding of HRM can reduce the risk of conflict and loss of commitment, while creating more sustainable, motivated teams.

3. Research Methodology

The study was conducted using qualitative in-depth interviews (IDI), which allowed for an in-depth examination of the complex relationships in the areas of Sustainable Human Resource Management (SHRM), personnel risk and the psychological contract (Flick, 2018; Maxwell, 2013). The IDI method is adequate for capturing managers' individual beliefs and experiences, which often cannot be fully recorded in quantitative surveys. Based on a literature review (Bryman, 2012) and a pilot study, a questionnaire with 17 questions was developed, and the interviewer could ask additional in-depth questions (Silverman, 2013). The research

was conducted from June to August 2023 (an average of one hour per interview), purposively selecting managers with diverse HR experience and representing a range of industries, from microenterprises to large companies (Frankfort-Nachmias, Nachmias, 2001). Such a sample does not guarantee representativeness, but it does provide comprehensive insight into adaptation practices and strategies, providing a basis for possible further quantitative research (Barrera-Animas, Leal-Rodríguez, Alonso-Cruz, 2017). The collected interviews were transcribed and then subjected to open coding, allowing key concepts and issues to emerge. In the next step, the codes were grouped into thematic areas (e.g., HRM, personnel risk, psychological contract), and then the results were interpreted from the perspective of the research objective. This made it possible to capture recurring patterns, as well as the nuances of the organizational context, which allowed a better understanding of how managers perceive the interrelationships between the factors analyzed.

Table 1.

Structure of the study group n = 35

Category	Subcategory	Number of managers	Percentage
Company size	Large companies	14	50%
	Small and micro businesses	12	40%
	Medium-sized companies	9	10%
Industry	IT	10	35%
	Finance	8	25%
	Higher education	7	15%
	Training and development	10	25%
Seniority	Under 5 years	10	35%
	6 to 10 years	13	30%
	Over 11 years old	12	35%

Source: Own study.

The survey included 35 managers from various sectors (IT, finance, training and development, higher education), working in companies ranging in size from small businesses to large corporations. This captured a broad spectrum of practices and the impact of various organizational contexts on the implementation of HRM and HR risk management. Although the results are not representative, they provide valuable insights for further academic research in this area.

4. Applications

In the first part of the study, the authors focused on how respondents understand Sustainable Human Resource Management (SHRM) and whether the stated definitions actually translate into concrete actions in organizations. The analysis showed a clear variation in the interpretation of SHM: 37% of respondents focused mainly on environmental and CSR practices, while 55%

pointed to a holistic approach, combining economic aspects with concern for the mental and physical well-being of team members. In large corporations, managers surveyed described extensive programs (including comprehensive training, environmental projects), the effectiveness of which was often monitored using KPIs (key performance indicators). In small and medium-sized companies, on the other hand, initiatives took a more informal form, focused on local, day-to-day needs, such as flexible working hours or reducing resource consumption. Nearly 60% of respondents appreciate an organizational culture that is open to employee activity and initiative, seeing this as an opportunity to increase innovation and reduce personnel risk. The most frequently cited measures (65%) were various forms of support for well-being and work-life balance, while 42% pointed to mentoring and coaching programs to develop individual competencies. In addition, 45% of managers mentioned cooperation with psychologists, 50% mentioned remote work, and 38% mentioned organic practices to support flexibility in team functioning. Table 2 takes a closer look at examples of managers' statements, illustrating the diversity of approaches to HRM.

Table 2.

Quotes from interviews on the area of Sustainable Human Resource Management (SHRM)

Question	Quote	Interpretation
How do you understand the concept of Sustainable Human Resources Management?	"For me, it's just being eco, meaning taking care of the environment in the office and things like that. Well, and they bought me a hybrid car now"	CSR
	"It means for me taking care of people so that they are not overtired and that they have time for themselves and their family. And, you know, if someone is demotivated or something goes wrong, for example, I know we can send them to these coaching sessions with you"	Employee well-being
What specific measures related to Sustainable Human Resources Management have been implemented in your organization?	"In our case, there is a remote working option and additional vacation days for people who need more time for themselves"	CSR / Welfare
	"We have a 'Green Office' program, where we try to use as little paper and energy as possible"	CSR

Source: Own study.

The second area analyzed in the survey was the concept of personnel risk, understood as the probability of adverse employee or organizational events. Analysis of the interviews revealed that 65% of managers associated it mainly with employee turnover, insufficient competence or professional burnout, while 31% also perceived the risk of internal conflicts and neglect of duties. All respondents (100%) considered them important to the stability of the organization, but pointed to the lack of consistent tools to mitigate these risks. In prevention strategies, 29% of managers rely on incentive systems (bonuses, raises), 42% emphasize the importance of development and education, and 17% point to succession of key positions. In addition, 26% pay attention to regular feedback, and 22% see coaching as an effective way to bind employees to the company in the long term. While 61% consider systematic risk monitoring very important, 34% count on the initiative of the HR department or management, which in

practice leads to intuitive responses to problems. The examples of statements summarized in the table show that the lack of formal procedures results mainly in ad hoc actions, which confirms the need to develop tools for identifying and assessing risks in the area of HRM.

Table 3.
Quotes from interviews regarding the HR risk area

Question	Quote	Interpretation
How do you understand the concept of Personnel Risk?	"Personnel risk is mainly turnover. People leave and then they have to be replaced, which generates costs and slows down projects"	Employee turnover
	"For me, it's mainly a lack of skills in the team. If we don't have the right people, the quality of work goes down"	Lack of qualifications
	"It's burnout. When someone gets burned out, it's not just them that suffers, it's the whole team, and that affects efficiency"	Professional burnout
	"Personal risk is also conflicts in the team. If they don't get along, the work goes like hell and the atmosphere is bad"	Internal conflicts
How to minimize the impact of risk? What impact does it have on teams and organizations?	"Raises and bonuses so that people stay with us. It works because employee turnover is lower"	Incentive systems
	"Training and courses to improve skills. This is important because then we have fewer problems with the quality of work"	Education and competence development
	"We have an anti-stress program and psychological support for employees. This helps, because we see fewer cases of burnout"	Psychological support
	"We organized communication workshops to reduce conflicts in the team. This is crucial, because conflicts affect efficiency"	Conflict management
Do you think personnel risk should be monitored?	"Yes, without monitoring personnel risks it is impossible to manage the team effectively"	Risk monitoring
	"No, I think it's too invasive and can negatively affect team morale. Besides, I don't even know how I would do it, it's too complex and not very practical"	Lack of monitoring
	It seems so, but we don't have any systems to do it, I often do it on what I call "feeling". I know that someone wants to leave well then I report it to HRBP.	No monitoring

Source: Own elaboration based on the authors' research.

Some respondents (31%) pointed to retaining key employees through individualized incentive programs, financial rewards and salary increases. Others (27%) stressed the importance of early recognition of symptoms of burnout, which allowed to minimize its negative impact on the work of the team. Some managers (18%) emphasized the implementation of extensive training programs to foster competence development and improve cultural cohesion within teams. Some respondents (24%) also pointed to the effectiveness of coaching conversations and sessions with a psychologist, recognizing them as innovative tools to reduce risks arising from imperfections in human nature or stressors.

In terms of the psychological contract, the majority of managers (56%) considered loyalty and trust to be key elements of mutual, unspoken agreements between employee and employer, stressing that their violation leads to a deterioration in productivity or an increase in turnover. Few respondents (14%) equated the psychological contract with clearly communicated commitments in the areas of career development and fringe benefits. In doing so, many respondents (42%) indicated that the interpretation of the psychological contract depends largely on career stage, corporate culture and individual generational preferences. They also noted (19%) that in a remote work environment, expectations for availability and productivity are sometimes unclear, which can make it difficult to maintain consistent rules for mutual exchange. Several managers (11%) additionally pointed to the risk of human resource manipulation in situations where the psychological contract is not clearly understood and respected. According to the respondents, generational diversity further complicates the uniform definition of mutual expectations, which in some cases leads to tensions within the team and hinders effective cooperation. Selected quotes from managers are included in Table 4.

Table 4.

Quotes from interviews regarding the psychological contract area

Question	Quote	Interpretation
What is your understanding of the term "psychological contract"?	"It's some unwritten rules. It is known what is expected of whom, although no one says it"	Unspoken contract
Have you noticed the positive effects of a fulfilled psychological contract on the functioning of the organization?	"If everyone sticks to these rules, the atmosphere is great"	Team atmosphere
	"When everyone knows what's going on, and it's generally fun, then the work goes as smoothly as possible, then I don't even have to get very involved somehow, because they take the initiative themselves and help each other"	Productivity
Have you noticed any negative effects of an unfulfilled psychological contract on the functioning of the organization?	"There are times when we see something is not quite ok, that's when gossip and misunderstandings start"	Misunderstandings
	"When we spin something we don't stick to, then people start to leave or they do things on the spur of the moment"	Fluctuation

Source: Own study.

Responding to a question about employees' expectations of their employer, managers indicated a wide variety of needs and priorities. In addition to the financial aspect (salary, additional benefits), 38% of respondents noted the importance of work-life balance, and 26% emphasized the priority of career development and clearly defined promotion paths. At the same time, 41% of respondents emphasized the role of an organizational culture that fosters cooperation and mutual support. Many managers (44%) considered communication to be crucial in fulfilling their stated commitments to employees. They pointed to the need for

regular one-on-one conversations and ongoing feedback. For 33% of respondents, the most important thing was the consistent fulfillment of the demands expressed by employees, which they believe translates into higher levels of commitment, motivation and better business results. Respondents (29%) also noted the challenges of having to flexibly adapt to the rapidly changing needs of the team, especially in the context of implementing new technologies or organizational restructuring. According to 22% of managers, effective management of expectations requires first and foremost an accurate identification of their nature, followed by a quick and adequate response to emerging needs.

5. Discussion

The results show a variety of approaches to Sustainable Human Resource Management (SHRM). Some managers place special emphasis on environmentally friendly measures and corporate social responsibility (Amrutha, 2020; Chams, 2019), while others emphasize employee well-being and strengthening team relationships (Macke, 2019; Ghitulescu, 2013). These discrepancies suggest that HRM does not function as a uniform model, but rather as a set of flexible solutions that reflect both organizational priorities and the culture of a given company. Both larger and smaller entities may reach for different strategies: some limit themselves to short-term solutions (e.g., reducing current competency gaps), while others implement a long-term perspective, linked to training programs and succession planning, as Brown (2014) and Barrera-Animas (2017) point out. The lack of formal monitoring mechanisms can lead to unforeseen financial losses and reputational damage, especially in the context of costly recruitment and deployment of new employees (Tannenbaum, 2020; Gołębowski, 2015). Of particular note is the psychological contract (Rousseau, 1995), which, in a situation of imprecisely defined expectations, is sometimes a source of conflict and increased turnover (De Cuyper et al., 2014). At the same time, clearly defining and expressing this contract contributes to strengthening mutual trust (Rogozińska-Pawełczyk, 2018). On the other hand, actively involving employees in setting the rules of cooperation (Cohen, 2012; Liang, 2024) can significantly reduce the risk of unexpected departures and improve the quality of internal communication, and as a result, have a positive impact on financial stability and human capital development. In practice, larger companies tend to have more sophisticated tools, such as KPIs, to identify risks early, while smaller companies, despite greater flexibility, are less likely to formulate long-term plans. It should be noted that while the data collected allows for interesting conclusions, the sampling may have been limited to selected sectors and specific types of companies. In addition, the focus on the managers' perspective may not fully reflect the expectations and needs of lower-level employees. Despite these limitations, the work makes an important practical contribution, pointing out the need to introduce or develop

HR risk monitoring instruments (e.g., systematic analysis of HR data) and emphasizing the importance of consciously defining mutual expectations transparently within a psychological contract. HR leaders can use these findings to better align policies and procedures, especially in the context of financial and image challenges resulting from turnover and low staff engagement. From a theory development perspective, the findings presented here confirm the importance of organizational context in shaping HRM interpretations and approaches to HR risk. The size of the company, its affluence, as well as the organizational culture or leadership style shape both the definition of economic, social and environmental goals and the practical ways of achieving them. Further research could cover a wider range of industries and positions, and incorporate quantitative methods to verify the magnitude and regularity of the discrepancies observed. An important direction would also be to investigate the extent to which diverse forms of work organization - from hybrid solutions to international teams - affect the consistent application of HRM practices and the management of the psychological contract.

6. Conclusions

The study confirms the need to further develop and standardize Sustainable Human Resources Management in management practice, while shaping methods for monitoring personnel risk. The analysis presented demonstrates the importance of the role of managers in shaping the impact of Sustainable Human Resource Management (SHRM) on personnel risk. Managers increasingly understand that SHRM goes beyond environmental issues to include employee well-being, organizational effectiveness and social responsibility. Special attention should be paid to the importance of the psychological contract, which influences trust, commitment and stability in the employer-employee relationship. Neglecting mutual expectations and commitments can lead to an increase in personnel risks, such as job burnout and excessive turnover. Effective management of these risks requires the conscious building of a psychological contract through transparent communication, clear development goals and activities that support work-life balance. An integrated approach to HRM that takes into account the psychological contract and HR risk management is therefore the foundation for an organization's long-term success and its ability to create value in a sustainable manner.

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ACTIVATING FACTORS OF PSYCHOLOGICAL CONTRACT DISRUPTION

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Purpose: The article examines the idiosyncratic processes that lead to violations of the psychological contract in work relationships. The purpose of the study was to understand how the various activating factors, the recurrence of their occurrence, and their interrelationships affect perceptions of psychological contract violation.

Design/methodology/approach: The qualitative study was based on the critical incident technique and the narrative event mapping technique, in which 62 female graduates of the “Mommypreneurs” project shared their memories of significant experiences of returning to work after maternity leave.

Findings: The results of the study show that the process of violating the psychological contract is idiosyncratic and non-linear, involving, among many unnoticed stimuli, activating factors that lead employees to consciously analyze their psychological contract. Activating factors, through an iterative process of interference, stop automatic processing and arouse conscious attention to the terms of the contract, activating sense-making and affecting the psychological contract.

Originality/value: A key finding indicates that it is only the accumulation and recurrence of activating factors over time that can lead to crossing a certain threshold, after which employees perceive a contract violation. The results obtained suggest that managers should implement personnel practices that reduce the accumulation of activating factors, thereby helping to prevent psychological contract violations.

Keywords: psychological contract dynamics, disruption process, activating factors, psychological contract violation.

Category of the paper: Research paper.

1. Introduction

Psychological contracts (PC)s reflect the mutual expectations of employees and the organization, constituting mental models governing the exchange of commitments in the work environment (Rousseau, 2001). Violations of these contracts, resulting from perceptions of an employer's failure to fulfill promises, are associated with negative consequences for employee attitudes and behavior (Conway, Briner, 2005; Rogozińska-Pawelczyk, 2020).

Previous research has often viewed violation of a contract as a single, isolated event, analyzed in the context of a linear cause-and-effect relationship (Van Hootegeem, De Witte, 2019). However, growing interest in the dynamic nature of PCs (Griep, Vantilborgh, 2018; Bankins et al., 2020) suggests that contract violation should also be analyzed as a process that can unfold over time and involve an accumulation of individual events (Chaudhry, Song, 2014).

However, the literature lacks an understanding of the factors that initiate the process of disrupting the PC and the mechanisms that guide its dynamics over time. The existing phase-based model of Rousseau et al. (2018), considers the dynamics of contract change in the context of a misalignment between expectations and reality (a shortage or excess of commitments), but ignores the key research questions posed in this article: what activating factors precede the disruption, how they are interpreted by employees, and how they affect the perception of violations. Thus, there is a need to extend this theoretical model with practical research to better describe the activating factors of the psychological contract violation (PCV) process, and the interpretive and emotional mechanisms that influence employees' perception of violations. The purpose of this article is to examine the idiosyncratic processes that lead to the formation of perceptions of PCV, and to identify the factors that initiate these processes. This study aims to fill the research gap by deepening the understanding of PC dynamics, enriching the model based on the phases of Rousseau et al. (2018), and providing a new perspective that takes into account the iterative effects of activating factors.

The article provides an important contribution by showing that the accumulation of interrelated activating factors can exceed individual tolerance thresholds, leading to the perception of violation. The approach presented empirically examines how these interactions affect the process of assessing violations over time. In addition, an analysis of the dynamics of these processes allows us to understand the nonlinear nature of PCV, offering a new perspective on their causes and consequences.

2. Psychological contract in the perspective of appraisal and sensemaking theory

A PC refers to an employee's subjective beliefs about mutual obligations (Rousseau, 2001). Unlike formal contracts, PCs are idiosyncratic and shaped by personal experiences, expectations and interpretations of mutual relationships. A characteristic of the PC is that it is rarely fully realized by the individual (Freese, 2007). Understanding its role, however, becomes crucial in situations where there is a shake-up or change in the work environment, which can lead to a disruption of mutual obligations. Employees are particularly sensitive to situations that they perceive as a failure of the organization to fulfill its promises, which initiates processes of evaluation and renegotiation of contract terms. Evaluations of these changes automatically

activate the process of making sense of the discrepancy between expectations and reality by evaluating the situation and making sense of it (Bankins, 2015; Tomprou et al., 2015). Therefore, the theories of appraisal and sensemaking serve as the conceptual basis of the present study, in which the perception of PCV is explored.

Appraisal theory provides a theoretical framework for understanding the cognitive processes involved in responding to changes in the work environment. According to Harrington and Lee (2015), primary appraisal provides a quick and automatic way to recognize whether a factor poses a potential threat to an individual's values or goals. When the PC is disrupted, this assessment indicates whether the change in the work environment is positive or negative. This is followed by a secondary, more conscious and complex assessment, which involves assigning meaning to the identified factors. Catino and Patriotta (2013) emphasize that this process serves to build a more complex picture of the situation and enables the individual to adapt his actions to the new conditions. In the context of the PC, the secondary assessment allows the employee to decide whether to take corrective action and renegotiate the terms of cooperation or accept or reject the change.

When there is a discrepancy between expectations and reality, a key role is played by the process of sensemaking, which helps individuals understand the new circumstances. As Bankins (2015) and Diehl and Coyle-Shapiro (2019) note, sensemaking enables the identification of activating factors of PC disruption and their significance in the broader organizational context. The process of sensemaking is particularly important in situations of uncertainty, which often accompany PC disruptions. In such cases, individuals seek information to fill cognitive gaps, often using social comparisons as a source of data to build explanations (Weick, 1995). This dynamic interaction between appraisal and sensemaking lays the groundwork for understanding the mechanisms of recognizing and interpreting disruptions.

While existing research provides a wealth of information on appraisal and sense-making processes, there is still a lack of clear guidance on the specific factors that cause distortions that lead to PCV. Due to the unconscious, automatic nature of many appraisal processes (Moors et al., 2013), it is important to identify more precisely those factors that draw the conscious attention of employees and cause their PC to become relevant in a given situation. Conducting research in this area can provide new insights into the mechanisms for evaluating disruptions and help organizations better anticipate employee responses to changes in the work environment. In particular, the identification of activating factors for violations will allow the development of strategies for managing employee-organization relations that minimize the negative effects of such situations.

3. Methods

The study was conducted using a qualitative method, using the Critical Incident Technique (CIT), which allows the study of significant events (incidents), how they are managed and their effects in cognitive, emotional and behavioral terms (Chell, 1998). CIT focuses on the analysis of short episodes considered by participants to be central to their experience. This description includes facts, emotions and, where relevant, respondents' behaviors, allowing an understanding of reality from the respondents' point of view (Pratt, 2009). The method is also used to help participants uncover their own attitudes and the ways in which they interpret the behavior of others, and thus is particularly useful in research on the processes and dynamics of PCs, as it captures narrative sequences of events over time (Pentland, 1999). Previous research on PCs has used the CIT technique to analyze issues such as how employees perceive organizational commitments (Nadin, Williams, 2011), reactions to perceived contract violations (Parzefall, Coyle-Shapiro, 2011), the impact of individually negotiated terms (i-deals) on acceptance of new PCs (Davis, Van der Heijden, 2018), and the dynamics of PCs (Van der Schaft et al., 2019). For this reason, it is considered a particularly suitable method for the qualitative study of the processes and dynamics of the PC through the collection of participants' stories that, in their own words, depict unfolding and ongoing sequences of events while describing relevant experiences and processes (Atkinson, 2007). The study used semi-structured interviews that allowed participants to freely present experiences of disruptions in their PCs.

The research context of the study was the professional support of young women mothers returning to the labor market after maternity leave, implemented within the framework of the international project “Mommypreneurs”¹. The project aimed to counteract barriers to women's professional activity, including the mismatch between their education and the requirements of the modern labor market and gender stereotypes. The project, whose participants were women who were economically inactive during maternity leave, provided them with training (training component) in entrepreneurship and information technology, as well as preparation for running their own businesses. As part of the research component, a survey was conducted that included only those participants who returned to work after their maternity leave and agreed to participate in the study. Of the 150 project participants, a total of 62 women were eligible for the study. The respondents' recollections of their experiences of returning to work formed the basis of the qualitative analysis. After 41 interviews were conducted, the sample was expanded to include 21 women who had already quit their jobs by mutual agreement before joining the Mommypreneurs project, thus increasing the diversity of the sample and enriching the data

¹ The “Mommypreneurs” project is co-financed by Norwegian funds, implemented within the framework of the EEA-Norway International Programme for Youth Employment on the basis of an agreement concluded with an international organization or a foreign entity of the EEA-Norway Funds for Youth Employment No. 2017-1-277. The author of the article acted as project manager.

(Palinkas et al., 2015). The final research sample included 62 female graduates of the program who had work experience and returned to work after maternity leave. The average age of the respondents was 30.38 years ($SD = 4.58$), and their average work experience was 6.02 years ($SD = 3.08$). Respondents represented a variety of industries: manufacturing (9.5%), construction (6.3%), energy and environment (7.9%), agriculture (1.6%), trade (9.5%), transportation (14.3%), food service (6.3%), information and communication (11.2%), financial services (15.9%), public services and education (3.2%), healthcare sector (9.5%), other services (4.8%) and three levels of education: high school (9.7%), bachelor's degree (38.7%) and higher education (51.6%). The interviews were conducted between September and December 2023. At the beginning of each interview, participants were explained the purpose of the study and assured of the confidentiality and anonymity of their responses. Each interview lasted approximately one hour and was recorded and transcribed. Respondents were asked to give examples of disturbances in their PCs and to describe the emotions, actions and contexts that accompanied them. A timeline of events, developed jointly with the participants, helped identify the chronology and dynamics of the disruptions. A pre-prepared interview questionnaire allowed exploration of key themes, and questions were modified during the course of the study to accommodate emerging findings.

Data analysis was carried out in four stages, using coding techniques in MAXQDA software. The coding process was guided by Gioia et al. (2013), according to which any discrepancies were resolved by re-analyzing the data, discussing them together, and developing a common understanding to reach consistent interpretations.

In the first stage, lower-order coding was used: In vivo coding (Maher et al., 2018) was used, based on the authentic expressions of female participants, which were later grouped and interpreted. In the next stage, higher-order coding was carried out: Similar codes were grouped into broader categories, allowing the identification of key concepts and patterns (Chenail, 2012). In the third, categorization of the phases of violations was applied: Following Morse's (2008) approach, the analysis re-coded to link identified phases to potential outcomes, focusing on systematically linking meanings, actions and social structures, and unifying analytical ideas based on theoretical meanings of the data and grounded theory approaches (Chenail, 2012). Two main categories were identified - identification of activating factors of contract violation and idiosyncratic conscious sensemaking - that structured the processes of PCV. The analysis was supported by collaboration with independent researchers, which increased the reliability of the results. The fourth stage was a validation check: In order to confirm or deny the patterns found (Pandey, Patnaik 2014), the results were verified in an organizational context with additional female respondents ($n = 21$), which confirmed the accuracy of the conclusions drawn.

Narrative event mapping (Langley, 1999), in turn, made it possible to visualize the connections between activating factors in the PC. Plots of individual cases were tested in collaboration with the participants, and a research journal provided a tool for reflection and

documentation of the analysis process. This approach made it possible to develop a complex, multidimensional theory to explain the dynamics of PCV.

4. Results

CIT's findings reveal a general mechanism in which 62 female respondents identify activating factors for PCV, and then consciously assign meaning to these events and determine the impact that the activating factors play in the process of PCV.

4.1. Characteristics and types of activating factors of psychological contract disruption

The participants were asked to recall a critical event in their relationship with their employer. In the course of conducting the interview, the respondents recalled a variety of more-or-less significant events that followed one another and, in effect, made up the occurrence of a critical incident. One of them (P54) recalls: *Several situations arose in our relationship with the employer over the past few months, which gradually built up tension and affected my perception of this cooperation. At first it was small things - for example, the fact that my ideas in team meetings were not always taken into account, although later I saw that very similar solutions were implemented, only under different names. Later I began to notice that in conversations with my superiors my achievements were taken a bit for granted, while other team members received a lot of praise for their actions. All of this began to accumulate, but the breaking point came when I heard from the management team that a project task (...) that I particularly cared about had been assigned to a colleague of mine. This was a difficult moment for me, because not only did I feel really committed to the project, but I had long clearly communicated how much I wanted to participate. I spent a lot of time preparing, followed similar projects that would be useful - and all this in the hope that I would get a chance. In the end, I realized that this decision was not due to a lack of my competence, but rather, I think, to the fact that my work and commitment were not properly recognized and appreciated. This was the moment for me when I began to wonder whether my presence in this organization actually made sense in the long term.* Sequences of consecutive events, such as this one, disrupt the daily routine of the female participants while simultaneously eliciting conscious attention to the terms of the contract. An excellent example is the following statement (P28): *(...) I immediately thought, this doesn't bode well. In an instant you start analyzing everything - your role, your place in the team, the way you are perceived. Such moments hit self-confidence and make you start to wonder if you are definitely where you should be.* In this way, accumulated critical events, treated as activating factors, activate the PC of the participants, generating their conscious attention to their perceptions of the discrepancies in the terms of the contract, as a result of the shift from automatic processing of stimuli to a conscious level of

processing (Schein, 1980). According to earlier work by Bankins (2015), activating factors foreshadow the process of nascent disruption, as employees' interpretation and reaction may ultimately lead to perceptions of contract violation.

A number of activating factors were identified during the narrative analysis of the interviews. All of these factors signaled a deviation from the norm and activated the conscious attention of female respondents toward the exchange relationship. Three types of activating factors were categorized in the data obtained: negative (69%), ambivalent (24%) and positive (7%). Positive factors refer to events that could theoretically be perceived as favorable, since they are related to over-fulfillment of contractual terms, but ultimately lead to a mismatch between the employee's expectations and reality (Morrison, Robinson, 1997). For example, a respondent (P5) stated: *I got a promotion, great! (...), but it turned out to involve a huge amount of additional responsibilities that no one announced to me beforehand*. Negative factors are situations directly perceived as unfavorable and contrary to expectations, such as the lack of reward for work done (Conway, Briner, 2005). One respondent (P20) expressed it as follows: *I was promised a bonus for that year of work, but in the end I only got a thank-you note - I felt cheated*. The research also revealed the existence of ambivalent activating factors, which occur when a situation arouses mixed emotions, such as when an employer's decision is logical from the organization's perspective, but at the same time perceived as unfair by the employee. An example of such a situation is the statement (P51): *I understand that the colleague has more experience, but I still find it difficult to accept that he is the one who was assigned the task (...) for which I was so prepared after returning from maternity leave*. These three types of activating factors indicate the multifaceted nature of contract disruption, which arises as a result of activating conscious attention to the terms of the PC.

4.2. Idiosyncratic processes leading to psychological contract violation

Narrative event mapping was used to determine how PC disruptors arise, and the interconnectedness and recurrence of their occurrence. To do this, various events that were reported in each interview were identified, such as attending a meeting, emails from a supervisor or passing on information. Then, these events were placed on a timeline and asked to rate the likelihood of a PC disruption activating factor recurring in the future based on the respondents' retrospective experiences. This generated unique stories for each person, which determined how a conscious perception of a contract violation developed through the accumulation of related activating factors over time.

Following the activating factor of the PCV, the respondents tried to change their contracts based on past experiences, but the frequent succession of related activating factors seemed to hinder the process. This manifested itself through a sense of intensifying contract disruption. As a result, the respondents analyzed the situation of contract disruption not only by analyzing the initial activating factor of the perception of contract disruption, but by analyzing the sequence of other triggers that emerged over time. Here is one respondent's story (P8):

Returning to work after maternity leave was a huge challenge for me. I remember the first week I was invited to a meeting to discuss the project I had been working on before my leave. However, it turned out that its direction had been completely changed, and I was not informed about it. (...) I felt as if my previous involvement was null and void. The next day I received a message from my supervisor with new tasks that were not at all in line with what we had previously agreed upon. This was the moment when I first felt that something had changed - as if the expectations of me had been reevaluated without my knowledge. (...) In the weeks that followed, there were more situations like this - for example, my plan for flexible working hours, which was supposed to enable me to reconcile my professional duties with childcare, was not respected. I constantly had to negotiate with the team to adjust my working hours to meet their needs, which in practice meant that I was the one who had to bend. (...) These events began to accumulate - one after another undermined my sense that we could act in accordance with previous agreements. When I analyze this in retrospect, I see that these factors were interrelated. Each successive one intensified my feeling that my place in the company was no longer the same as before. I feel that the likelihood of this happening again is high because the company seems to operate in an unpredictable and reactive manner, and communication between me and my supervisor is still limited. All of this has caused me to start redefining my expectations and attitude towards working here - although, to be honest, it's not easy, because such constant changes make it difficult for me to rebuild trust and a sense of stability.

All idiosyncratic plots that were identified by narrative event mapping contained at least three or more consecutive interrelated activating factors. It was only after several activating factors were present that respondents tended to notice that they had noticed something unusual, and then turned their conscious attention to the specific context. In this situation, most of the female participants began to feel emotional tension about their professional futures. One participant (P60) reports: *(...) now I can already see what is happening around me, and I think, moment! I have to be careful, because something is approaching that resembles a situation I've experienced before.* It turns out that activating factors of disturbance can create fear or uncertainty, prompting respondents to watch their surroundings more closely for additional critical events. The accumulation of interrelated activating factors had a significant impact on the perception of PCV by female study participants. Factors that recalled previous experiences of past violations reinforced the emotional response. As one participant (P36) noted: *When I returned after [maternity] leave, I initially ignored minor changes, such as being left out of team emails, but when such situations began to recur, I felt a growing frustration. Each subsequent team email reminded me of earlier omissions and intensified the feeling that my contribution was no longer being taken seriously.* The sequence of related critical incidents gradually increased the strain on the work relationship until the respondents reached a threshold of tolerance and recognized that their PCV had occurred. As one respondent (P11) stated: *After another such event, I thought: how much more do I have to put up with this, (...) because I already felt that everything had exceeded the limit of my tolerance.*

The research also confirms that frequent activating factors can significantly affect respondents' negative attitudes toward fulfilling organizational responsibilities, leading them to engage in job-seeking and withdrawal behaviors. As one survey participant (P4) noted, the frequency of such experiences has become unbearable: *With each quarter I was promised a raise (...), I hoped that something would change, but these changes were only temporary. When the situation repeated itself once again, I stopped believing that things could be different in this organization, and started looking for another place for myself.* It turns out that a key role is played not only by the sequence of activating factors but also by the repetition of their occurrence, which increase the likelihood of perceiving them as elements of a PCV.

5. Discussion

The results of this study shed new light on the dynamics of PCV, confirming the key role of activating factors in the process of perceiving a contract violation. The study provides evidence that the perception of breach is not the result of a single event, but the result of a sequence of iterative interactions of activating factors that exceed employees' individual tolerance thresholds thereby triggering disruption. Strongly emotionally charged stimuli, whether positive, negative or ambivalent, were found to play an important role in activating the employee's conscious attention to the terms of the PC.

The proposed concept of the accumulation of activating factors over time supports the theory that the perception of PCV is non-linear in nature (Bankins, 2015; Griep, Vantilborgh, 2018). The study found that the factors activating the disruption and the conscious perception of contract violation leading to a change in contracts based on past experience mutually influence each other over time. This temporal idiosyncratic mechanism leading to perceptions of contract violation was found in all respondents, regardless of whether they returned to work after maternity leave or resigned by mutual agreement. Explaining the model, not only do activating factors cause perceptions of disruption, but the interconnectedness of these triggers over time ultimately affects all respondents' perceptions of breach of contract. The sequence of interrelated activating factors leads to a cumulative effect that can escalate an employee's emotional response and affect their evaluation of the exchange relationship with the organization. Such a model is consistent with the research of Conway and Briner (2002), who suggested that repeated daily events can lead to PCV.

The results also suggest that employees' responses to activating factors are shaped by their past experiences. Different experiences result in the formation of distinct cognitive schemas (Rogozińska-Pawełczyk, 2016), and PCs provide an individual frame of reference that determines whether a stimulus will be recognized as an activating factor (Petrucci, Pecchinenda, 2017). Appraisal theory allows us to understand why some stimuli become the object of

conscious attention, while others are overlooked or suppressed (Catino, Patriotta, 2013). The appraisal process enables the attribution of meaning to stimuli and their selection, separating those that remain unconscious from those that become subject to conscious analysis. Unconscious stimuli are weakened, while selected ones reach a higher level of cognitive processing (Knapp et al., 2020). In the context of the research conducted, activating factors can be defined as stimuli that attract conscious attention, arousing a cognitive response capable of activating the PC pattern. In turn, the activation of conscious attention within the framework of the sensemaking theory depends on the accompanying emotions that signal a deviation from the previous norm, as well as on the previous experienced stored stimuli (Conway, Briner, 2005). This mechanism explains why some stimuli are perceived as activating factors while others go unnoticed. Strongly emotionally charged stimuli - whether positive, negative or ambivalent - as well as those reminiscent of previous situations of contract violation, give meaning to events and attract conscious attention. As a result, less important details are overlooked, while emotionally charged stimuli become clearer and more strongly influence the perception of the terms of the PC.

In addition, the links between activating stimuli may be deeply rooted in the employee's memory, which supports the hypothesis that these stimuli have a long-term effect on the dynamics of the PC. The accumulation of triggers reminiscent of past experiences of contract violations leads to a heightened emotional response and a redirection of conscious attention to past exchange relationships. Posten et al. (2024) indicate that the memory effect can enhance the rapid identification of activating factors, which is reflected in the results of this study. In all subjects, the correlations of factors based on previous experiences were revealed, illustrating how remembered stimuli form a network of interdependencies, automatically activating a PC pattern. These results not only confirm, but also develop the findings of Conway and Briner (2002), who showed that small, everyday events can accumulate and lead to a violation of the contract. This process is particularly evident when activating factors are seen as interrelated, as people make sense of their relationships (Weick et al., 2005).

The study provides a new perspective on the complex, multidimensional nature of activating factors, taking into account their positive, negative and ambivalent nature. Participants who expected to fulfill commitments often showed surprise and were less prepared for the appearance of negative stimuli. As Banks (2015) notes, such experiences can amplify the impact of subsequent negative activating factors. Accordingly, the accumulation of triggers does not simply involve the summation of negative events, but includes the identification of activating factors and the conscious attribution of meaning to related stimuli that build up in a non-linear fashion, exceeding the individual's tolerance threshold and leading to the perception of PCV. Moreover, storing these stimuli in memory gives them a lasting impact (according to the results of narrative event mapping). This process increases the pressure on the exchange relationship until the accumulation exceeds the tolerance limit and leads to a sense of contract violation (Rousseau et al., 2018). As Rigotti (2009) points out, disruptions develop

within tolerance thresholds, where linkages and repetitions of activating factors - expected or unexpected - accumulate until a critical point is reached (Wiechers et al., 2023). The results obtained provide a solid foundation for better understanding this process.

This study extended previous knowledge by complementing the concept of positive and negative affective disturbances described by Rousseau et al. (2018), indicating that there are also ambivalent activating factors, referred to as “mixed interference”. Ambivalent activating factors show less influence on the perception of contract violation, which may be due to the operation of independent brain areas responsible for processing positive and negative emotions (Lindquist et al., 2016). Since these areas function independently, with no flow of information between them, this may explain why participants experiencing ambivalent stimuli experienced conflicting emotions at the same time.

6. Theoretical implications

The findings of the present study add significant value to the theory of the PC by deepening our understanding of its dynamics and the activating factors that initiate the disruption process. The findings extend the model of the phases of the PC proposed by Rousseau et al. (2018), adding the iterative nature of activating factors' interactions and their emotional significance. The presented approach emphasizes that the mechanism leading to feelings of contract violation is sequential and cumulative, based on previous experiences, which is an extension of traditional linear approaches. Consideration of the cumulative effects of activating factors provides a better understanding of how employees' perceptions change in response to a dynamic organizational environment.

The use of appraisal theory and sensemaking as stimulus selection mechanisms provides further evidence of the key role of conscious attention and the cumulative effect of related activating factors in shaping the perception of contract violations. Developing this approach can extend the existing theoretical framework with new perspectives on the analysis of the determinants of violation perception.

The identification of ambivalent activating factors as a distinct category is also a theoretical contribution, expanding the existing framework for analyzing PCV. This suggests that the effects of these factors may be more complex than previously thought. Stimulus evaluation theory (Catino, Patriotta, 2013) and emotion research (Lindquist et al., 2016) offer valuable theoretical tools to further explore this topic. This finding opens up new avenues of research on the role of emotions evoked by ambivalent activating factors in the interpretation of workplace stimuli.

7. Practical implications

This study provides valuable practical guidance for managers and employers in managing the PCV and minimizing the risk of its breach. The study indicates that the activating factors that lead to a perceived breach of contract can be complex and multidimensional, so management of this process should be regular and tailored to specific organizational circumstances. Managers should particularly focus on identifying activating factors and their interrelationships so that early signals of disruption can be noticed and managed appropriately. Offering support in the form of valuing employee contributions, training and tailored development activities can help minimize the impact of negative activating factors and foster a stronger PC. In addition, individualized approaches to employees and the use of personalized contracts (“i-deals”) can effectively counteract the negative effects of accumulating activating factors while providing greater flexibility and commitment to the contract. In addition, the study underscores the importance of monitoring and responding to changing conditions, such as organizational changes, and providing employees with support in the form of training and coaching to help them better cope with new challenges. Often, the rapid succession of activating factors of various scattered events from multiple sources, which as a whole affect the PC, makes it an almost continuous process. Moreover, by understanding all the possible factors that can provoke a PCV, managers will be more alert to any initial signs in employees, as described in this study, and thus enable them to intervene earlier. The research findings presented here therefore provide a better understanding of the dynamics of the PC and will help employers develop a proactive approach to create a more robust contract framework that is less prone to disruption.

8. Limitations and suggestions for future research

This study has several important limitations that point to directions for future research on PC disruption. First, the generalizability of the presented results may be questioned due to the specific and unrepresentative research group. Research in different organizational contexts and with more diverse groups, including both women and men, could provide more universal conclusions. Future research should also include dynamic and highly competitive industries, such as banking or the technology sector, to verify the mechanisms of violation in diverse working conditions. As a result, the conclusions drawn from the survey may not be applicable to the broader population of respondents, young female mothers returning to the labor market after maternity leave.

The second limitation relates to the narrative event mapping method used, which only allows retrospective study of the sequence and accumulation of activating factors. In order to more accurately determine the timing of activating factors and their interrelationships, future research should use other methods, such as diary techniques, vignette studies or experiments. This will allow for a better understanding of the dynamics of the violation process and its relationship to employees' emotions and cognitive patterns.

The third limitation is related to differences in the impact of positive, negative and ambivalent factors. The results indicate that negative stimuli have a more lasting impact than positive ones, which is supported by the literature (Baumeister et al., 2001; Harrington, Lee, 2015). However, it remains to be explored how ambivalent activating factors affect the PC. Future research should answer questions about the effects of alternating positive and negative cues and their side effects. It is also worth investigating whether disruptions with ambivalent affect lead to renegotiation, repair or rupture of the contract. A better understanding of these processes will allow the development of management strategies that take into account the complexity and variability of emotional reactions over time.

9. Summary

This study uncovers the mechanisms leading to PCV, highlighting the key role of activating factors and their interrelationships. The results indicate that the violation process is not linear, but an idiosyncratic phenomenon in which the perception and evaluation of activating factors accumulate over time until the threshold of conscious attention is crossed and the violation is perceived. The findings suggest that understanding the dynamics of the PC requires analysis of the sequence and interaction of activating factors.

The study extends the existing literature by providing empirical evidence of the complexity and non-linearity of the contract violation process. The results provide a solid foundation for future research on the different types of activating factors, their temporal nature, and the ways in which they affect the renegotiation, repair or rupture of a PC.

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IMPACT OF EU FUNDS ON LOCAL INFRASTRUCTURE DEVELOPMENT IN THE POMERANIAN VOIVODESHIP

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Purpose: The aim of the article was to assess the impact of EU funds on local development, with particular emphasis on technical and social infrastructure.

Design/methodology/approach: Based on the analysis of statistical data and reports, a significant impact of EU funds on the development of the Pomeranian Voivodeship was demonstrated, including the implementation of numerous investment projects and a noticeable increase in GDP. The application of multiple regression analysis revealed a strong correlation between the share of local government revenues and the level of implemented investments.

Findings: Over the 20 years of Poland's EU membership, the GDP of the Pomeranian Voivodeship increased from PLN 52.6 billion to PLN 191.4 billion (from 50% to 75% of the EU average), and exports also rose. Approximately PLN 20 billion in EU funds were invested. The region obtains EU funds per capita at a level comparable to the national average. The main beneficiaries are local governments, for which grants constitute a significant source of investment financing. A key factor determining the level of these expenditures is the share of local governments in co-financing the projects.

Research limitations/implications: Due to the lack of detailed statistical data, the study did not make it possible to present the variation in the impact of EU funds at the level of individual municipalities within the voivodeship.

Practical implications: Co-financing EU projects by local governments significantly influences investment levels. Limited own revenues may hinder required contributions, causing debt. Authorities should monitor investment indicators and EU fund efficiency to better plan locally needed investments.

Social implications: Research can contribute to shaping a positive image of Poland's membership in the European Union by highlighting its tangible socio-economic benefits.

Originality/value: The research highlights the significance and impact of EU funds on the development of the Pomeranian Voivodeship during the twenty years of Poland's membership in the European Union, with particular emphasis on the role of local governments in the investment process involving EU funding. The article may be of interest to both national and local authorities, as well as to residents—especially those of the Pomeranian region.

Keywords: EU funds, investment expenditures, local infrastructure, local government units.

Category of the paper: Research article, case study.

1. Introduction

EU funds play a key role in the development of local infrastructure by supporting modernization and improving the quality of life for residents. Community financial resources contribute to the implementation of projects that often exceed the financial capabilities of local governments. One of the main strategic objectives of the European Union is to reduce disparities in the level of development among its regions. EU funds represent one of the most important external sources of financing, influencing the scale of investment policy implemented in Polish cities (Koj et al., 2023).

The article presents a review of the relevant literature and an analysis of available statistical data concerning the funds obtained from the European Union by local government units in the Pomeranian Voivodeship, as well as the scope of investments co-financed with own-source revenues in the years 2020-2023. To examine the significance of EU funds for the investment development of local governments, a multiple regression model was applied using data analysis tools in the R environment. The summary was based on reports by the Board of the Pomeranian Voivodeship, covering 20 years of EU fund absorption.

Local development should be viewed in a multifaceted way, as achieving the ultimate goal—a positive civilizational change in the living conditions of residents within a given local system—depends, among other things, on improving economic indicators. This places an important responsibility on local governments to manage public finances rationally (Psykt-Piotrowska, 2011; Wojarska, Marks-Bielska, 2015).

Investments in a municipality's technical infrastructure have a direct impact on improving the living conditions of the local population. They include facilities and initiatives related to: the transport of people and goods; sewage and water supply systems; energy, encompassing the production and distribution of electricity, heat, liquid fuels, and gas; communication and connectivity, including postal, telecommunications, and internet services; as well as waste management and environmental protection (Adamowicz, Stolarczyk, 2022).

The primary focus of activities financed by European funds is infrastructure projects. Investments co-financed by EU funds enable the construction of modern roads, sewage systems, and cultural centers, which directly contribute to improving the quality of life for residents (Churski, 2014). Investments in educational and cultural infrastructure are also an important element of EU support. Projects supported by EU funds contribute to the construction of modern schools, libraries, and cultural centers, thereby strengthening social capital. Krasowska (2021) points out the positive impact of these funds on the implementation of the idea of sustainable development in small towns, provided that expenditures are directed toward activities that stimulate such development.

One of the main areas of support is transport infrastructure. The acceleration of road infrastructure development would not have been possible without substantial financial support from the European Union's structural funds, particularly the Cohesion Fund. It is estimated that approximately 80% of the value of road investments was financed from this source (Śleszyński, 2024). It was precisely after Poland's accession to the European Union that spectacular investments in this area took place. This was due to the significant infrastructural backlog compared to developed countries. In 2004, Poland had only 784 km of motorways and expressways. By 2022, this length had increased to 4,872 km. As a result, in the first decade following accession to the EU, time-space accessibility improved significantly—referred to as the "big push" (Rosik et al., 2015)—along with comfort and traffic safety (Koziarski, 2018).

One of the objectives of the European Union (EU) policy in its member states is the protection of the natural environment. Therefore, an increasing number of investors are taking advantage of funds allocated for environmental protection (Bylicki, 2014).

The scope of operational programmes confirms that structural funds support environmentally friendly investments, such as renewable energy sources, modernization of water supply infrastructure, or the revitalization of degraded areas.

2. The Impact of EU Funds on the Development of the Pomeranian Voivodeship

Thanks to EU funds, the Pomeranian Voivodeship has experienced dynamic development, achieving significant success in infrastructure, social, and economic spheres. In 2004, the region's GDP amounted to 50% of the EU average, and by 2021 it had increased to 75%, which in real terms means growth from PLN 52.6 billion to PLN 191.4 billion in 2022. Exports also increased nearly fourfold – from PLN 22.2 billion in 2004 to PLN 83.3 billion in 2022 – primarily due to access to the open EU market. The Pomeranian Voivodeship invested over PLN 20 billion of EU funds into key areas of development. These funds were allocated to the construction of roads, railways, hospitals, urban revitalization, the development of culture and tourism, support for the elderly and people with disabilities, education, and training programs. Among the most important investments were the Pomeranian Metropolitan Railway (carrying 4 million passengers annually), the expansion of Gdańsk Airport, and the construction of the Pomeranian section of the S7 route. Significant investments were also made in urban mobility, including the modernization of 34 transfer hubs. In the healthcare sector, specialized equipment (e.g., CT scanners, MRIs) was purchased and medical facilities were renovated, which improved the quality of treatment for lifestyle diseases. Social and infrastructural revitalization covered 27 cities, including the adaptation of a former power plant into the seat of the Polish Baltic Philharmonic, the construction of the Shakespeare Theatre, and the

establishment of the European Solidarity Centre, which has been visited by 5.7 million people. The Pomeranian region also invested in science and technology, establishing the Pomeranian Science and Technology Park in Gdynia and the STOS Competence Center at Gdańsk University of Technology, featuring the Kraken supercomputer. Educational initiatives included collaboration between vocational schools and employers (19,000 students completed internships) and the creation of over 3300 childcare places for children under the age of 3 and 10,300 preschool places (20 Years of Poland in the European Union – report by the PAP Local Government Service, based on information from the Board of the Pomeranian Voivodeship).

3. Areas of Intervention of the Regional Operational Programme for the Pomeranian Voivodeship for the years 2014-2020

The Regional Operational Programme of the Pomeranian Voivodeship for 2014-2020 (RPO WP 2014-2020) constituted a key tool for regional development, financed by the European Union under the cohesion policy. The programme focused on strengthening the competitiveness of the economy, developing infrastructure, and improving the quality of life of the region's inhabitants. It was one of the best-planned regional programmes, tailored to the needs and potential of the Pomeranian region.

Table 1.

Status of implementation of the ROP PV 2014-2020 as of April 30, 2024

Priority axis	Objective	EU Funds in million PLN	Number of contracted projects
Commercialization of knowledge	Supporting innovation in enterprises and cooperation between R&D units and businesses	352,6	67
Enterprises	Strengthening enterprises, their import activity, development of business support institutions, and improvement of the region's investment attractiveness.	709,3	512
Education	Improving access to educational services, enhancing the quality of general and vocational education, and ensuring high-quality preschool availability.	618,2	377
Vocational education	Increasing the attractiveness and quality of vocational education for young people, both at the level of vocational schools and higher education institutions.	301,4	29
Employment	Increasing employment of people in a difficult situation on the labor market, development of entrepreneurship, lifelong learning, and improvement of health.	933,7	513
Integration	Professional and social integration of people at risk of social exclusion, increasing the availability of social services, and development of the social economy.	549,5	326

Cont. table 1.

Health	Improvement of the health status of the inhabitants of the voivodeship.	723,9	45
Conversion	Comprehensive revitalization of cities along with the development of regional tourist products.	712,4	105
Mobility	Improvement of public transport efficiency in cities and enhancement of road and rail connections within the region.	1,6	48
Energy	Improvement of public transport efficiency in cities and enhancement of road and rail connections within the region.	989,4	147
Environment	Protection of natural resources, efficient management of municipal waste, organization of water and wastewater management, and protection of biodiversity.	527,4	116
Recovery and Resilience	Restoration of business resilience, mitigation of the health impacts of the pandemic, and increased use of renewable energy sources (RES).	111,7	14
Integration of Immigrants	Assistance for individuals arriving from the territory of Ukraine.	25,6	3

Source: Own elaboration based on the Report on the Implementation of the Regional Operational Programme of the Pomeranian Voivodeship for 2014-2020, Pomeranian Voivodeship Government.

In total, under the Regional Operational Programme of the Pomeranian Voivodeship for 2014-2020, as of April 30, 2024, 2315 contracts were signed for a total of PLN 8.5 billion, of which PLN 7.7 billion has already been disbursed to beneficiaries. Out of the PLN 8.5 billion, PLN 6.1 billion constitutes funding from the European Regional Development Fund designated directly for infrastructure investments.

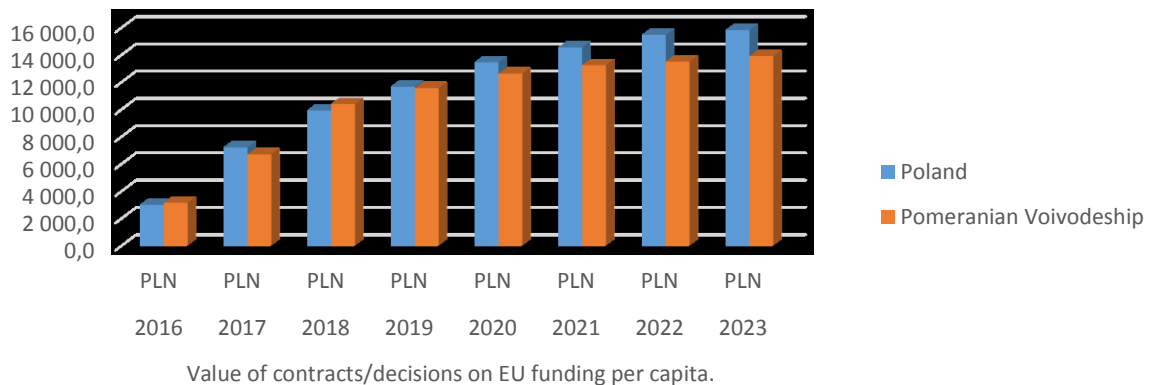


Figure 1. Comparison of the amount of EU funds per capita (based on the value of contracts/decisions) in Poland and the Pomeranian Voivodeship.

Source: Statistics Poland (GUS). Local Data Bank.

The Pomeranian Voivodeship does not statistically differ from the national average in terms of EU funds obtained per capita.

4. The Importance of EU Funds in the Development of Local Government Units in the Pomeranian Voivodeship

EU funds play a key role in the development of local government units (LGUs) in Poland, including in the Pomeranian Voivodeship. The amount of funds obtained by municipalities fluctuates over time due to the European Union's seven-year financial programming. This means that LGUs must adapt their development strategies to the changing possibilities of EU fund financing (Wyszkowska, Wyszkowski, 2021).

A long-term analytical perspective allows for a more comprehensive understanding of the effects of investments co-financed by EU funds and their impact on the socio-economic development of regions. By taking into account programming cycles as well as the time required for project implementation and settlement, it is possible to more accurately assess the effectiveness and efficiency of fund utilization and their actual contribution to the development of local governments.

As noted by Wiatrak (2011), Poland's accession to the European Union contributed to the growing importance of strategic planning in local development, although it has not always delivered the intended outcomes. Therefore, it is essential to seek answers to the question of the role of planning as a tool for economic development and public engagement, as well as the conditions that determine the effectiveness of development instruments.

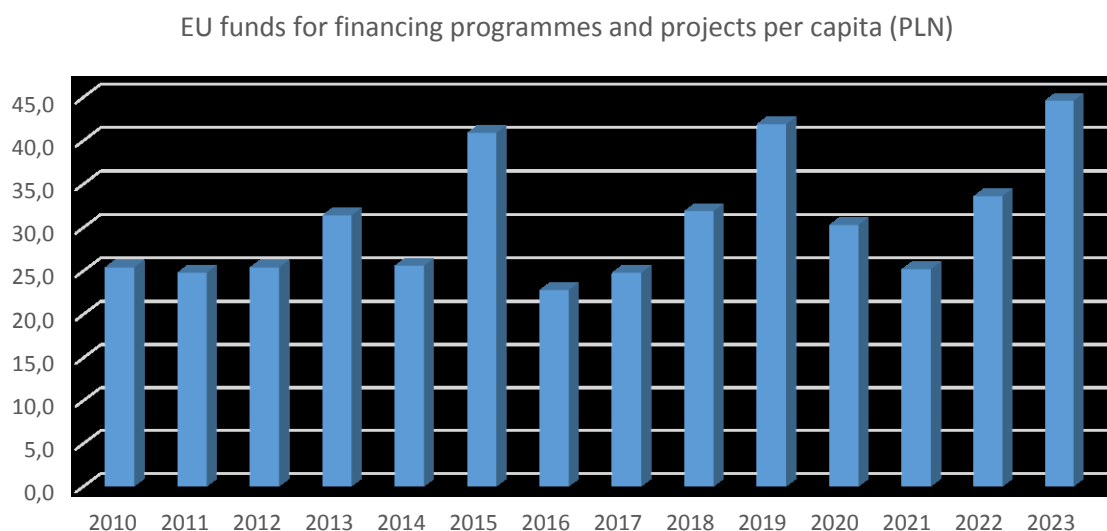


Figure 2. EU funds for financing programmes and projects per capita obtained by local government units of the Pomeranian Voivodeship in the years 2010-2023.

Source: Statistics Poland (GUS). Local Data Bank.

Taking into account the programming periods and the conditions related to the implementation and settlement of projects, the analysed period 2010-2023 primarily covers funds obtained under the EU financial perspectives 2007/2013 and 2014-2020. The chart of funds obtained by local governments in the Pomeranian Voivodeship confirms the variation of

this indicator over the years. Wojarska (2020) notes that, while the overall significance of European funds for local government units is relatively limited, it increases in the budgets of specific municipalities, significantly influencing their investment plans. This means that although, on a macro scale, EU funds constitute a moderate part of local government budgets, they can be crucial for the implementation of investments in individual municipalities.

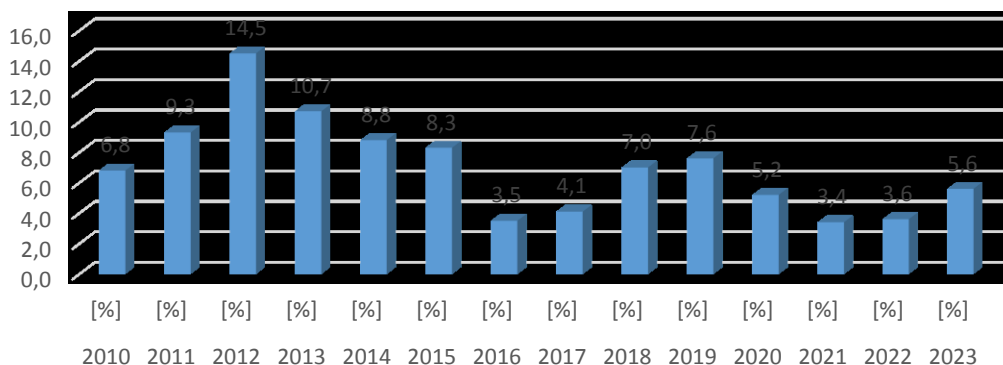


Figure 3. Share of local government revenues allocated for financing and co-financing EU projects and programmes in total revenues in the Pomeranian Voivodeship (%) in the years 2010-2023.

Source: Statistics Poland (GUS). Local Data Bank.

The share of EU support in the total value of projects amounts to a maximum of 85%, but is usually much lower. The remaining amounts are supplemented by the local governments' own funds. Often, the share of own contributions is increased by so-called non-eligible expenditures, which refer to tasks not covered by EU funding but necessary for the rational implementation of the investment. Therefore, the share of own-source revenues in the financing of EU projects is higher than it would appear from the project's financial structure.

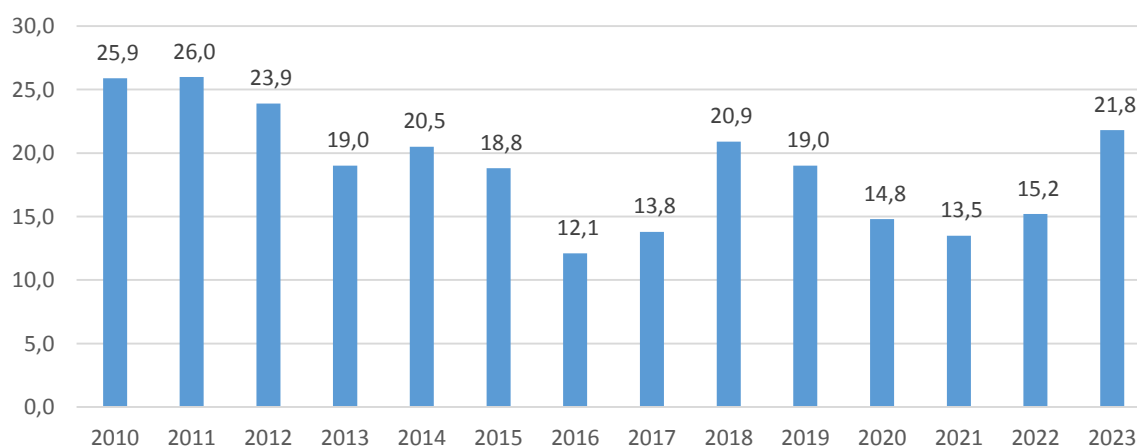


Figure 4. Share of investment expenditures of local government units (LGUs) in total expenditures in the Pomeranian Voivodeship (%) in the years 2010-2023.

Source: Statistics Poland (GUS). Local Data Bank.

The use of European funds by municipalities is significant, although it varies greatly in scope. A large portion of the grants is allocated to investment expenditures. The highest amounts are utilized by cities with county rights, both in absolute terms and per capita. The volume of funds obtained by municipalities fluctuates over time, which results from the seven-year financial programming cycles of the European Union (Wyszkowska, Wyszkowski, 2021).

To examine the significance of EU funds in the investment development of local government units (LGUs), a multiple regression model was applied using data analysis tools in the R environment.

Dependent variable:

- Share of LGU investment expenditures in total expenditures in the Pomeranian Voivodeship (Y).

Independent variables:

- EU funds obtained by LGUs per capita for financing programs and projects (X1).
- Share of LGU revenues allocated for financing and co-financing EU programs and projects in total revenues (X2).

The data covers the period from 2010 to 2023. Multiple regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon \quad (1)$$

It aims to examine the impact of two independent variables: “EU funds for financing programs and projects per capita” and “The share of local government revenues in the financing of EU projects” on the dependent variable, which is “The share of local government investment expenditures in total expenditures”. The model shows the extent to which these variables influence the level of investment expenditures of local government units. The analysis was conducted in accordance with the adopted assumptions of the model, and the results were verified using statistical diagnostics. A significance level of 0.05 (p-value) was adopted. The study shows that the variable “EU funds per capita obtained by local government units in the Pomeranian Voivodeship for financing programs and projects in the years 2010-2023” does not have a significant impact on the share of investment expenditures in total local government expenditures (p-value = 0.70261 > 0.05). Although the increase in EU funds per capita influences the growth of investment expenditures, this effect is statistically insignificant in this model. It is also important to note that investments supported by EU funds were carried out using the local governments’ own resources, with EU funding provided as a reimbursement (in recent years, advance payments during project implementation were also possible). This means that the two analysed indicators do not always correlate in specific years. The analysis of the indicator “The share of local government revenues used to finance and co-finance EU projects and programmes in total revenues in the Pomeranian Voivodeship” and its correlation with the share of investment expenditures in total local government spending shows that this variable has a very strong and statistically significant impact on the dependent variable (p-value = 0.00903 < 0.05). The higher the share of local government revenues in

financing EU projects, the greater the share of investment expenditures in the total expenditures of local governments. Co-financing of EU projects by local authorities is a key factor determining the level of investment spending. It confirms the involvement and significant impact of EU funds on the scale of investments in local governments in the Pomeranian region. A high share of local government revenues in these projects may lead to greater investment in infrastructure and local development. Although EU funds theoretically influence expenditure, the funds alone—even in large amounts—may not be a sufficient factor to increase investment spending if local governments do not allocate their own revenues to co-finance these projects. Therefore, local governments should focus not only on the effective use of available EU funds but also on mobilizing their own resources to co-finance EU-funded projects. Local government units (LGUs) should prioritize investments, especially those that can be co-financed with EU funds. Additionally, actions should be taken to increase the efficiency of EU fund utilization in investment areas, particularly in the context of infrastructure and sustainable development.

The analysis suggests that local government units (LGUs) that are able to allocate a larger share of their revenues to financing EU projects may achieve better outcomes in terms of investment expenditure. Therefore, it is advisable to develop financial management strategies that allow for greater commitment of own resources to projects, which will, in turn, lead to more effective use of EU funds and a higher share of investments in the budget. It should be noted that most local governments have insufficient revenues to cover expenses, including the required own contributions for EU-funded projects. Local government units must plan their finances with a long-term perspective, taking into account both the EU funds obtained and the obligations related to their own contributions (Banaszczak-Soroka, Mosionek-Schweda, 2017, pp. 293-311). Often, when municipalities take advantage of the opportunity to co-finance investment projects, it also means they must finance their own contributions through revenues from loans or bond issuance. This implies that in order to access EU funds, local governments may create or increase their public debt.

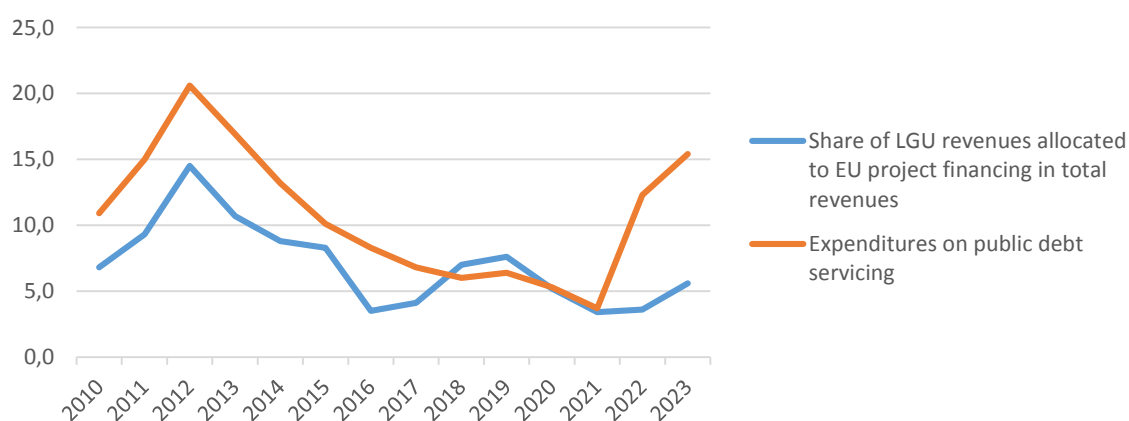


Figure 5. Comparison of trends in the share of local government revenues allocated to the financing and co-financing of EU programs and projects in total revenues (%) and expenditures on public debt servicing by local governments at all levels per PLN 1000 of local government budget revenues.

Source: Statistics Poland (GUS). Local Data Bank.

Pomeranian local governments, by increasing the financing and co-financing of EU projects, also increase their debt levels—although this is not the only factor driving local government indebtedness. Inflation (including high interest rates on loans) and a decline in revenue shares from personal income tax (PIT) may also contribute. However, the trends of the indicators presented in the chart for the years 2010-2023 appear to support this conclusion.

5. Summary

Over the 20 years of Poland's membership in the European Union, the GDP of the Pomeranian Voivodeship increased from 50% to 75% of the EU average, which in real terms means a rise from PLN 52.6 billion to PLN 191.4 billion. Exports nearly quadrupled. Approximately PLN 20 billion in EU funds were invested. Thanks to EU support, many spectacular projects were implemented in the Pomeranian region. Under the ROP of the Pomeranian Voivodeship, as the main source of regional support for 2014-2020, more than PLN 6 billion was allocated for investments. The Pomeranian Voivodeship obtains EU funds per capita at a level close to the national average. The largest beneficiaries of EU assistance include local governments, particularly in the form of non-repayable aid such as grants. While EU support may be less significant in the context of overall local government budgets, it constitutes an important source of investment financing for individual units. The co-financing of EU projects by local government units (LGUs) is a key factor determining the level of investment expenditure. The own-source revenues of local governments in the Pomeranian Voivodeship may be insufficient to cover the required contributions to EU-funded projects, potentially generating public debt. Local government units (LGUs) should regularly monitor investment indicators and the effectiveness of EU fund expenditure. The analysis of outcomes should be an integral part of decision-making processes in order to better plan and implement investments that address the needs of local communities.

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IMPLEMENTATION OF SELECTED MANAGEMENT 3.0 PRACTICES IN PROJECT TEAMS – CASE STUDY OF A COMPANY FROM THE IT INDUSTRY

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Purpose: The aim of this paper is to increase the knowledge on how particular practices recommended within M3.0 framework stimulate motivation and commitment of project team members.

Design/methodology/approach: The paper – based on literature studies - describes a theory of M3.0 and selected M3.0 practices. Then a case study method is used. This paper presents results of interviews collected in three different project teams.

Findings: The introduction of selected M3.0 practices in the organization was met with positive feedback from both employees and their superiors. Their positive impact on both motivation and commitment was presented. However, some practices need to be adapted to the organization's current needs. These insights provide valuable guidelines for other organizations considering the implementation of the M3.0 concept.

Originality/value: This study contributes to the emerging research area of Management 3.0, where most existing studies focus on organizational structures. It is the first to examine the effectiveness of selected Management 3.0 practices in fostering motivation and commitment among project team members.

Keywords: Management 3.0, Leadership, Agile Project Management.

Category of the paper: Research paper.

1. Introduction

Management concepts continuously evolve as organizations face the challenge of implementing significant transformations efficiently and sustainably. According to Kotter (1996), a compelling sense of urgency and a cohesive guiding coalition are essential for driving change. Clear and transparent communication of the vision helps maintain motivation and commitment during transitions.

Management 3.0 (M3.0) builds on its predecessors, Management 1.0 (M1.0) and Management 2.0 (M2.0). M1.0 represents the early foundations of management, which later influenced organizational methods, including traditional (managerial) and modern (agile) approaches in project management. Understanding this evolution from rigid structures to flexible, people-focused practices highlights M3.0's role in fostering adaptability and engagement within organizations.

Nowadays, there are a lot of studies dedicated to agile project management, but there is not that much research concerning implementation of selected M3.0 practices (Piwowar-Sulej et al., 2022). There are some studies devoted to relations between general human resource management practices (such as mentoring) and employee motivation (Appelo, 2016; Adewuyi, Gbemi-Ogunleye, 2023). But there are no studies related to M3.0 tools and their influence on team's members motivation and commitment. The problem has not been discussed or empirically examined before.

The present paper addresses this very issue. Its purpose is to present how the implementation of M3.0 concept affects the motivation and commitment of project team members. Motivation may be described as the process of initiating and maintaining activities directed toward achieving specific goals (Schunk et al., 2014). In turn, commitment is a driving force that compels an individual to adhere to a specific course of action directed toward one or more objectives (Meyer, Herscovitch, 2001). The dependence of employees' motivation and commitment in the context of the implementation of M3.0 will be verified through a case study. In particular, the authors will examine M3.0 practices such as Mentoring, Moving Motivators, Kudo Box and Idea Box.

2. Literature Background

The classical school of management developed at the turn of the 19th and 20th centuries. (Kitana, 2016). In 1903, Taylor (1903) published an article on the sciences of organization and management. According to M1.0 organizations were managed from top to bottom, and power was exercised by only a few (Appelo, 2016). These practices worked well in large projects in which there was high repeatability of processes, and the manufacturing processes were very well known and burdened with low, predictable risk (Asthana, 2017).

In the concept of M2.0, the perspective and understanding of the employee's role in the organization has changed. It has come to be considered that people are the most valuable assets (Appelo, 2014). M2.0 models are based on M1.0, so organizations which implement this concept are still top-down in a hierarchical structure. M2.0 was to help managers better manage the organization with the use of one-on-one conversations, but the hierarchy remained in the management architecture 2.0 (Appelo, 2016).

According to Appelo M1.0 is doing the wrong thing and that M 2.0 is doing the right thing in the wrong way. In turn, M3.0 is guided by three principles: engaging people, improving systems, and delighting clients. It is built on six pillars: Energize People, Empower Teams, Align Constraints, Develop Competence, Grow Structure, and Improve Everything (Appelo, 2014). Furthermore, Appelo (2014) proposed a set of practices to align with M3.0's principles and pillars. Companies are not required to use all of them but should select those that best fit their needs and adapt them accordingly. He also encouraged companies to create their own M3.0 practices, as long as they align with the core assumptions of M3.0.

When implementing Mentoring or the Moving Motivators practice, it is useful to remember that intrinsic motivation often involves autonomy, mastery, and purpose. Pink (2009) underlines that people thrive when they are granted the freedom to approach tasks on their own terms, the chance to improve their skills, and a clear link between their work and a broader goal. According to Yang (2024) it is possible to enhance proactive behaviors among employees by fostering a sense of security through psychological support. These perspectives align with M3.0 emphasis on empowering teams and fostering individual growth.

Superiors play a key role in employee mentoring. According to Goleman (1995), emotional intelligence fosters effective communication, empathy, and trust. Applying these principles helps leaders address team members' concerns, creating a psychologically safe environment that encourages open dialogue and empowers employees to take on responsibilities confidently.

To better understand their subordinates' motivations and values, managers use the Moving Motivators (CHAMPFROGS) exercise from M3.0 concept. Deci and Ryan (1985) emphasize the strong impact of intrinsic motivation on performance and satisfaction. By exploring employees' internal drives, teams can enhance engagement and investment in projects. CHAMPFROGS represents ten intrinsic motivators: Curiosity, Honor, Acceptance, Mastery, Power, Freedom, Relatedness, Order, Goal, and Status (Appelo, 2014). In this exercise, the manager and subordinate prioritize motivators and discuss their choices. This helps both parties understand each other's values and drivers, fostering better communication and cooperation. For mentors, it provides insight to better guide and support the development and motivation of their mentees.

The Happiness Door method evaluates team mood and satisfaction using icons (e.g., smiling, neutral, sad) displayed on a door or board, with team members selecting the icon that reflects their emotional state. The Idea Box is a structured tool within M3.0 for collecting and implementing ideas, fostering innovation and engagement. Finally, the Kudo Box allows teams to express gratitude and reward each other, following six guidelines: no pre-promised rewards, small rewards, continuous rewards, public recognition, rewarding behavior, and peer-to-peer rewards (Appelo, 2014).

At this point it is worth noting that M3.0 is an emerging research area. Almeida and Espinheira (2021) identified only 23 publications about M3.0. Most of them explored an organizational structure. Qualitative research approaches through the adoption of case studies, focus groups, and action research dominate in this area.

3. Methods

Due to the extensiveness of the researched issue, the case study method was chosen for the study, thanks to which its in-depth analysis and assessment was possible. This method makes it possible to collect a very large amount of qualitative data. In qualitative research such as case study during interviews we can ask people about all the things that are behind a given level of correlation (Kotter, 1996).

In a 25-person IT company composed mainly of recent graduates in their first jobs, selected M3.0 practices (Kudo Box, Happiness Door, and Mentoring) were introduced. Three teams of up to nine people worked using Scrum project management methodology. Data was collected through structured, casual interviews with Likert-scale questions on motivation and commitment. Interviews were conducted before and six months after the M3.0 implementation to assess its impact. Employees were asked about feeling appreciated, supervisor care, being heard, encouragement for development, teamwork quality, their progress, and learning opportunities.

4. Results

Table 1 presents results for the three teams before the implementation of M3.0 practices. The percentages in the table represent the proportion of employees within each team who responded positively to specific interview questions.

Table 1.

Baseline results for employee perceptions before the implementation of M3.0 practices

Issue	Team 1	Team 2	Team 3
Feeling of being appreciated at work in the last 3 months	60%	60%	60%
Supervisor's care about them as people	50%	50%	50%
Employee opinion taken into account	45%	45%	45%
Encouragement to develop professionally	40%	40%	40%
Co-workers' care about doing their job well	55%	55%	55%
Experience of talking to someone about progress in the last 3 months	35%	35%	35%
Opportunity to learn and develop	50%	50%	50%
Assessed level of motivation as 3 or higher*	50%	45%	45%
Assessed level of commitment as 3 or higher*	40%	55%	50%

* Where 1 represents no motivation/commitment and 5 represents high motivation/commitment.

Source: The authors' own work

Mentoring was the first M3.0 practice introduced in the company. Initially, project managers had limited open communication with team members about human resource development. As the team progressed through formation stages, mentoring yielded increasingly positive results. Beyond regular meetings, employees began seeking support from mentors for

work-related challenges. Before M3.0, employees felt hesitant to approach supervisors for development support, but mentoring fostered more comfort and frequent feedback on performance.

With the passage of time, there was also a visible change in the reported readiness of employees to take on more and more demanding tasks or those which made them leave their comfort zone. The relationships that developed during the mentoring programs in the organization meant that over time some employees also approached their mentors asking for support in private matters.

CHAMPFROGS complemented the mentoring program by having supervisors and subordinates prioritize motivators and discuss their choices during the first meeting. While some pairs used Moving Motivators only once, in successful cases, mentors applied the insights to goal-setting and addressing challenges aligned with mentees' values. Revisiting the exercise after three months helped assess changes in motivations, gather feedback, and improve communication, enhancing support and alignment of expectations.

The Kudo Box was introduced one month after the team was formed and started with the mentoring program. The Kudo Box was placed in a visible and easily accessible place for all team members. Team members did not have any awards announced based on the number of thanks in the Kudo Box. In the first iteration, people put in their main thanks and admiration for the work done or the help they were given. In subsequent iterations, cards that they appreciated also began to appear, e.g. the way of talking to the client, open feedback during the meeting, a joke, or preparing tea for someone from the team.

During regular meetings, teams opened the Kudo Box to share gratitude, which was well-received and strengthened team bonds. Recipients were often surprised by the recognition, boosting their motivation, confidence, and willingness to take on challenges. Employees noted that the practice helped "strengthen workplace relationships" and "recognize their strengths".

At the end of each meeting, participants were asked to leave feedback on the door, though not everyone participated. Some opinions were too general or vague, and anonymous suggestions prevented follow-up for clarification, often rendering the feedback unhelpful for improving future meetings.

The interviews provided valuable qualitative insights into the impact of Management 3.0 practices on employee motivation and commitment. One of the participant remarked: *The introduction of Kudo Cards made me feel more appreciated by my colleagues. It's a simple gesture, but it has a big impact on morale.* Another employee admitted: *I noticed that after implementing the Happiness Door, our team started communicating more openly about challenges and successes, which made me feel more involved and valued.* These statements highlight how specific tools fostered a sense of recognition and collaboration within teams, aligning with the quantitative findings of increased motivation and engagement.

Due to the above, after two months, the approach to collecting feedback after the meetings was changed. It usually took place immediately at the end of the meeting, and each participant was asked to briefly summarize the meeting and highlight its strengths and weaknesses. This solution gave much more benefits because the lecturer had the opportunity to ask for details when getting to know the opinion, what gave the opinion, and what is the exact vision of the person who gave the feedback. Such open conversations in front of all meeting participants often activated other people who, hearing opinions or suggestions of other team members, gave their solutions to the problem and at the same time gained awareness of what is important for individual team members.

The Idea Box, based on M3.0 pillars of "Empower Teams" and "Improve Everything", was a recurring organizational practice. For four weeks, employees could submit improvement suggestions visible to all staff. Proposals were reviewed by management, who provided feedback or requested revisions if they were not feasible. Employees then voted, each having 10 points to distribute among proposals. The highest-scoring idea was implemented. Unselected proposals remained available for future voting rounds if still relevant.

The introduction of the above-mentioned practices in the organization was met with great enthusiasm by the employees. The results of the implementation of individual practices are presented in Table 2, broken down by the type.

Table 2.

M 3.0 Practices' impact on motivation and commitment

Practice	Impact on Motivation and Commitment
Mentoring	Built strong, open relationships between employees and supervisors. Increased willingness to share feedback, take on challenging tasks, and develop professionally and personally. Enhanced trust and motivation.
Moving Motivators (CHAMPFROGS)	Helped understand individual motivators, enabling tailored goal-setting. Improved communication and alignment of values between mentors and mentees, fostering personal growth and engagement.
Kudo Box	Strengthened team bonds by encouraging gratitude and recognition. Boosted motivation and self-confidence, leading to greater willingness to take on challenges and support team members.
Happiness Door	Initially ineffective due to anonymity and lack of actionable feedback. Modified approach (open discussions) improved feedback quality, encouraged participation, and fostered collaborative problem-solving.
Idea Box	Empowered employees by involving them in decision-making processes. Increased commitment by providing transparency about organizational constraints and enabling employees to influence their work environment.

Source: The authors' own work.

Employees were enthusiastic about the new improvements that emerged as a result of the votes, and clear and transparent rules regarding this practice ensured that even if one of the employees' proposals was rejected, it did not make them discouraged or incomprehensible to the new practice.

The results were formulated based on the responses provided by employees. Participants were asked to indicate either affirmative or negative answers to the specified question. The percentage of positive responses to the questions assessing motivation and commitment after six months of implementing M3.0 practices is shown in Table 3.

Table 3.

Baseline results for employee perceptions after the implementation of M3.0 practices

Issue	Team 1	Team 2	Team 3
Feeling of being appreciated at work in the last 3 months	80%	85%	75%
Supervisor's care about them as people	85%	90%	80%
Employee opinion taken into account	75%	80%	70%
Encouragement to develop professionally	70%	75%	65%
Co-workers' care about doing their job well	90%	85%	80%
Experience of talking to someone about progress in the last 3 months	65%	70%	60%
Opportunity to learn and develop	80%	85%	75%
Assessed level of motivation as 3 or higher*	60%	70%	65%
Assessed level of commitment as 3 or higher*	55%	60%	70%

* Where 1 represents no motivation/commitment and 5 represents high motivation/commitment.

Source: The authors' own work.

These results suggest that while all teams benefited from the implementation of Management 3.0 practices, differences in team dynamics or initial conditions may have influenced the degree of impact. No participant who provided an affirmative response in before implementing M3.0 practices gave a negative response after implementation.

The interviews conducted before and after the implementation of Management 3.0 practices provide a basis for assessing changes in employee motivation and commitment (see: Table 4). Percentages presented in Table 4 were calculated by dividing the number of positive responses by the total number of respondents (25) and multiplying by 100.

Table 4.

Comparison of employee perceptions before and after the implementation of M3.0 practices

Issue	Before implementation	After 6 months
Feeling of being appreciated at work in the last 3 months	60%	80%
Supervisor's care about them as people	50%	85%
Employee opinion taken into account	45%	75%
Encouragement to develop professionally	40%	70%
Co-workers' care about doing their job well	55%	85%
Experience of talking to someone about progress in the last 3 months	35%	65%
Opportunity to learn and develop	50%	80%
Assessed level of motivation as 3 or higher*	47%	65%
Assessed level of commitment as 3 or higher*	48%	62%

* Where 1 represents no motivation/commitment and 5 represents high motivation/commitment.

Source: The authors' own work.

5. Discussion

The study demonstrates that M3.0 practices significantly improved employee motivation and commitment. For instance, the percentage of employees feeling appreciated increased from 60% to 80%, while those perceiving supervisor care rose from 50% to 85%.

The findings align with the theoretical foundations of M3.0, demonstrating its positive impact on employees-related outcomes when tailored to organizational needs. Mentoring emerged as the most effective practice, fostering strong, open relationships between employees and supervisors. This aligns with Goleman's (1995) emphasis on trust and emotional intelligence in creating psychologically safe environments. Regular mentoring sessions enabled employees to share feedback openly, enhancing their professional and personal development. This study contributes to research on mentoring (Czeska, 2023) through demonstrating that mentoring plays a crucial role in building a sense of self-efficacy which has been confirmed in conducted studies. This was also supported by research findings, which indicate that assuming the role of a mentor can enhance both commitment and the perceived psychological meaningfulness of work among mentee (Lin et al., 2021).

The Kudo Box strengthened team cohesion by fostering a culture of recognition and appreciation. This practice aligns with Deci's and Ryan's (1985) theory of intrinsic motivation, emphasizing relatedness as a key driver of engagement. Team members reported feeling more connected, which increased collaboration and willingness to take on challenges. Aligning the recognition process with organizational values enhances awareness of the company's mission, stimulates creativity, and promotes the appreciation of both major and minor contributions. Integrating this approach into daily operations fosters a culture of mutual recognition and strengthens the overall workplace environment (Rusin, 2025) what also been confirmed in research.

The Idea Box empowered employees by involving them in organizational decision-making. It enhanced transparency regarding company constraints and goals, increasing employees' commitment. This reflects M3.0 principles of empowering teams and improving systems. However, not all practices were equally effective. The Happiness Door technique faced challenges due to its anonymous feedback mechanism, limiting actionable insights. Adjusting the approach to open discussions improved feedback quality and engagement.

6. Conclusions

This study provides empirical evidence supporting the effectiveness of M3.0 practices within modern management frameworks. The results have practical implications for managers seeking to improve team dynamics and engagement. By adopting M3.0 tools, organizations can create a more motivated and productive workforce.

Mentoring, *inter alia*, by ensuring the confidentiality of conversations and meetings, had a positive impact on the willingness to share feedback during meetings and open discussions thanks to the management's feeling of security to employees. The Happiness Door practice has not proved to be successful in a given organization. Lack of knowledge about who is the author of the feedback, and thus the inability to talk and learn about the source of the problem or what a given person would see as an improvement, often left feedback turned out to be of little value, without the possibility of working with it. In summary, the organization adopting a methodological approach to the implementation of M3.0 could find and adapt those practices that worked and give up those that did not bring much-added value to the organization.

The study has several limitations that should be acknowledged. First, the case study method, while allowing for an in-depth exploration, restricts the generalizability of findings to other industries or cultural contexts (Goleman, 1995). Additionally, the reliance on interviews and observations introduces subjectivity, as factors like interviewer bias or respondents' reluctance to share honest opinions may have influenced the results. Another limitation is the short evaluation period of six months, which may not capture long-term impacts of M3.0 practices on team motivation and commitment. Lastly, challenges with anonymous feedback mechanisms, such as the Happiness Door, reduced the ability to derive actionable insights from employee input. Future research are enhanced to address these limitations. Furthermore, longitudinal studies are recommended to assess the sustained effects of Management 3.0 practices over time. Incorporating quantitative methods alongside qualitative approaches could provide more robust evidence of correlations between practices and outcomes like employee satisfaction or productivity. Lastly, integrating emotional intelligence principles into future studies may help better understand their role in enhancing team dynamics and individual performance within this framework.

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THE ROLE OF SUSTAINABLE LEADERSHIP IN SHAPING EMPLOYEES' ORGANIZATIONAL COMMITMENT

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Purpose: The purpose of this paper is to explore the theoretical relationship between sustainable leadership and employees' organizational commitment. The article aims to identify key leadership practices that support long-term employee attachment to organizations, particularly in the context of contemporary challenges such as digital transformation, generational diversity, and evolving labor market expectations.

Design/methodology/approach: This is a conceptual paper based on an integrative literature review. It synthesizes theoretical contributions in the areas of sustainable leadership and organizational commitment. The approach combines Avery and Bergsteiner's (2011) model of sustainable leadership with Meyer and Allen's (1991) three-component model of organizational commitment. The analysis focuses on the alignment between leadership behaviors and factors fostering affective, continuance, and normative commitment.

Findings: The paper identifies that sustainable leadership can positively influence organizational commitment by creating a supportive work environment, enhancing trust, and fostering a sense of purpose. Leadership practices such as participatory decision-making, transparent communication, and long-term employee development contribute to building loyalty and reducing turnover.

Research limitations/implications: As a theoretical study, the paper does not include empirical validation. Future research should examine the relationship between sustainable leadership practices and organizational commitment through quantitative and qualitative methods. The need to explore sectoral differences and the impact of technological change is also emphasized.

Practical implications: The article provides practical guidance for managers and HR professionals aiming to increase employee retention and engagement. It highlights the importance of leadership strategies that balance economic, social, and environmental objectives in human resource management.

Social implications: Sustainable leadership may support employee well-being, foster ethical organizational cultures, and promote socially responsible practices. It can contribute to aligning organizational goals with societal and environmental expectations.

Originality/value: This paper offers a novel theoretical contribution by linking sustainable leadership with the multidimensional concept of organizational commitment. It provides a foundation for future empirical research and practical applications in leadership development and strategic HR management.

Keywords: organizational commitment; employee engagement; sustainable leadership; human resource management; sustainable leadership dimensions.

Category of the paper: conceptual paper, literature review.

1. Introduction

Contemporary enterprises operate in an exceptionally dynamic environment that requires leaders to remain flexible in fulfilling their responsibilities (Szewczyk, 2024). The growing diversity of employee needs, as well as changes in the generational structure of the workforce, are prompting organizations to seek new ways to strengthen organizational commitment (Pereira, 2023). Consequently, managers are increasingly turning to the concept of sustainable leadership, which encompasses not only economic but also social and environmental dimensions of organizational functioning (Meyer, Allen, 1991). This article presents key challenges faced by contemporary enterprises and their leaders, discusses the role of sustainable leadership in shaping organizational commitment, and provides examples of actions that may positively influence employee loyalty.

2. Contemporary Challenges Faced by Organizations and Their Leaders

Today's organizations operate in an environment characterized by an increasing pace of technological, social, and economic change (Urabniak et al., 2020). In this context, leaders play a crucial role in adapting to the changing reality. One of the key challenges remains maintaining a high level of employees' organizational commitment. Leaders who seek to attract and retain qualified personnel must create conditions conducive to task engagement and stimulate employee loyalty to the employer (Meyer, Allen, 1996; Hung, Huy, 2023).

Contemporary organizations often comprise members of up to four different generations, differing in leadership style preferences, attitudes toward work, and communication methods (Lewicka, 2017). Understanding the needs and values of different age groups supports synergy building and reduces the risk of conflict. As a result, leaders must demonstrate flexibility in their leadership approaches and be able to negotiate the expectations of individual teams to foster a healthy work environment.

A vital role is also played by the digital transformation associated with Industry 4.0, which has altered how enterprises operate (Poszytek, 2024). To implement innovations, leaders require not only technical competencies but also the ability to motivate and support their teams, fostering a sense of purpose in the changes being introduced (Cybal-Michalska, 2015).

Inadequate employee support during digital transformation may lead to frustration, resistance, and a decline in work engagement (Shahi, Sinha, 2021).

With the advancement of globalization and digitalization, sustainable leadership—seeking to integrate economic performance with social and environmental responsibility—gains increasing importance (Suriyankietkae, Avery, 2014). Developing such an approach is challenging but enables organizations to respond to stakeholder and market expectations. Applying sustainable leadership principles in daily practice requires ongoing balancing of diverse goals, often necessitating complex decision-making and adaptation of existing routines (Avery, Bergsteiner, 2011).

Another challenge is maintaining the consistency of organizational values. Discrepancies in norms and beliefs can lead to a decline in employees' commitment, workplace conflict, and diminished quality of work (Suriyankietkaew et al., 2022). Therefore, it becomes the leader's role to articulate and communicate a shared vision of action.

Dynamic technological processes, growing employee expectations toward leadership, and the need to balance business, social, and environmental objectives exemplify the complex environment in which today's organizations operate (Grześ, 2022). In this context, the appropriate selection of leadership practices and the cultivation of an organizational culture that allows each team member space for development become especially significant.

3. Characteristics of Sustainable Leadership

The literature emphasizes the need to develop a new approach to leadership in organizations. Scholars argue for moving away from perceiving leadership solely as a control function, and instead focusing on dialogue (Gerard et al., 2017). Within leadership studies, increasing attention is also being paid to organizational stakeholders, the relationships between leaders and subordinates, and the need to implement leadership practices aligned with the principles of sustainability (Armani et al., 2020). The concept of sustainable leadership assumes a departure from the traditional focus on financial outcomes in favor of recognizing that organizations are part of a broader environmental and social context, and that it is essential to adopt a long-term perspective on operations (Avery, Bergsteiner, 2011). Hargreaves and Fink (2003) highlight that the purpose of sustainable leadership is to meet the needs of today's society while also considering the needs of future generations. This approach stresses the responsibility of leaders to address sustainability-related challenges and to act regardless of their formal position within the organization. One of the most prominent frameworks, developed by Avery and Bergsteiner (2011), defines sustainable leadership as encompassing long-term decision-making, continuous innovation, nurturing a loyal workforce, delivering high-quality products and services, and balancing the well-being of people, profit,

and the environment. Such leadership is rooted in the broader social, cultural, and institutional context. The literature identifies three key dimensions of sustainable leadership, the main characteristics of which are presented in Table 1.

Table 1.
Characteristics of Sustainable Leadership Dimensions

Economical dimension	Social dimension	Environmental dimension
• focus on maximizing work efficiency, • use of performance metrics for both leaders and employees, • maintenance of internal organizational harmony, • attention to employees' awareness of goals and long-term consequences of their action.	• creating an optimal work environment, • implementing socially responsible business practices, • treating subordinates as autonomous individuals, • ensuring employee well-being, • supporting the development of subordinates, • building a positive organizational climate, • preventing and resolving conflicts.	• raising employees' awareness of environmental protection, • engaging leaders and employees in ecological initiatives, • conducting environmental education and training, • considering environmental well-being in organizational processes.

Source: own elaboration based on: Dillard et al. (2008); Kuhlman, Farrington (2010); Liao (2022); Juchnowicz et al. (2024).

Based on the information presented in Table 1, it can be inferred that sustainable leadership aims to engage a broad range of organizational stakeholders and defines success in multidimensional terms. It emphasizes a shift from an egocentric to a collective approach (Rehman et al., 2019). Leadership actions, which often involve organizational and process restructuring, require employee acceptance and an understanding of the long-term benefits of new ways of working (Suriyankietkaew, Avery, 2014). However, the new approach is oriented toward the well-being of employees and their environment, which makes it more likely to gain acceptance.

In summary, sustainable leaders are characterized by a holistic perspective that enables the creation of a supportive and inclusive work environment. This type of leadership may contribute to the long-term development of the organization and its stakeholders, while also addressing employee Turnover - often linked to a lack of organizational commitment.

4. Employees' Organizational Commitment

Organizational commitment can be defined as a force that binds employees to the organization and makes it more difficult for them to leave (Lewicka, 2017). It is associated with an individual's identification with the organization and its goals, as well as with loyalty (Aydin et al., 2011). Becker (1960) described commitment as a mechanism through which an employee invests time and gains skills, thereby reducing the desire to leave the organization. Another

definition was proposed by Mowday (1979), who characterized organizational commitment as an employee's personal involvement with and identification with the organization.

A breakthrough in the study of organizational commitment was the work of Meyer and Allen (1991), which examined its correlation with employee behavior. They distinguished three components of organizational commitment, each associated with a different psychological state and corresponding work behavior. The affective component is based on positive emotions and job satisfaction. The continuance component arises from a calculation of the costs of leaving the organization. The normative component reflects a sense of moral obligation an employee feels toward the organization.

The importance of maintaining a high level of organizational commitment among employees is reflected in the benefits it generates, as presented and described in Table 2.

Table 2.
Key Benefits Resulting from Employees' Organizational Commitment

Type of benefit	Impact on the organisation
Reduction in employee turnover and absenteeism	• reduced costs of recruitment, selection, and onboarding • teams stability • potential for long-term strategic actions
Increased productivity and work engagement	• motivation and operational efficiency • performance beyond standard expectations • employees' concern for successful task completion
Higher quality of interpersonal relationships among employees	• improved workplace atmosphere • high-quality teamwork and collaboration • adherence to high work standards
Better adaptation to organizational change	• quick acceptance of new strategies and processes • reduced risk of conflicts • greater resilience to the negative effects of change
Stronger identification with organizational goals	• alignment of individual goals with the organization's mission • lower risk of employee–organization conflicts • high level of work engagement
Enhanced organizational reputation	• improved organizational image • attraction of new talent • fulfillment of employees' need for belonging and recognition
Increased customer loyalty	• improved customer relations, • maintenance of long-term client relationships
Higher level of innovativeness	• employee creativity • search for more effective work methods • ongoing process improvement
Job satisfaction	• higher quality of work and organizational culture • greater involvement in organizational life • reduction of occupational burnout

Source: own elaboration based on: Bańka et al. (2002); Lewicka (2017); Gigol, Grabarska (2024); Opolot et al. (2024).

Shaping employees' organizational commitment in the context of today's labor market is challenging but also critically important for effective human resource management and business development. Research findings emphasize its link to employee satisfaction and performance. A lack of effort in building employee commitment, on the other hand, facilitates the decision to leave the organization (Jalowska, 2015). It is essential to note that properly implemented

management practices lead to increased trust in both the leader and the organization, which translates into employee attitudes such as loyalty and engagement (Galpin, Whittington, 2012). This requires organizations and their leaders to undertake internal restructuring efforts and to update the role and methods of leadership implementation.

5. Identifying the Role and Key Actions of Sustainable Leaders in Building Employees' Organizational Commitment

The increasing complexity of the competitive environment makes simple motivational mechanisms insufficient to strengthen employees' organizational commitment. In this context, the leader's role becomes crucial (Knap-Stefaniuk, 2020). The literature highlights the diversity of leadership styles and the specific demands placed on leaders who aim to achieve economic, social, and environmental goals simultaneously. Leadership actions should foster a work environment that supports employees (Avery, Bergsteiner, 2011).

From the perspective of building organizational commitment, it is important to note that excessive pressure and overburdening of employees may, in the long run, result in decreased engagement, higher stress levels, and diminished motivation (Mockało, 2011). On the other hand, an overemphasis on relational aspects, while neglecting control mechanisms, may hinder the maintenance of discipline and a clear division of responsibilities (Agarwal, 2020).

Sustainable leadership, by design, seeks to integrate the strengths of various leadership styles in a way that supports the achievement of strategic objectives, while also nurturing human capital and the organization's broader environment. As previously discussed, sustainable leadership involves balancing individual and collective interests, building a long-term vision, demonstrating sensitivity to employee needs, and fostering loyalty (Avery, Bergsteiner, 2011). In this context, Table 3 presents examples of sustainable leadership actions that support the development of strong relationships between the organization and its members and contribute to building organizational commitment.

Table 3.
Sustainable Leadership Actions Supporting Organizational Commitment

Sustainable Leadership Action	Expected Outcome
long-term development vision	fostering a sense of stability and purpose
sustainable employee development	engagement in multidimensional organizational development and a sense of belonging
participatory decision-making	increased motivation and identification with the organization
transparent communication	building trust and strengthening relationships
support for work flexibility	enhanced satisfaction and loyalty
support for organizational identification	sense of pride in one's work
employee competence development	preparation for promotion and increased employee competitiveness in the labor market

Source: own elaboration based on: Avery, Bergsteiner (2011); Pec, Lewicka (2022).

The actions presented in Table 3 can contribute to the systematic strengthening of employee commitment, as they support the development of organizational culture, foster a sense of purpose in one's work, and provide opportunities for growth and quality relationships with supervisors (Meyer, Allen, 1996). As a result, employees develop a sense of connection with the values promoted by the organization.

A sustainable leader thus plays a key role in shaping a culture oriented toward long-term outcomes, team potential development, and employee involvement in shaping a better future. In the era of dynamic socio-economic change, addressing employee needs allows not only for achieving stable financial results, but also for building lasting relationships characterized by high levels of loyalty (Suriyankietkaew, Avery, 2014; Opolot et al., 2024).

Sustainable leadership is therefore gaining increasing significance both in the practice of personnel management and in the research domain, offering a promising response to the need to reconcile diverse interests within a single organization.

6. Summary

In the context of increasing competition and dynamic market changes, the ability to build lasting relationships with employees is becoming a key factor in organizational success. Nurturing employee commitment, strengthening their identification with organizational goals, and creating a work environment that supports job satisfaction are elements that can significantly influence long-term organizational effectiveness. Striking a balance between economic, social, and environmental dimensions proves essential in fostering enduring employee loyalty. Implementing sustainable leadership within an organization emerges as a promising approach to holistically supporting human capital.

Future research should focus on empirically verifying the impact of specific sustainable leadership practices on the components of organizational commitment: affective, normative, and continuance. It is also advisable to explore the practical aspects of implementing sustainable leadership in the context of digital transformation, increasing employee mobility, and generational diversity. Such an approach may contribute to a better understanding of the mechanisms that support long-term employee–organization relationships and to the development of more resilient and adaptive leadership models.

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UKRAINE'S TRANSPORT INFRASTRUCTURE IN THE FACE OF WAR – THE CONTEXT OF THE FINANCIAL CHALLENGES OF RECONSTRUCTION

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Purpose: The aim of this article is to analyze and assess the impact of Russian aggression on Ukraine's transportation infrastructure and to identify the financial challenges of its reconstruction.

Design/methodology/approach: The article outlines the extent of damage to Ukraine's transport infrastructure caused by ongoing warfare. Within the context of rebuilding and restoring transportation services, it discusses the financial burdens faced by the Ukrainian population. The study is based on an analysis of secondary data.

Findings: The cost of rebuilding Ukraine's transport sector is estimated at nearly \$74 billion, representing about 15% of the total funds needed to revitalize the war-damaged economy. This figure underscores the scale of the financial challenges confronting the country.

Research limitations/implications: Due to space limitations, the article focuses only on war-related damage and reconstruction needs. It does not include a full account of the transport sector's broader economic role. Future studies should examine international cooperation mechanisms and support instruments, as well as wartime adaptation measures across transport sectors and the territorial distribution of infrastructure damage. All cited sources emphasize that current data are incomplete and that the extent of damage remains an estimate, particularly in areas outside government control.

Social and Practical Implications: The findings highlight the urgent need for major financial investment in Ukraine's transport infrastructure. The destruction surpasses the state's financial capacity, necessitating international support both in the short and long term. Reconstruction should follow the "build back better" principle, ensuring higher standards than pre-war infrastructure. Such efforts will enhance mobility, economic activity, and recovery, ultimately improving citizens' quality of life, reinforcing national security, and advancing EU integration.

Originality/value: This article contributes to the existing body of knowledge by offering a structured analysis of the damage to Ukraine's transport infrastructure based on current and reliable data. It identifies key investment priorities and is particularly relevant to policymakers, international donors, and researchers engaged in post-war reconstruction.

Keywords: Ukrainian transport infrastructure, losses and damages to Ukraine's transport infrastructure, needs for the rebuilding and reconstruction of Ukraine's transport infrastructure, service delivery restoration needs.

Category of the paper: Research paper.

1. Introduction

Transport infrastructure is a subsystem of the transport system. In the context of economics, the development of transport infrastructure is of critical importance in ensuring the stability and continuous economic growth of a nation. In the event of armed conflict, the continued functioning of transport infrastructure assumes even greater significance. It is a prerequisite for the maintenance of daily life, the facilitation of economic development, and the assurance of national security.

Consequently, the transport sector must maintain its capacity to facilitate population mobility, ensure the delivery of food and goods, and support military logistics and humanitarian aid operations.

The present study is undertaken to analyse and assess the impact of Russian aggression on Ukraine's transport infrastructure, and to identify the financial challenges associated with its reconstruction.

The paper focuses on the significance of the transport sector in Ukraine, the magnitude of damages and losses in transport infrastructure, its current condition, looks at some essential requirements for rebuilding and reconstruction as well as the demand for restoration of service delivery.

The originality of the publication lies in its provision of a detailed and organized analysis of the damage to transport infrastructure in Ukraine, developed and based on a comprehensive set of reliable and up-to-date data. The presented estimates and forecasts provide insight into the financial prerequisites associated with the rebuilding of the studied infrastructure.

The work is of significance for a range of stakeholders, including decision-makers, international donors and economic planners. Firstly, it highlights the multifaceted challenges Ukraine faces. Secondly, it identifies the most damaged sectors of transport infrastructure. Thirdly, it provides guidance on priority areas for investment in the rebuilding process. This is crucial for developing practical and effective reconstruction strategies.

By emphasising the necessity for international cooperation and the role of external financial support, the article contributes to ongoing discussions in the international political circles regarding the importance of somehow coordinated international assistance in post-war reconstruction processes.

2. Selection of Variables for the Study and Description of Research Methods

The paper provides a detailed description of the scale of war-related damage to Ukraine's transport infrastructure. It identifies the challenges associated with the reconstruction of this infrastructure from a financial perspective. The estimated costs are presented in both short- and long-term terms, categorized by various types of transport infrastructure. The research section of the paper is based on secondary sources. During the analysis, the most up-to-date and reliable data from 2022-2023 were used, sourced from the OECD, the Ukrainian Statistical Office, the Statista research platform, KSE, and the Ukrainian Ministry of Economic Development.

The primary sources from which comprehensive information on the damages was obtained include reports and databases from the World Bank.

The research involved calculating the dynamics of phenomena, determining percentages, and sorting objects according to specific characteristics.

For the purposes of this paper, due to the multifaceted nature of the issues arising from the war and the availability of data, the concept of transport infrastructure was narrowed down to transport networks and infrastructure objects in Ukraine. The term "challenges" was used to refer to the financial needs for the reconstruction of the infrastructure under discussion.

3. Results

3.1. The Significance of the Transport Sector in Ukraine

Ukraine is a transit country between Europe and Asia. It is situated at the convergence of major trans-European corridors that connect Eastern Europe with Western Europe, as well as the Baltic states with the Black Sea. The country's extensive transport infrastructure network [1] results from its expansive territory and the distribution of its population [2] (World Bank).

Transport is a significant sector of Ukraine's economy, accounting for 5.4% of the country's Gross Domestic Product (GDP) in 2021. This figure places it as the seventh largest sector in terms of its share of GDP [3]. The institution responsible for managing Ukraine's transport sector is the Ministry of Infrastructure. Auxiliary ministries, in conjunction with municipal governments, constitute executive bodies. Authorities and state-owned enterprises under the jurisdiction of the Ministry of Infrastructure are responsible for the provision of services, the execution of investments, and the management of assets (World Bank).

In 2021, Ukraine's transport networks included more than 164,275 kilometres of roads, including nearly 47,000 kilometres of highways (OECD). The area covered by bridges on national roads was approximately 18 million square meters, whereas on local roads,

it was almost 11 million. The railway network in Ukraine comprised approximately 1500 stations. The total length of the railway lines was 19,731 kilometres, of which more than 9000 kilometres were electrified (data-explorer.oecd.org). The entity responsible for managing Ukraine's railway infrastructure is the state-owned company Ukrzaliznytsia, which prior to the war employed 266,000 people and controlled 82% of freight transport (primarily metals, coal, iron ore, and construction materials) and 50% of passenger transport (Aebi, Hauri, Kambarage, 2024, p. 22).

In 2021, Ukraine had 25 airports (World Bank). The presence of passenger airlines was documented in twenty-one instances, while nineteen were designated as cargo and mail airlines (Aebi, Hauri, Kambarage, 2024, p. 22).

Airports were located in all oblast cities. The most significant in terms of international flights was Boryspil International Airport in Kyiv.

Other airports, the development of which was linked to the economic activities of cities, tourism, or labour migration, such as Zhuliany Airport in Kyiv and the airports in Odessa, Kharkiv, Dnipro, Lviv, Zaporizhzhia, Ivano-Frankivsk, Kryvyi Rih, Uzhhorod, Mariupol, Chernivtsi, and Rivne, were designated as international airports but mainly handled domestic traffic (PAIH S.A., 2021).

The responsibility for state policy in the field of airport infrastructure fell to the Ministry of Infrastructure, whereas the State Aviation Administration of Ukraine was the body charged with the supervision of civil aviation.

Ukraine had 13 seaports, including five ports: Kerch, Yalta, Sevastopol, Feodosia, and Yevpatoria, which were located on the territory of Crimea and had been occupied by Russia since 2014. In addition to those forementioned, there are 16 river ports, four navigable rivers (the Danube, the Dnieper, the Southern Bug and the Dniester, of which the Danube and Dnieper are among the longest rivers in Europe), with 1888 kilometres of navigable inland waterways. (World Bank).

It is evident that Ukrainian ports are state-owned. The primary governing body for these ports is the Ministry of Infrastructure of Ukraine, which exercises oversight of the Ukrainian Sea Ports Authority (USPA), an organisation established in 2013. The scope of the USPA encompasses the management of operational activities within Ukrainian ports, the responsibility for dredging riverbeds and bays where the ports are located, and the distribution of profits from these ports, with the subsequent investment of these profits in infrastructure projects (Radchenko et al., 2022, p. 11).

Seaports located on the continental territory of Ukraine, along the coastlines of the Black Sea and the Sea of Azov, included deep-water ports such as Mykolaiv, as well as three ports in the Odessa region—Odessa, Chernomorsk, and Yuzhny—that collectively handled approximately 60% of the total cargo volume. Other ports included the specialised seaport in Olvia, Berdiansk, Mariupol, Kherson, Skadovsk, as well as ports in the Danube Delta: Izmail, Reni, and the Ust-Dunaisk Commercial Seaport, along with Bilhorod-Dnistrovskyi. Prior to the

Russian invasion, 35,000 individuals were employed in these seaports. The port capacity was 62 million tons per year (Radchenko et al., 2022, p. 11).

The public transport fleet of major cities in Ukraine consists of metro systems, trolleybuses, trams, public buses, and private local buses known as "marshrutkas" (World Bank). In 2021, the public urban transport fleet consisted of approximately 81,000 vehicles. At the same time, there were 11 million registered private cars in Ukraine [4] (World Bank; OECD).

Ukrainian transport also includes the pipeline industry, which consists of the oil transport system, the gas transport system, and underground gas storage networks. Prior to 2020, the length of the oil transport system was approximately 4800 kilometres, with an input capacity of 114 million tons per year and an output capacity of 56.3 million tons per year (PAIH S.A., 2021).

Ukraine's gas transport system was the second largest in Europe. The total length of gas pipelines in Ukraine was estimated to be almost 40,000 kilometres, including 23,000 kilometres of trunk pipelines. The estimated input capacity of the pipelines was 290 billion cubic metres per year, while the output capacity was estimated at 175 billion cubic metres per year.

The gas transportation system, through direct connections to pipeline systems in Russia, Poland, Belarus, Slovakia, Hungary, and Romania, was integrated into the pan-European gas network (PAIH S.A., 2021).

Ukraine's gas storage networks are not only among the largest underground gas storage facilities in Europe, but they were also a crucial technological component of the transportation system, ensuring the reliability of Ukrainian gas supplies to domestic consumers and the transit of Russian gas to European countries.

The total active capacity of the thirteen underground gas storage facilities in Ukraine amounts to 32 billion cubic metres. Filling the tanks only halfway to secure domestic needs has enabled the rental of these facilities to customers across Europe (PAIH S.A., 2021).

Analysing the structure of passenger transport in Ukraine in 2021 (Figure 1), the dominant modes of transport were road and air transport.

Prior to the war, air transport (primarily facilitated by transit fees amounting to \$149 million) played a significant role in tourism and supply chain logistics, contributing approximately 1.1% to Ukraine's GDP (World Bank). Air transport in Ukraine has experienced a consistent annual increase in passenger numbers. However, in 2020, the global pandemic caused a significant decline of nearly 70% in air traffic (World Bank).

Rail transport also played the significant role. Waterway passenger transport accounted for 2% of total passenger transport. Taking 2014 as the base year, when the war in Ukraine began, it was observed that passenger transport using the examined modes, excluding air travel, systematically declined.

When considering population transport, it is noteworthy that in 2021, electric public transport in Ukraine carried 1.475 billion passengers [5]. Of these, 40% utilised trolleybuses, 33% employed the metro, and 27% opted for trams [6] (The Ukrainian Statistical Office).

Buses were the most popular public transport mode in Ukraine prior to 2022. In 2020, urban bus passengers accounted for over 43% of all public transport passengers. Concurrently, trolleybus services accounted for over 23% of public transport usage, while tram services accounted for nearly 17% (Statista).

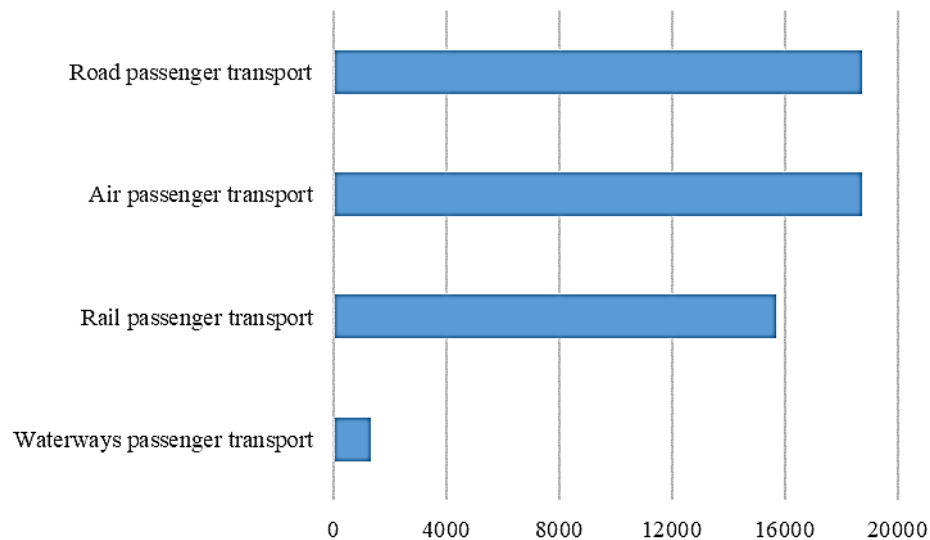


Figure 1. Passenger Traffic in Ukraine in 2021 [in million passenger kilometres].

Source: Own elaboration based on OECD data.

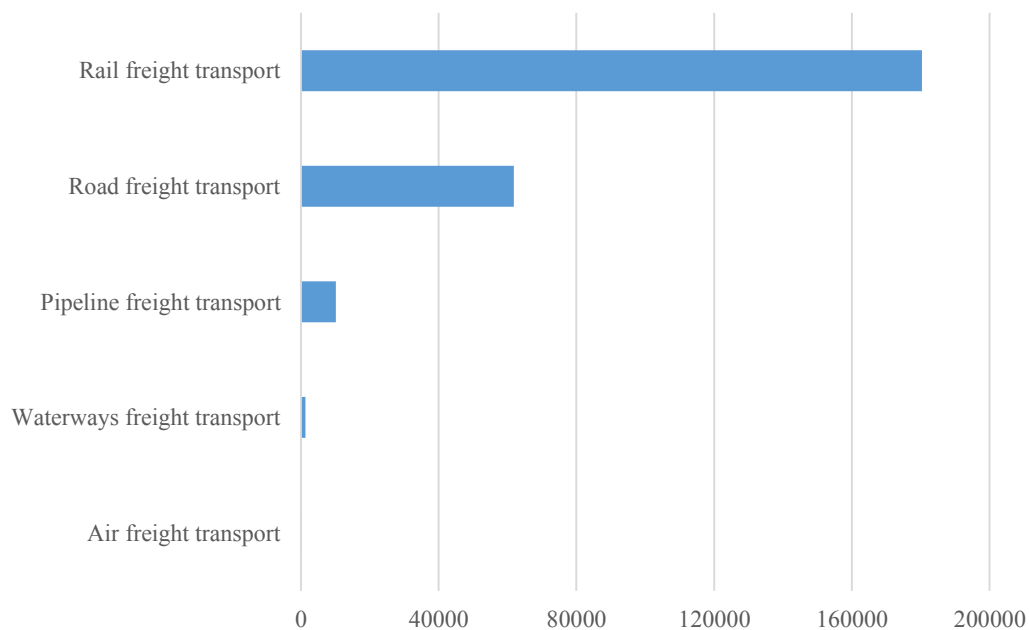


Figure 2. Freight Transport in Ukraine in 2021 [in million ton-kilometres].

Source: Own elaboration based on OECD data.

In the structure of freight transport in Ukraine in 2021 (Figure 2), rail transport played a dominant role. Conversely, air transport had the smallest share. In the context of road freight transport, the predominant form was hire and reward transport, accounting for 77% of all shipments, with an average annual growth rate of 3.4% between 2014 and 2021 (OECD, 2025). The second most important type of road transport was own-account transport, which accounted for more than 14 billion tonne-kilometres in the year analysed. As in the previous data, there has been a decline in the volume of goods transported since 2014. With the exception of 2015, road transport was the only sector to show consistent growth, with an average annual growth rate of 1.4%.

In the export of cargo using waterway freight transport, grains and iron ore emerged as the predominant cargoes in exports, while coal dominated imports (PAIH S.A., 2021).

4. Impact of the War on Ukraine's Transport Infrastructure

Ukraine has been suffering war-related losses since 2014, when Russia began its occupation and subsequently annexed Crimea and part of the territory in eastern Ukraine. As a result of the Russian military invasion of Ukraine in 2022, the largest damage to transport infrastructure occurred in the eastern and southern parts of Ukraine, which were occupied by Russian forces. The estimated area affected by military actions throughout 2022 was about 15% of Ukraine's territory.

The damages are caused by: military operations, road and bridge overloads due to military equipment and supply convoys, as well as temporary repairs to infrastructure. At the same time, all of Ukraine remains constantly exposed to missile attacks and electricity supply problems (World Bank).

Figure 3 illustrates the financial implications of the damage to Ukraine's infrastructure resulting from military operations, categorised by sector, from 24 February 2022 to 31 December 2023.

While the total war-related damage to Ukraine's infrastructure was estimated at nearly USD 152 billion, damage to the transport sector was valued at USD 33,623.3 million, accounting for 22% of the total damage, placing transport in second place in the ordering of sectors by war damage in Ukraine.

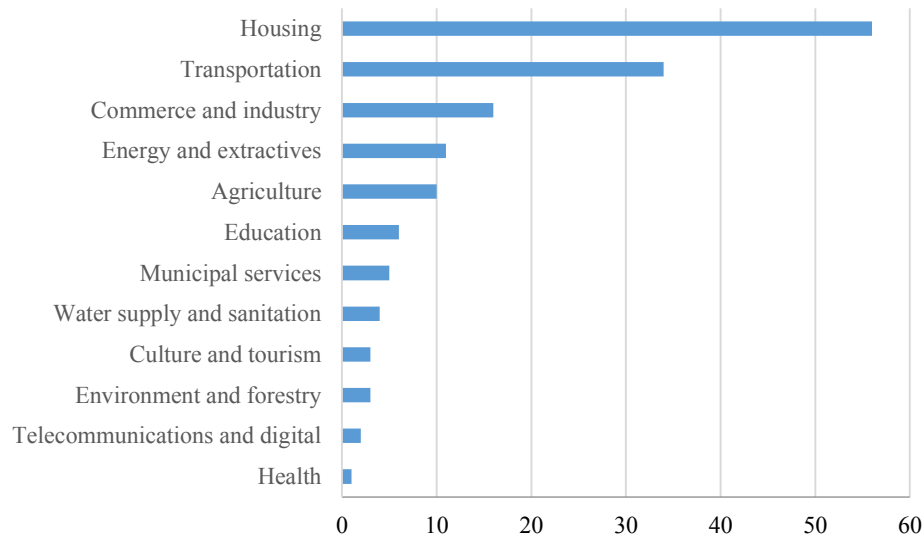


Figure 3. Estimated War Damage to Ukraine's Infrastructure in 2022-2023, by Sector [in billion USD].

Source: Own elaboration based on World Bank data.

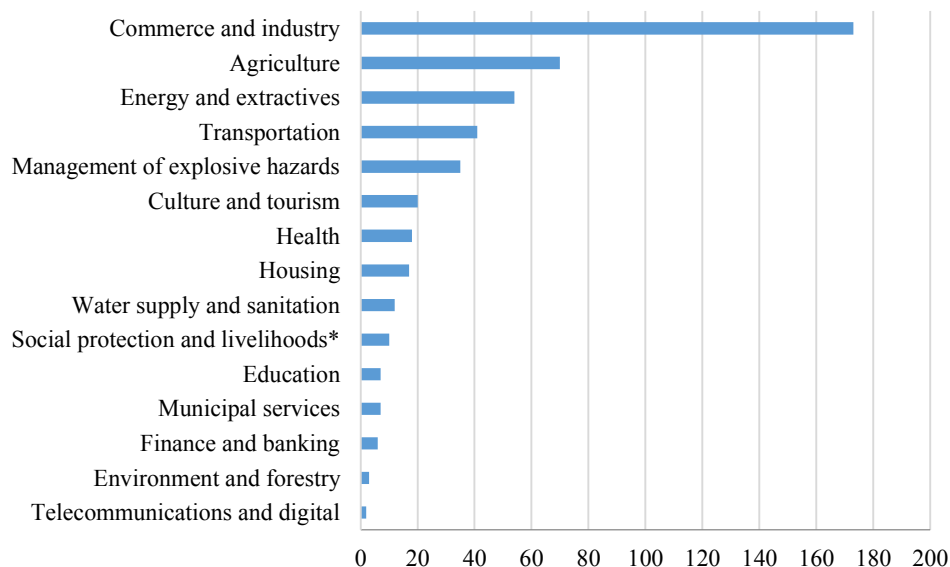


Figure 4. Estimated war losses in Ukraine's infrastructure from February 24, 2022, to December 31, 2023 [in billion USD].

Source: Own elaboration based on World Bank data.

During the same period, the losses, defined as the loss of income, for Ukraine's transport sector were estimated at \$40,678 million USD, accounting for 8% of the total economic, social, and other financial losses incurred during the analysed period of the war across all sectors of Ukraine's economy [7]. In this comparison, transport was the fourth most affected sector of the economy in Ukraine (Figure 4).

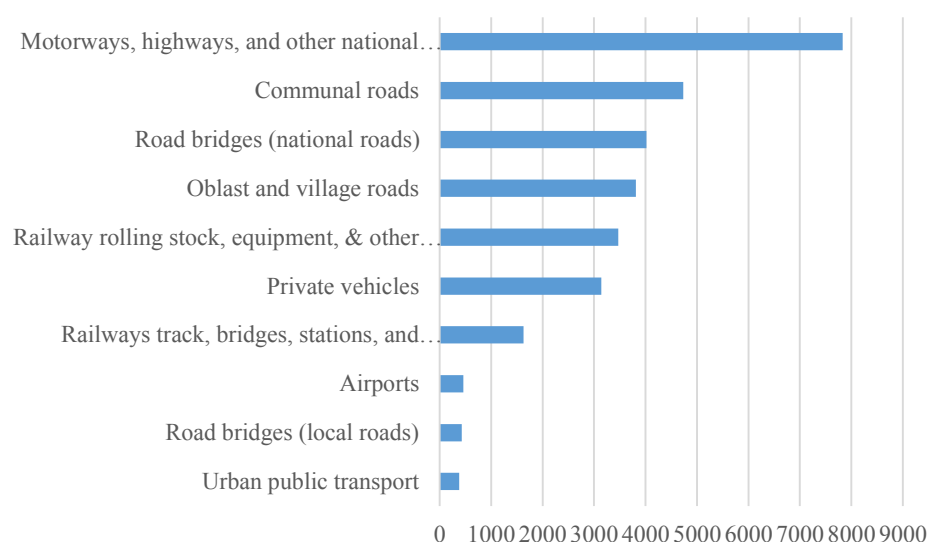


Figure 5. Damages by Asset Category as of June 1, 2022 [in million USD].

Source: Own elaboration based on World Bank data.

Based on data published by the World Bank, the transport sector assets of Ukraine were also organised by the value of damages recorded (Figure 5). As of June 1, 2022, the largest damages, estimated at nearly USD 8 billion, were attributed to highways, expressways, and other national roads. This accounted for 26% of the total damage to Ukraine's transport infrastructure and covered 8699 kilometres, or approximately 19% of highways, expressways, and other national roads.

The second most damaged category was local roads, with nearly 9500 kilometres of the roads destroyed, resulting in losses exceeding USD 4.7 billion.

Subsequent positions in the ranking of damages included road bridges on national roads (13% of the financial losses and 17% in infrastructure for this category of bridges), regional and rural roads (13% and 9%, respectively), railway rolling stock (12% of the total losses), and private vehicles (11% and 4% – nearly 400,000 of the 11 million registered vehicles were destroyed).

Railway tracks, bridges, stations, and electrical installations (including 1119 kilometres of railway lines, 93 railway stations, and more than 63,000 square metres of railway bridges) were also severely affected.

It should be noted that initially, railway infrastructure was not targeted, as it was essential for military logistics. Damages occurred more as collateral damage, primarily due to ongoing combat operations.

In urban transport, the greatest damage occurred in areas that experienced heavy fighting. The damage is estimated at USD 381 million, but this figure is likely underestimated (World Bank).

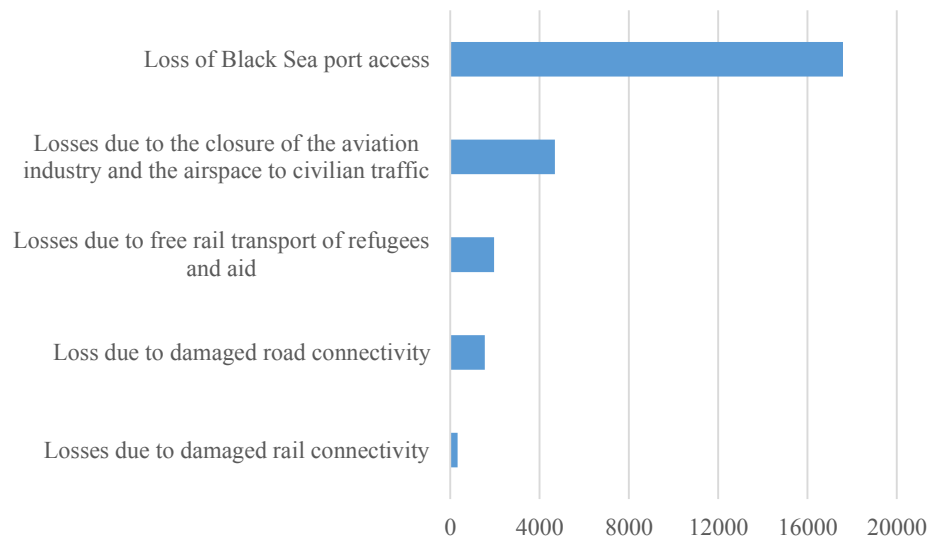


Figure 6. Losses by category [in million USD].

Source: Own elaboration based on World Bank data.

Figure 6 presents, based on data from the World Bank as of June 1, 2022, the ranking of Ukrainian transport sector losses, starting from the most significant. The losses are determined based on the loss of revenues due to the following factors: the lack of access to the Black Sea caused by the blockade of ports [8], aviation revenue losses due to the closure of the industry and airspace for civil aviation, free railway transport for refugees, and the destruction of road and railway infrastructure.

A comparable evaluation of damages and losses, as of June 2023, was conducted by KSE. This report estimated damages to transport at nearly \$37 billion, with losses amounting to over \$23 billion. These figures include damages in areas under Ukrainian control, affecting 19 civilian and military airports, as well as blockades or seizures of seaports, 507 kilometres of disrupted railway lines, over 25,000 kilometres of damaged public roads, and more than 340 dysfunctional bridges. The estimated damages to transport vehicles amounted to \$3.1 billion, with losses amounting to \$300 million (KSE, 2023).

5. An Evaluation of the State of Ukraine's Transport Infrastructure

According to the definition provided in the Polish Language Dictionary, the term "challenge" refers to: "a difficult task, a new situation... serving as a test of someone's... resilience" (Doroszewski, 2000).

Even prior to the escalation of the conflict in 2022, users of Ukraine's transport system encountered numerous challenges. The condition of Ukraine's transport infrastructure had not been rated highly [9].

Based on an assessment conducted in 2016 on 20,760 km of international, national and regional road network, 46% of roads were rated as satisfactory, 38% as moderate and 17% as unsatisfactory (World Bank).

In the 2021 WCY [10], a study encompassing 64 countries, Ukraine attained the 54th position in the transport infrastructure category, signifying a notably substandard evaluation (Radchenko et al., 2022, p. 8).

It is also possible to identify problems in other areas.

A persistent challenge in Ukraine is the width of the tracks (1520 mm), which does not align with the European standard (1435 mm). Additionally, the capacity of border crossings was limited to 50% of their potential efficiency before the war due to the need for wheelset replacement in wagons. Furthermore, it should be noted that only half of the railway system is electrified, with approximately 9000 kilometres out of 19,700 kilometres being affected. In the context of inland ports, a persistent challenge pertains to seasonal river shallowing.

Moreover, it is estimated that more than 51% of roads are considered problematic. A significant proportion of these roads, approximately 90%, had not undergone repairs for a period of 30 years.

The average service life of the over 28,000 bridges in Ukraine exceeds 60 years, with more than 30% of these bridges in critical condition (Aebi, Hauri, Kambarage, 2024, p. 22).

Concurrently, alongside already existing challenges, the new ones are emerging. Nearly 40% of Ukraine's roads still features poor durability due to the damaged surface.

The electrified portion of the railway system requires a constant supply of electricity, which is currently scarce due to the war.

Currently, both sides of the conflict deliberately destroy transport infrastructure to hinder the logistics operations of the opposing side, and retreating military forces engage in looting of movable property. Another issue is unexploded ordnance and mined areas and facilities (Human Rights Watch, 2025).

6. The Most Crucial Reconstruction Requirements

The Ukrainian sectors of the economy have been ranked according to the size of the reconstruction needs, as determined by the estimates conducted by the World Bank evaluation team (Figure 7). The analysis revealed that the transport sector is the second-largest recipient of resources. The total estimated costs for the restoration of Ukraine's transport sector amount to nearly 74 billion USD, accounting for 15% of the total funds estimated to be required between 2024 and 2033 for the reconstruction of the war-damaged economy.

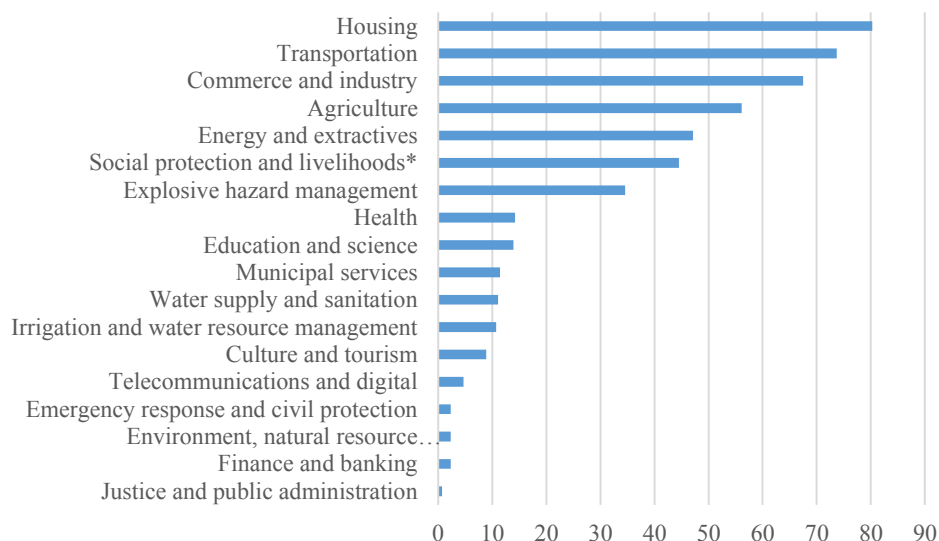


Figure 7. Total Estimated Needs for the Reconstruction of Ukraine 2024 - 2033 by Sector [in billion USD].

Source: Own elaboration based on the World Bank data.

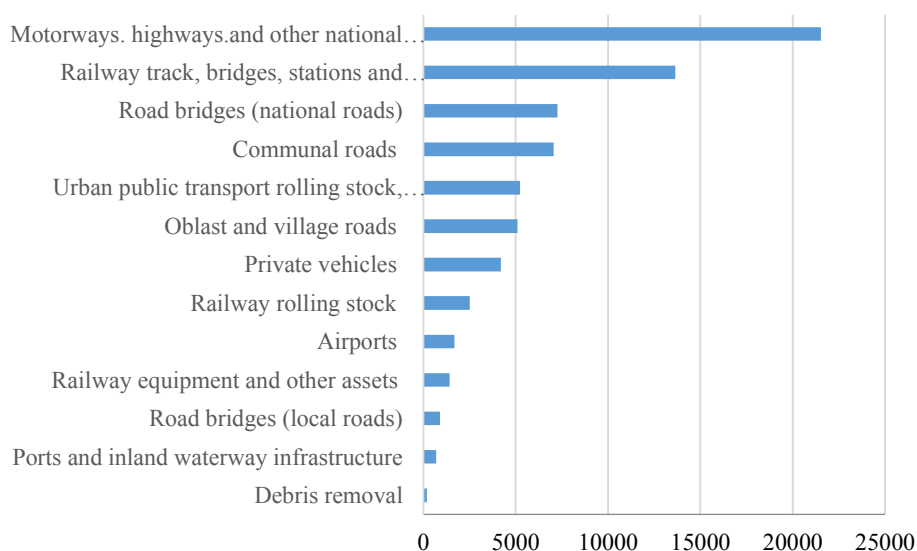


Figure 8. Recovery and Reconstruction Needs of Ukraine's Transport Infrastructure as of February 24, 2023 [in million USD].

Source: Own elaboration based on World Bank data.

A detailed classification of the recovery needs for transport infrastructure is shown in Figure 8. Among the thirteen categories listed, the most demanding in terms of investment—over 30% of the total funds required for reconstruction—are highways, expressways, and other national roads.

Another significant item in the list is railway tracks, bridges, stations, and electrical installations (over 19%). Road bridges on national roads and municipal roads require reconstruction investments at a similar level of approximately \$7 billion USD, which accounts for about 10% of the expenditures. Further down, in 5th, 6th, and 7th place there are: urban

public transport, rolling stock, depots, and maintenance infrastructure (7.3%), ring roads and rural roads (7.1%), and private vehicles (5.9%). The next categories in the ranking, from 3.5% to 1%, will include: 8. railway rolling stock, 9. airports, 10. railway equipment and other assets, and 11. road bridges on local roads. The needs of the last category – ports and inland waterways infrastructure – are estimated at nearly \$190 million USD, which accounts for 0.3% of the total expenditures for the reconstruction of Ukraine's transport resources.

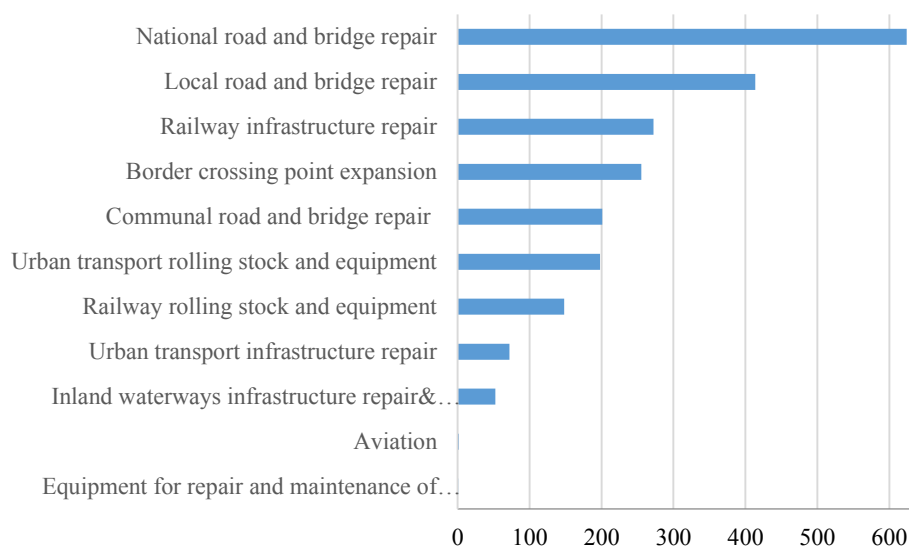


Figure 9. Service Delivery Restoration Needs as of February 24, 2023 [in million USD].

Source: Own elaboration based on World Bank data.

Additionally, Figure 9 ranks the service restoration needs of transport, which was identified as a priority for the rebuilding and reconstruction of Ukraine's infrastructure in 2024. As of February 24, 2023, total expenses in this area were estimated at USD 2239.7 million (World Bank). The categories requiring the most urgent and largest investments were the repair of national and local roads and bridges, which together accounted for over 46% of the needs. Following these were repairs to railway infrastructure (3rd position) and the expansion of border crossings (4th place), the repair of communal roads and bridges (5th place), rolling stock and urban transport equipment (6th place), and railway rolling stock along with equipment (7th place). The lowest-ranking expenditures, ranging from \$40,000 to \$72 million USD, are allocated for the repair of urban transport infrastructure, inland waterways with the expansion of the Danube port, aviation, and equipment for the repair and maintenance of national and regional roads and bridges.

7. Discussion and Summary

The present article sought to ascertain and evaluate the repercussions of the war on Ukraine's transport infrastructure, in addition to the requisite expenditures for the reconstruction of the aforementioned infrastructure. The objective was achieved by utilising the most up-to-date available secondary sources, including data and reports from the World Bank, OECD, KSE, the Ukrainian Statistical Office, and the Statista research platform. The paper discusses the significance of the transport sector in Ukraine, presents the magnitude of damage and losses in transport infrastructure, assesses its condition, and examines the crucial recovery and reconstruction needs, as well as the service delivery restoration needs.

According to estimates as of June 2022, the most damaged roads were highways, expressways, and other national roads, as well as many other local roads. The war damage in these two categories generated almost 42% of the total damage to Ukraine's transport infrastructure.

In 2023, when Ukraine's GDP was just under USD 180 billion, the amount needed to rebuild Ukraine's transport sector was estimated to be almost USD 74 billion, or about 41.4% of Ukraine's GDP in 2023 [11].

For comparison, in 2022, Ukraine's projected budget revenues were over 46 billion USD, while expenditures were more than 52 billion USD.

Short-term transport infrastructure needs have been estimated at nearly \$2.24 billion. Addressing these needs is critical in the context of the ongoing conflict. However, long- and medium-term infrastructure investment must also be considered. Those requirements have been estimated at almost USD 71.5 billion. Meeting them is expected to accelerate Ukraine's reconstruction process, strengthen its integration with the European Union, and contribute to further economic recovery.

Admittedly, the available data are estimates, so they are subject to error. However, in a situation of persistent information shortages, when, due to the ongoing armed conflict, restrictions are imposed that limit the disclosure of data, including statistical data, every piece of knowledge helps mitigate the risk of making wrong decisions. Orienting oneself to the level of losses, one can try to estimate the size of the needs so as to be able to take on the next challenge, this time of rebuilding the damage.

All amounts analysed in the article indicate the vast scope of financial needs that Ukraine faces. The reconstruction of Ukraine's transport infrastructure will be a major challenge, requiring not only significant financial investments but also strategic planning, the swift implementation of corrective actions, and, of course, international support and coordination of assistance throughout the process [12]. These areas represent promising directions for future research.

From a scientific perspective, it is also noteworthy to ascertain the impact of the war on the state of transport infrastructure in the regional division of Ukraine. Furthermore, a comprehensive description of the corrective measures implemented in various transport sectors to adapt to the wartime situation is of interest. A detailed review of extant global literature should be a subject of separate analyses.

Poland, as the closest contiguous state that has repeatedly supported Ukraine during the war, plays a key role, both due to its geopolitical proximity and previous commitments to provide support. Consequently, Poland leveraging its experience and resources, should actively participate in the reconstruction of Ukraine's transport infrastructure.

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Footnotes

1. In terms of area, Ukraine is the largest country located entirely on the European continent, covering over 603,000 square kilometres. The meridional span of Ukraine is 1300 kilometres, and its latitudinal span is 900 kilometres.
2. In 2021, Ukraine's population exceeded 41.5 million (The Ukrainian Statistical Office. Retrieved from: <https://stat.gov.ua>, 29.01.2025).
3. In 2021, the share of transport and warehousing in Poland's GDP was 5.7% (GUS, 2024, pp. 664-665).
4. Concurrently, analogous metrics in Poland were as follows: 429,816 kilometres of roads, including 1761 kilometres of highways, 19,326 kilometres of railway lines (of which 12,137 kilometres were electrified), 15 fully certified public airports meeting European Commission standards, 34 seaports, and 3768 kilometres of navigable inland waterways, over 16,000 urban public transport vehicles, and nearly 26 million private cars (GUS, 2022, pp. 542, 548, 555).
5. At that time, about 70% of Ukraine's population lived in cities (compared to 60% in Poland), of which five cities had around one million inhabitants, four between 500,000 and one million, and fifteen between 500,000 and 250,000.
6. In Poland, 2,617,926 passengers were transported by public transport during the same period, including 3083 by metro (GUS, 2022, pp. 546, 548).
7. Total losses across all economic sectors are estimated at nearly 499 billion USD (World Bank. Retrieved from: [https:// documents1.worldbank.org](https://documents1.worldbank.org), 16.02.2025).
8. In 2021, Ukraine accounted for 34.2% of all loaded containers in the Black Sea region. In 2022, as a result of the war, this figure dropped to 7% (Statista. Retrieved from: <https://statista.com>, 19.01.2025).
9. For instance (Radchenko et al., 2022, p. 8), and the Works of the Commission on Transport Geography (Radchenko et al., 2022, p. 13).
10. IMD World Competitiveness Yearbook (WCY) is an annual report on the competitiveness of countries, comparing the performance of 64 countries based on over 330 characteristics that describe the competitiveness of the economy (IMD World Competitiveness Centre. Retrieved from: [http:// www.imd.org](http://www.imd.org), 30.01.2025). This decline can be attributed to the loss of access to seaports in Mariupol and Berdiansk, as well as the closure of ports in Mykolaiv and Kherson for security reasons. Consequently, Ukraine's ports were only able to handle 24.4% of the cargo mass compared to 2021 (Sędzimir, 2022).
11. According to the most recent data published as of December 31, 2024, this amount has increased to \$77.5 billion (World Bank. Retrieved from: <https://documents1.worldbank.org>, 13.03.2025).

12. A specific coordination mechanism, termed the International Transport Forum - Ukraine Common Interest Group, has been established within the OECD to oversee the coordination of international support for the reconstruction of transport infrastructure in Ukraine (the International Transport Forum, Retrieved from: www.itf-oecd.org, 08.04.2025).

SMART CITIES, SMART GOVERNANCE: THE ROLE OF COMMUNICATION AND SOCIAL PARTICIPATION IN BUILDING CITIES OF THE FUTURE

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Purpose: The article aims to determine the role of communication and social participation in implementing the concept of smart governance in smart cities. The article considers how modern communication tools and citizen engagement strategies affect the efficiency of urban governance, sustainability and residents' trust in public institutions.

Design/methodology/approach: This article is based on a review of secondary sources, including academic literature and reports, and case study analysis of selected cities implementing smart governance principles. The research approach is qualitative and interpretative, focused on identifying good practices, main barriers and success factors

Finding: It can be seen that cities that integrate digital communication tools with openness and co-decision policies achieve a higher level of resident engagement and greater managerial efficiency. An important factor of success is not only technology, but also the organizational culture of local governments, the ability to dialogue and include groups at risk of digital exclusion. Social participation strengthens trust in the authorities and contributes to the greater durability of urban projects. Projects that are based on data improve the quality of life. Some challenges were also indicated, including the risk of digital exclusion of certain social groups or a lack of proper communication.

Research limitations/implications: The article is based on a limited number of examples and secondary literature. The results are not representative, but allow for drawing conclusions at the exploratory level. Future research could include comparative and quantitative analyses, taking into account the perception of residents and the effectiveness of specific e-participation tools.

Practical implications: The results of the study can support data-based management in cities, broad communication and cooperation with residents. The article can be particularly useful for local governments.

Social implications: Communication and social participation have the potential to increase social capital, counteract digital exclusion and improve the quality of life of residents. This can contribute to building more just and sustainable urban communities.

Originality/value: The article emphasizes the current perspective on the issue of smart governance and smart cities, integrating the theoretical approach with practical observations from selected cities. It is mainly addressed to academic circles and local government administration.

Keywords: smart cities, smart governance, social participation, communication, AI.

Category of the paper: research paper, case study.

1. Introduction

The concept of smart cities, and in particular the role of governance and communication in their development, has attracted considerable attention in recent years. The communication strategies used by local governments have a significant impact on public participation in smart city initiatives. Effective communication fosters trust and engagement, enabling residents to feel more connected to the decision-making processes that affect their communities.

In recent years, the concept of “smart cities” has become one of the most important issues in research on urban development and management. By integrating new technologies, including the Internet of Things (IoT), artificial intelligence (AI), and data management systems, cities have the opportunity to improve the quality of life of their residents, increase the efficiency of public services, and minimize the negative effects of urbanization (Batty et al., 2012). Implementing smart cities is not just a technological challenge – effective communication management and engaging citizens in decision-making processes play a key role in their development. This is the foundation of smart governance, which is essential for achieving the goals of smart cities (Nam, Pardo, 2011).

In the literature on smart governance, the role of communication and public participation is increasingly seen as crucial for the success of processes towards smart cities. However, there is a need for a deeper understanding of how these elements work together and how they affect the effectiveness of local governments’ activities in the context of sustainable urban development. There is a risk that, without appropriate public involvement, smart cities may deepen existing social and economic inequalities. An approach to city management that ignores the voice of citizens may lead to social alienation and distrust of public institutions. There is often a gap in research on the use of specific communication tools that support civic participation in smart city management processes. As indicated by Caragliu et al. (2011), the “smartness” of a city depends not only on technology but also on social capital and the ability of authorities to engage residents in decision-making processes. The UN report (2016) emphasized that the sustainable transformation of cities requires transparent governance mechanisms that enable citizens to co-create urban policies.

This article aims to examine how communication and social participation affect the development of smart cities and better management. The article is based on examples from selected cities implementing smart governance principles, analyzing both theoretical and practical aspects of engaging citizens in decision-making processes and urban management. The work aims to indicate good practices and challenges related to these processes, as well as to present specific examples of cities that have achieved success in this area.

2. Literature review

The concept of smart cities encompasses a wide range of strategies aimed at improving urban life through the integration of information and communication technologies (ICT) while promoting citizen participation and governance. Many concepts define smart cities through six main dimensions: people, government, economy, mobility, environment and life. Other studies confirm these areas, adding to them the quality of life of residents, city logistics, development of awareness of urban communities and evaluation of smart cities (Anthopoulos, 2016). Hartog, Akker and Houdt (2024) also propose six key elements: smart economy, smart mobility, smart citizens, smart governance, smart life and smart environment. Smart governance enables effective and collaborative interaction between citizens and local government. The European Commission (2020) emphasizes that the key challenge is not only digitalization, but also building trust and transparency in the relations between authorities and citizens. The importance of this issue is also evidenced by the creation of the UN document “International Guidelines on People-Centred Smart Cities” (2025) in 2025. This document presents the principles of smart city development, emphasizing community participation, transparent communication and inclusive decision-making processes. It encourages stakeholders to mainstream community involvement in urban policies and strategies. Therefore, social participation in the context of smart cities not only improves the quality of decisions but also builds trust between citizens and local authorities, which is essential in striving for sustainable urban development. It should be emphasized that smart cities are a synthesis of hard infrastructure (physical capital) with the availability and quality of knowledge capital, communication and social infrastructure, which is crucial for the competitiveness of cities. The literature review conducted by Kumar (2024) analyzed the practices of citizen participation in smart cities, pointing to the need for active involvement of residents in decision-making processes to ensure inclusive and equitable urban development.

Smart cities not only integrate advanced technologies into urban infrastructure but also redefine the way citizens participate in governance and decision-making processes. At the heart of this transformation is the idea of smart governance – intelligent governance that uses information and communication technologies (ICT) to promote transparency, efficiency and social participation in public administration. Effective use of digital tools enables citizens to actively participate in decision-making processes, which in turn leads to more responsive and inclusive urban policies. Examples such as the Decidim platform in Barcelona show how technologies can support the democratization of urban governance, enabling citizens to be directly involved in the creation of public policies.

The role of citizen participation in smart cities is crucial. Local governments that prioritize transparent and consistent communication see higher levels of civic engagement. Creative cities tend to initiate participatory governance practices, which significantly strengthen social

cohesion (Cortés-Cediel et al., 2019). A study conducted in Zabrze (Mańka-Szulik et al., 2023) showed that residents' perception of smart city solutions is closely related to the effectiveness of local government communication activities. The authors indicate that effective local government communication significantly affects public participation in smart city initiatives, as residents expressed the need for public consultations and preferred to be informed via online media, emphasizing the importance of engagement and awareness. Research conducted by Ismagilov et al. (2019) also suggests that trust in government initiatives must be supported to ensure the successful implementation of smart city services, emphasizing the importance of solid communication channels and engagement platforms for an open dialogue between citizens and local authorities. These observations indicate that citizen engagement strengthens the democratic structure of smart cities and plays a key role in bridging social divides, promoting equal access and participation in city governance.

The use of modern communication tools, such as digital platforms, mobile applications, social media or e-participation tools, creates new opportunities for engaging citizens, enabling them to actively participate in city governance. It should be emphasized that civic education and involvement in smart city projects often originate from social networks and various social platforms. Sontiwanich et al. (2022) argue that citizen participation is essential to drive sustainable development, and changes in social values are key to realizing the potential of smart city initiatives. The analysis of the links between civic engagement and technology is also carried out by Wahyuni et al. (2022), who emphasize the implementation of technologies that enable the effective provision of public services while increasing citizen participation. The emphasis on education and digital skills in the urban environment requires equipping citizens with skills that allow for meaningful engagement in the processes of managing smart cities (Valencia-Arías et al., 2021).

It should therefore be noted that governance in the context of smart cities has moved from a hierarchical model of governance to a more participatory and collaborative one. Citizen engagement and communication with them is increasingly recognised as a key element in the development of smart cities, particularly in the Smart City 3.0 concept, where their active participation in shaping the future of the city is essential.

3. Methods

This article adopts a qualitative approach, based on the analysis of selected examples and secondary data sources. The main goal was to identify and compare specific communication practices and solutions supporting social participation within the concept of smart governance in smart cities. Secondary data analysis is a frequently used research method in management

studies, as it allows for the examination of existing empirical data, reports and industry publications, enabling a systematic review and synthesis of results from multiple perspectives.

4. Practical applications and discussion

Smart cities are increasingly environments that foster civic participation and communication among citizens, using technology to create more inclusive urban spaces. For smart cities to fully realize their potential, they must prioritize citizen engagement and address existing social inequalities. Chen et al. (2022) emphasize the need to consider social inequalities and exclusion when planning, launching, and evaluating smart city initiatives. By adopting a bottom-up approach to civic engagement, smart cities can better respond to the needs of diverse populations, which significantly improves the quality of life of residents and leads to a more equitable approach. Smart city frameworks should not only focus on technological efficiency but also actively address social issues.

One important example of smart governance is the use of information and communication technologies (ICT) to facilitate collaborative decision-making processes with multiple stakeholders. For example, in cities such as Amsterdam and Barcelona, smart governance initiatives include open data platforms that allow citizens to access urban data, thus enabling them to engage in discussions about urban planning and service provision (Wang et al., 2021; Esposito et al., 2023).

Barcelona has become a model city that combines advanced technologies with social participation. The city authorities have implemented the Decidim platform, based on open software, which allows residents to submit ideas, vote on projects and monitor the implementation of city investments (Bakici et al., 2013; <https://decidim.org/>). Thanks to this, over 70,000 citizens have actively participated in decision-making processes in the years 2016-2023. Another innovative solution is the concept of superilles (superblocks), i.e. areas that limit car traffic in favor of public space. This project was consulted with residents through workshops and digital tools, which allowed for explaining the concept, collecting comments, and thus adapting it to local needs. Rueda (2018) emphasizes that Barcelona's success is due to the combination of digital tools with the direct involvement of residents, because then it is possible to reduce social resistance and increase acceptance of change. The example of Barcelona shows that effective citizen participation in a smart city requires more than just technology – institutional frameworks supporting openness are crucial, as well as the city's ability to translate citizen data into concrete policy actions. Despite their success, maintaining long-term citizen engagement remains a challenge.

Since 2009, Amsterdam has been implementing a policy of living labs, which brings together residents, companies and universities to test new urban solutions (Lai, 2024; Steen, van Bueren, 2017). Examples include over 170 different activities on mobility, energy and public spaces, in which residents play the role of active co-creators, not just recipients of services. Amsterdam proves that participation can be embedded in innovation processes. This model fosters shared responsibility and strengthens social capital. However, urban labs require time, resources and a willingness to experiment, which can be a barrier for cities with fewer opportunities. As part of the Amsterdam for All program, tools and methods for improving accessibility are being developed through collaboration with people who experience the daily challenges of navigating certain parts of the city. This approach builds public trust and increases the effectiveness of implementing innovations.

Social media and online platforms have transformed communication from a one-way process to a multi-way process, allowing citizens to become more actively involved in urban planning and development. A study by Delmastro et al. (2022) focuses on the role of mobile technologies in promoting civic participation in smart cities. The authors present the SmartCitizen app, which allows residents to actively participate in generating and sharing content related to the quality of life in the city. Smart City Laguna in Brazil uses the Planet App, which acts as a community engagement platform, facilitating conversations and collaboration among residents and helping to understand the changing needs of residents. Philadelphia, on the other hand, actively seeks to understand and map digital service gaps through surveys such as the Connecting Philadelphia Household Internet Assessment Survey, using the results to improve access to digital services for its residents. The city has also established a Transportation Advisory Committee, composed of residents and stakeholders, to address the city's transportation needs (SmartCitiesWorld, 2023). Such behaviours enable residents to contribute their point of view and cooperate with city officials, strengthening democratic processes and ensuring that city development is in line with the needs of the community.

Another example is Vienna, which has been consistently implementing the Smart City Wien Framework for years, based on sustainable development and involving residents in city management. One key tool is the BürgerInnen-Räte (citizens' councils), in which randomly selected residents co-decide on key investments such as the development of public transport or green energy. In addition, the city uses the "Sag's Wien" platform, where citizens can report problems (e.g. infrastructure failures) and propose solutions. In 2022, this initiative resulted in the implementation of over 1.2 thousand projects submitted by residents (<https://smartcity.wien.gv.at/>).

An interesting example is Medellín in Colombia (Green, 2018), which shows that in cities of the Global South, face-to-face communication is key, especially in areas with low trust in government. The then mayor Sergio Fajardo introduced a new approach, calling it "urban society". The aim was to use urban planning and landscape architecture to reduce inequalities

and heal environmental damage. He invited communities to participate in planning, which resulted in large investments in metros, aerial trams, bicycle infrastructure, libraries and beautiful parks – with most of the new facilities created in neglected communities. Thanks to Comuna Labs, it was possible to reach excluded groups (e.g. gang youth) and involve them in the process of city revitalization.

Copenhagen is also a city combining smart cities with smart governance, focused on communication with residents. Many projects are solved thanks to continuous cooperation between companies and knowledge providers, i.e. data providers. This not only results in a smarter, but also greener city. Copenhagen provides a wide range of public data, enabling residents and entrepreneurs to create innovative solutions and increasing the transparency of government activities. Access to high-quality public data is the basis for developing smart solutions that respond to the challenges of urbanization and climate change. The city integrates innovative technologies with active community participation. For example, it is implementing a project on lighting systems that adjust their intensity depending on the presence of pedestrians and cyclists, which increases safety and energy efficiency. The Copenhagen Solutions Lab is also a collaboration platform between the public and private sectors, focusing on creating solutions that improve the quality of life of residents. Some city applications also include gamification elements, such as challenges or rankings, to increase user engagement in pro-ecological activities. The example of Copenhagen shows that effective social participation in a smart city requires not only an advanced technological infrastructure but also a management culture based on trust and cooperation. The initiatives undertaken indicate how residents can actively participate in shaping their surroundings, which leads to more inclusive and effective urban solutions.

It should be emphasized that many cities do not have comprehensive and long-term smart city strategies that include security risk management (Vitunskaitė et al., 2019). Some forms of participation are criticized as being shams, so city authorities need to create accessible and familiar communication channels and be open to partnerships with various organizations and technology providers. Guo et al. (2024) also emphasize that raising public awareness through effective communication and community engagement strategies is crucial to supporting participation in smart city programs. They point out how information campaigns can stimulate a sense of responsibility among residents, prompting them to actively engage in smart initiatives. Examples of many cities show that the long-term success of smart cities depends on the active involvement of citizens. Effective communication between residents and local government is crucial to increasing public participation in smart city initiatives, supporting a more connected and participatory environment. For smart cities to be truly effective, they need to integrate advanced technologies with public engagement strategies. This requires a shift in perspective, where citizens are not just passive recipients of technological solutions, but active participants in the planning and implementation processes. Effective citizen engagement leads to more representative city governance that takes into account equity and integration, elements necessary for building sustainable smart cities.

5. Conclusion

In summary, the successful implementation of smart cities relies on the interaction of technology, governance and social participation, as well as effective communication. By supporting an environment conducive to citizen engagement within smart governance, cities can create sustainable solutions to urban challenges, leading to an improved quality of life for all residents. This requires a change in the approach to governance, giving priority to inclusive and participatory mechanisms that empower citizens as co-creators. Effective communication between local governments and residents has a significant impact on public participation in smart cities. Engaging citizens through various channels, including online platforms, increases their involvement in decision-making processes, which ultimately leads to improved governance and quality of life.

As indicated, the idea of smart cities is gaining increasing importance in the face of dynamic urbanization and challenges related to current trends and sustainable development. Modern cities are increasingly reaching for advanced technologies, but their true “intelligence” is manifested not only in innovative infrastructure but also in efficient management based on dialogue with residents. Communication and social participation are becoming key to creating cities of the future – cities that are not only technologically effective, but also respond to the real needs of the community. Effective communication in smart cities and smart governance, however, requires a two-way flow of information (facilitated by digital platforms, e.g. online civic budgets), broad education not only of office workers but also of residents in the use of digital tools, as well as the inclusion of excluded groups (e.g. the elderly or those with low digital skills). It is important to be aware of certain challenges. One of them is the risk of technocratization, i.e. excessive focus on technologies without taking into account social needs, as this can affect digital exclusion, i.e. deepening inequalities by basing participation on digital tools. It is also important to notice in time the risk of apparent participation, i.e. a situation in which the authorities conduct communication, e.g. consultations, without the residents having a real influence on decisions. Hybrid models of participation (combining online and offline tools), adaptive communication strategies that take into account the local socio-cultural context, as well as monitoring the actual influence of residents on decisions, may be crucial for the development of smart cities.

Therefore, certain recommendations for other cities can be indicated. Hybrid models of participation, adaptive communication strategies that take into account the local socio-cultural context, as well as monitoring the actual influence of residents on decisions, may be key to the development of smart cities. It is worth it for cities to develop hybrid models of participation, combining digital and traditional forms, adapted to local social and demographic conditions. They should also invest in digital education programs aimed at both officials and residents, especially those at risk of digital exclusion. It is important to create mechanisms for the

community to have a real influence on decisions, e.g. by evaluating social consultations and publicly reporting their results. It is worth establishing a team/unit that will deal with social dialogue and ethical supervision of implemented technologies, to ensure a balance between technological efficiency and the needs of residents. It is also recommended that communication tools be designed inclusively, involving marginalised groups already at the stage of creating a smart city strategy.

The author is aware of certain limitations. The article is based on an analysis of the literature on the subject and selected examples and secondary data sources. This approach was deliberate because it wanted to create a review space that would be a starting point for more in-depth empirical research. Future research should therefore be supplemented with quantitative analyses (e.g. surveys among residents) as well as in-depth qualitative research (e.g. in-depth interviews with experts, local government representatives or focus groups) to understand the real impact of implemented technologies on communication, participation and social trust. Quantitative research on larger, representative samples would allow for a comparison of the level of acceptance and involvement of residents in various types of smart governance tools. Further activities could also include comparative analyses, taking into account residents' perceptions and the effectiveness of specific e-participation tools. Such research could fill existing gaps and, at the same time, contribute to the development of more empirically grounded knowledge on smart governance and the use of artificial intelligence in the public sector.

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MOTIVATION OF STUDENTS TO ENGAGE IN THE ACTIVITIES OF STUDENT GOVERNMENTS

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Purpose: The article deals with the motivation of students actively involved in the work of student governments to work for these organizations. Understanding these motivations is crucial to effectively support and mobilize members of the local government to take action in line with the goals of the organization and their own aspirations. Empirical investigations also focus on the assessment of whether work in the student government satisfies the three, indicated by Deci and Ryan, basic for the development of the highest form of motivation – intrinsic motivation, the need for relationships, competence and autonomy.

Design/methodology/approach: Qualitative research based on individual interviews was conducted among people who had experience of being active members of student governments.

Findings: The analysis of the obtained empirical material emphasizes the importance of intrinsic motivation, both in the context of students' decision to join the student government and in the context of continuing work for the benefit of this organization. The results also indicate that activity in the local government creates the opportunity to meet the needs: relationships, competences and autonomy.

Research limitations/implications: The study did not consider contextual variables, such as organizational culture or competencies of people holding managerial positions in local governments, their leadership style, as well as the personality traits of the respondents. All these variables can be important for motivation to work in local governments. To confirm the results obtained, it would be worthwhile to conduct research in a quantitative model.

Practical implications: The research presented in the article can contribute to a more effective design of the work of student governments in a way that is conducive to the development of the highest form of motivation and commitment. In the light of the results obtained, it seems crucial to organize the activities of the local government in such a way that they focus on supporting the development of internal motivation by comprehensively taking care of the satisfaction of three needs important for its development: relationships, competences and autonomy.

Originality/value: The results indicate intrinsic motivation that is important for building engagement in the work of student organizations. However, the implementation of the SDT theory requires organizational support, which, apart from the spontaneous actions of the members of local governments themselves, would create an opportunity to satisfy the needs that are important for the theory in question: the relationship of competence and autonomy.

Keywords: self-determination theory (SDT), intrinsic motivation, student governments, student organizations.

Category of the paper: Research paper.

1. Introduction

The student government is a place that fosters the comprehensive development of students, enabling them not only to expand their knowledge and skills in the field of education acquired during their studies, but also to build new interpersonal relationships and engage in various non-teaching activities. It is an organization whose members are all students at a given university, but only some of them decide to actively participate in shaping academic life by becoming active members of student governments. They carry out work in various areas, such as support in didactic and social matters or the organization of events integrating the student community. Each person actively working in the student government is guided by individual motivations that affect their involvement in the activities of this organization. Understanding these motivations is crucial to effectively support and mobilize members of the student government to take action in line with the goals of the organization and their own aspirations. It can be assumed that people who are involved in the activities of non-profit organizations, in this case student organizations, show particularly strong intrinsic motivation. The aim of this article will be to assess students' motivations for joining and participating in student government. The analysis will be based on the theory of self-determination created by Edward Deci and Richard Ryan (2000). It is also important to examine whether the experience of being a member of the student government allows for the satisfaction of three basic needs important for the development of internal motivation: belonging, competence and autonomy. In this context, it will be examined to what extent the student government environment supports or inhibits the fulfillment of these needs.

2. Student Governments

The student government is a body established in accordance with the Act of 4 May 1982 on Higher Education. According to statistical data collected by the Central Statistical Office, in the academic year 2023-2024 there were 354 higher education institutions, which equals the number of student governments. The role, competences and tasks have been expanded in successive updates of legal acts. These updates took place on 12.09.1990, 21.07.2005, 20.07.2018 (Grzonka, 2013; Musiałkiewicz, Więżnowski, 2019). According to the latest update of the Act, the local government operates through two bodies: the chairman and the legislative body. The most important task of this institution is to be the sole representative of all students at the university. This means that the student government represents all students at the university to the authorities. Other important tasks of the student government described in the Act include: conducting activities in the field of student affairs belonging to social, living and

cultural activities, distributing funds allocated to student affairs by the university authorities, then preparing a report on the distribution of these funds and their settlement at least once a year, and finally making the report available in the Public Information Bulletin on the university's website. The tasks of the student government body's legislative body include adopting regulations which define the organization and operation of self-government institutions and appointing representatives to the governing bodies of an HEI and, in the case of a public HEI, also to the electoral college (Journal of Law 2018, item 1668).

Through student government activities, students have the opportunity to gain practical knowledge and psychosocial competences, which they are often unable to acquire by participating in major classes alone. The student government teaches how to deal with projects, which can be a valuable experience to help you start your career. In addition, it helps in establishing contacts with other students at a given university, universities from all over the country, as well as foreign universities. The activity of the student government, active members, shows a real impact on meeting the needs of students. It can also be a field of competition or a place to look for one's own self (Grzonka, 2013).

Considering the important role played that student governments, both for universities and for the development of students, it seems important to know the motivation that guides students who undertake additional academic activity. This seems to be important not only from a cognitive perspective, but also considering the possibility of using this knowledge as a guide when designing the structures of student organizations and the processes taking place in them.

3. Motivation of students to engage in the work of student governments in the context of the theory of self-determination

The concept of motivation derives from the Latin verb *movere* (Zimabrdo, Gerrig, 2024, p. 468), which means "to move" in a specific direction. In broad terms, motivation refers to illustrating the mechanisms that are responsible for initiating, directing, maintaining, and terminating behavior. It applies to both simple and complex behaviors, internal and external, affective and cognitive machisms (Łukaszewski, 2006, p. 427). Deci and Ryan (2000), based on many years of research on intrinsic and extrinsic motivation, present the theory of self-determination theory (SDT). They point out that human behavior is intentional, goal-oriented, and this intentionality depends on internal and external causes, but as they emphasize, this division is not simple but is a continuum showing a multidimensional conceptualization of motivation. When describing the components of SDT, the authors start with amotivation, lack of motivation, which describes a state of lack of regulation. Amotivation results from the fact that the individual does not value a given activity, does not feel competent to perform it or thinks that a given activity will not lead him to the goals he sets for himself. Describing extrinsic

motivation, they indicate that the cause of behavior is pressure or control, distinguishing four types of pressure. The first, external regulation, is characterized by the fact that the individual's behavior depends on an external reward or the desire to avoid punishment. The second, introjective regulation, is characterized by an internal compulsion to take action in order to gain one's own approval and the approval of the environment. In the case of another type of regulation - identification, the individual takes action because they have personal meanings for him, are valuable to him to some extent. The highest autonomous type of extrinsic motivation is the integrated regulation following identification, which is characterized by activities that are personally important due to their valued outcome. Internal regulation is independent of external stimuli, it includes the desire to engage in action for the sake of action. Intrinsic motivation describes actions that are undertaken by a person for their own curiosity, joy, passion, as opposed to instrumental behaviors that characterize extrinsic motivation. According to the authors, it is intrinsic motivation that is the natural tendency of an individual to develop and learn (Deci, Ryan, 2000; Ryan, Deci, 2000a, 2000b). Research indicates that intrinsically motivated students feel more interested in their activities (Deci, 1971).

Motivation, i.e. the ability to direct an action, thus develops on a continuum from external motivation to internal motivation. Researchers emphasize the importance of two types of motivation and point out that an individual experiences true happiness when he engages in activities focused on the fulfillment of internal needs, while all actions taken for external reasons are less conducive to a sense of fulfillment, and thus to the experience of true happiness (Ryan, Deci, 2000b).

At the center of the described SDT are three universal, basic needs: autonomy, competence and relationships with others, which are satisfied as part of the actions taken by the individual. They are the basis for the emergence of internal motivation. The need for relationships (belonging) refers to interaction with other people and is related to the feeling of being part of a community, attachment and experiencing respect, interest and care from other people. The need for competence is related to the desire to feel one's own effectiveness, the sense of having skills in a given area, as well as the belief in the sense of the actions taken. Competence, also referred to as a sense of mastery, is fostered by a well-organized environment that will provide optimal challenges, positive feedback and development opportunities. Autonomy, on the other hand, is related to the individual's sense that he or she is the cause of events. It is a sense of agency, the ability to make choices, to make decisions. It is perceiving one's behavior as coming from within, as consistent with one's own individual desires, beliefs, values and interests. This sense is weakened by external control – both in the form of punishment for negatively evaluated actions taken and rewards for desired behaviors (Gózdź, 2015; Ryan, Deci, 2020a)

The assumption of SDT is the belief that the conditions supporting the individual in experiencing autonomy, competence and relationships are conducive to the highest quality forms of motivation and commitment to action. Creating an environment that meets these needs

also results in increased productivity, perseverance, and creativity in the activities people undertake. SDT also suggests that the lack of support or thwarting any of these three needs – relationships, competences and autonomy – will have a detrimental effect on the well-being of individuals in this environment, and that the management level's focus solely on external remuneration may become demotivating in the long term. Disturbed intrinsic motivation is highly likely to translate into negative prosperity of employees in the organization and, ultimately, reduced effectiveness of their activities. It is also pointed out that deprivation of even one of the three mentioned needs has a negative impact on mental health, as well as a decrease in motivation to take action (Ryan, Deci, 2020a; Center for Self-Determination Theory, 2025).

In higher education, motivation plays an important role in the process of shaping students' commitment and competence development. According to SDT, students' behaviors illustrating their level of academic activity can be arranged on a continuum: from behaviors illustrating the basic scope of activities necessary to obtain a higher education diploma (which are a response to external regulations and expectations of the university) to students' academic activity significantly exceeding these activities, expressed in involvement in many university initiatives, to co-creation of academic reality, influence it through activity in student organizations. Undertaking voluntary volunteer work in the student government, going beyond the duties of a student, has its motivational basis. This motivation seems to have its own specificity and the identification of these needs that can be satisfied by activity in student organizations is extremely important in the process of stimulating student engagement. It is also worth noting that motivating members of student councils or non-profit organizations differs from motivating a typical employee, due to the specificity of work, which is unpaid and voluntary. It is extremely important to maintain a high level of motivation among members and stimulate it among potential members, because voluntary work within student governments is work for the benefit of the entire university.

It can be assumed that people who engage in additional activities in non-profit organizations, in this case student organizations, are characterized by particularly high intrinsic motivation. Previous research among students using the assumptions of the SDT theory has focused mainly on the choice of fields of study (Arden, Tomik, 2014) or motivating students to learn (Grabowski, 2014).

Knowledge about the motivation behind joining and acting in the student government could support universities in the process of designing the organization of the student government. In the case of extrinsic motivation, it would be possible to intensify the external mechanisms of influence (rewards, punishments), and in the case of intrinsic motivation, it would be possible to create an environment of local governments that is conducive to satisfying the three needs indicated in the SDT theory – belonging, competence, autonomy.

4. Methods

In connection with the above, a research question was formulated about the motivation of students joining and acting in student organizations in the context of the theory of self-determination. The aim of the empirical work was an attempt to examine whether, in the perception of students, the experience of being a member of the student government allows for the satisfaction of three needs, which are important and crucial for the development of internal motivation: belonging, competence and autonomy. And to what extent does the student government environment meet or frustrate these basic needs.

In search of answers to the above questions, a survey was conducted among people who had experience of being active members of the student government. The research was carried out in the period 06.-09.2024.

The research was carried out using the method of a diagnostic survey. Individual interviews were conducted using the form of a semi-structured interview. The interview questionnaire consisted of three sections. The first one was used to collect metric data, while the other two were focused on searching for answers to the research questions constructed by the authors. The second group grouped questions that were aimed at examining what motivated respondents to join and act within the framework of self-government. The last section of the questions focused on examining the respondents' perceptions of satisfying the three basic ones mentioned by Deci and Ryan (2020a) as conducive to the highest quality forms of motivation and commitment to action, as well as the needs: autonomy, competence and relationships. The questions are presented in Table 1.

Table 1.
Interview questions

Study area	Questions section	Questions
Metrics	S1	• Age • Sex • University • Number of students at the university • Field of study • Student organization • Number of active members of the self-government • One year and one year of studies - joining the student government • Function
Respondents' motivation to join the student government	S2	• Why did you decide to join this student organization? • What were your main expectations before joining the organization? • What are the benefits of being a member of a student organization? • What motivates you the most to continue your activity in the organization? • What changes in the organization could increase your motivation even more?

Cont. table 1.

Survey of respondents' experience of meeting three needs as part of membership in an organization	Section 3: S3_R (need for relationships) S3_K (need for competence) S3_A (need for autonomy)	
	S3_R	• What motivates you the most to continue your activity in the organization? • Does collaborating with other members of the organization affect your motivation? How? • Do you have a sense of community and belonging within the organization? How does this affect your engagement? • Do you have a sense of support from people working in the local government? Do you support others yourself?
	S3_K	• What skills have you gained through membership in the organization? • What are your greatest achievements within the organization?
	S3_A	• Does the organization allow you to implement your own ideas and initiatives? • Do you have the ability to make decisions on your own, the ability to choose tasks, actions taken as part of your work in the local government? How does it affect your motivation?

Source: own study.

The survey involved 10 respondents aged 20 to 30, 5 women and 5 men. The respondents were people who had experience of being active members of the student government. They represented a total of 8 Polish universities: AGH University of Krakow (2 people), Lodz University of Technology (2 people), Lublin University of Technology, Warsaw University of Life Sciences, University of Physical Education in Krakow, Koszalin University of Technology, University of Economics in Katowice and Silesian University of Technology. The respondents studied various fields of study.

Each interview lasted about 1 hour. Questions were asked to everyone according to the order presented in the table, interesting topics were deepened.

A thematic analysis of the respondents' statements was used to analyze the empirical material taken. The analysis was carried out without the use of tools supporting the coding process and consisted in extracting from the respondents' statements descriptions of motivation to join and participate in the work of the local government (S2) and experiences related to satisfying (or not satisfying) three needs during work in the local government: relationships, competences and autonomy (S3), which constituted the categorization key: S3_R the need for relationships – cooperation, community, belonging, receiving support, giving support, S3_K need for competence – development: skills, competences, achievements; S3_A need for autonomy - decision-making, a sense of influence, implementation of one's own ideas/initiatives.

5. Results

The respondents joined and acted in student governments mainly for their own internal reasons. They varied depending on the subject. There were signals that gratification in a sustainable way could additionally build motivation to act. In the light of the results obtained, the student government is a place that allows for the satisfaction of three needs important for achieving internal motivation: affiliation, competence and autonomy. A summary of the results is presented in Table 2.

Table 2.
Summary of the survey results

Questions section	Results	Quotes from interviews
S2	The respondents paid attention primarily to the possibility of development, the desire to meet new people and the need for real influence on the university's activities and the situation of students. In response to the recommended changes in local governments that would have a positive impact on the motivation of its members, there were mentions of external motivation, e.g. gratification of the most active members.	<i>Joining the student government allowed me to meet many new people and acclimatize/ If work in the university counted for a scholarship, it would certainly improve my motivation.</i>
S3_R	All respondents indicated a strong bond with both the organization and the members of the organization. They were often the motivation for them to act. The respondents indicated that they were open to supporting other members, and they also received support from other members, which strongly built their relationships.	<i>It is here that you are always supported by the majority. There is no such thing that a person who has the desire to do something does not have the support of people who will help them do something with us.</i>
S3_K	The respondents point to many specialist competences, as well as psychological and social ones, which allowed them to develop their activities in the local government. These are, include, resourcefulness, timeliness, responsibility, public speaking, negotiation, teamwork, organization of events, prioritization of tasks, communication, leadership competences or conflict resolution. The achievements mentioned by the respondents were very wide, from the possibility of organizing events to simplifying the life of students by finding interesting solutions	<i>... I am sent to various types of events where I can educate myself, I get projects in which I can fulfill myself. Well, it's definitely project management. This is a big plus for me from the local government. Managing the team too, maintaining these relationships in the team. My greatest achievement was the inclusion of my university in the structures of the forum of technical universities and the establishment of Industry Committee of the Forum of Life Sciences Universities.</i>
S3_A	Respondents had the opportunity to implement their own ideas, not only as part of already existing projects, but also to take their own initiative to create new ones.	<i>... Such an example is that I have always dreamed of a ball, like engineer's balls at other universities. And I insisted on doing a winter ball at the University of Technology. And I managed to make this ball happen and it was a completely budget-free event.</i>

Source: own study.

6. Discussion

The analysis of the results of the research, which was conducted among people who had experience of being active members of student governments, shows the importance of intrinsic motivation. The respondents declare that the motives for joining and further involvement in the work of local governments result directly from their interest in this type of activity, which consists of working with other people, the possibility of broadly understood development, as well as creating reality. Sociocentric behaviors of active members of the student government, directed towards the benefit of the community, which is the university, are related to the feeling of internal satisfaction. It is worth noting that despite the dominant answers, which indicated the participation of intrinsic motivation of the surveyed, especially when asked about recommendations regarding possible improvements in the activities of student organizations, they also indicated external stimuli that could be offered to active members of the student government. There were elements such as, for example, the issue of promotion in the structure of the local government, additional points to the scholarship, however, it is worth emphasizing, the respondents did not indicate external motivators as factors that decided that they joined the organization.

In the perception of the respondents, working in the local government is conducive to three needs that are key to building internal motivation. The first, the need for relationships, was indicated as one of the main factors motivating members of the self-government to actively participate in it. The need to belong, to be part of a community, to establish contacts and develop them built motivation to join, but also allowed them to maintain enthusiasm for work, as well as sustained the decision to stay in the organization despite the difficulties that arose. The respondents repeatedly pointed to the importance not only of the fact that they can achieve common goals, but also the fact that they can break it up together with others, they can count on mutual kindness and interest.

In the perception of the respondents, the student government is an excellent space not only to build bonds with others and carry out community activities, but also to develop competences. The respondents emphasized that this aspect was important both in the process of making decisions to join the organization and maintained the motivation to later engage in the work of the local government. The respondents indicated several competences that work in the local government develops, paying particular attention to psychological and social competences. It also turns out that activity in the student government allows you to improve leadership competences and stimulate proactive and entrepreneurial attitudes.

What is important for building intrinsic motivation is the sense of autonomy that seems to be experienced by members of student governments. The respondents indicated an important possibility for them to have an impact on shaping the university's activities. They referred here not only to the possibility of undertaking new initiatives, but also to the possibility of

co-deciding on the shape of cyclical events at the university. What was important for the respondents was not only the autonomy of the student government as a student organization, but also this individual sense of influence – the ability to make choices as to selected tasks tailored to one's own competences, as well as the way they are performed.

In the light of the results obtained, it seems crucial to organize the activities of the student government in such a way that they focus on supporting the development of internal motivation by comprehensively taking care of the satisfaction of three needs important for its development: relationships, competences and autonomy.

7. Summary

The motivation of students to engage in the activities of student organizations is important not only for the functioning of universities, but also for the development of their competences. Engaging in this type of activity is conducive to the development of interpersonal, organizational and leadership skills, which have a measurable impact on their further academic development and professional careers.

In the light of the results of the research, it can be noted that intrinsic motivation is important for building commitment to the work of student organizations. However, the implementation of the SDT theory requires organizational support, which, in addition to the spontaneous actions of the student government members themselves, would create an opportunity to satisfy the relationship of competence and autonomy, which are important for the discussed theory of needs.

The first key element is to create a space for creating bond-forming processes that satisfy the need for affiliation. Although the respondents pointed to integration activities undertaken by the student government, such as workshops, meetings and trainings, at many universities they are not obligatory and rather undertaken as a result of spontaneous, distant activities of the members of the student government. What seems to be important in this context is the implementation of *onboarding* processes for new members, which would also prevent the resignation of new people. In this key moment for building commitment, it is worth supporting local governments, also materially, in building a sense of belonging.

The second task, the implementation of which should be supported by the university, is to ensure the development of competences through participation in the student government. As the results of research indicate, not only substantive competences, but also transferable competences in the area of personal and social competences. In this matter, it is important not only to provide important and necessary training, which universities often offer to all members of student governments, but also to ensure that they are better suited to the needs of students involved in the work of student governments, for example through regular research in this area.

What is important in building the competences of representatives of the academic community is also the development of competences in the peer teaching model, which in this particular environment could also focus on contacts, trips to other universities – Polish and foreign – which would give the opportunity to acquire good practices.

The third, seemingly the biggest challenge, is to give the members of the student government a sense of autonomy. This provision of a need that is crucial for building internal motivation can be supported both by the university authorities treating students subjectively by allowing them to co-decide, and by internal processes within the student government itself. Using the assumptions of the SDT theory, it can be assumed that leadership that is characterized by respect for the individual and creating opportunities for self-fulfillment in the course of the implementation of the tasks of the student government will be conducive to the sense of autonomy of students. In employee research, among the activities stimulating intrinsic motivation, there are new challenges, continuous stimulation of employees' curiosity, as well as increasing their decision-making responsibility (Miller, 2010) as opposed to, among others, the sense of threat, directiveness and non-constructive evaluation that reduce in this area (Ryan, Deci, 2000b). Bearing in mind the importance of leadership for maintaining intrinsic motivation, it would be worthwhile to periodically monitor the satisfaction of members of the student government in order to effectively catch disturbing signals and take corrective actions. In this case, it also seems beneficial to support people performing managerial functions in the student government through appropriate training activities around leadership competences.

The issue of stimulating internal motivation in students seems to be important not only for building greater involvement in activities at the university. As shown by meta-analyses (Howard et al., 2021; Vasconcellos et al., 2020), this type of motivation is positively associated not only with academic success but with well-being. The latter argument seems particularly important, especially in the context of the deteriorating mental condition.

The qualitative research conducted by the authors should be treated as an introduction to the discussion on the motivation of students to engage in the work of student governments.

When drawing conclusions from the conducted qualitative research, it is also important to remember about its limitations, which include the number of respondents. The study also did not consider contextual variables, such as organizational culture or competences of people holding managerial positions in student governments, their leadership style, as well as the personality traits of the respondents. All of them can be important for the motivation to work in student governments. To confirm the results obtained, it would be worthwhile to conduct research in a quantitative model.

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MANAGERIAL COMPETENCE TEST: PSYCHOMETRIC CONSTRUCTION AND ANALYSIS

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Purpose: The aim of the article is to show the process of creating and validate a research tool for measuring the psychosocial competences of people performing managerial functions, the Managerial Competence Test (TKM).

Design/Methodology/Approach: The stages of work on the original construction of the TKM are presented, and the validity of this test is analysed using the Bochum Inventory of Personality Determinants (BIP).

Findings: The validation shows that the constructed test can be successfully used to measure the psychosocial competences of people who hold managerial positions in organisations.

Research limitations/implications: Validation of the test on a larger sample would allow evaluating the test with more accuracy. It would also be worthwhile for further work on test validation carried out on a larger sample to include demonstrating the differential validity of the test.

Practical implications: The constructed TKM can be used as an accurate tool to diagnose psychosocial managerial competences.

Originality/value: The value of the work lies in the comprehensive approach to the construction and validation of the Managerial Competency Test. The recipients of the article can be researchers, occupational psychologists, and HR practitioners interested in a reliable diagnosis of managerial competencies.

Keywords: situational competency test, competence measurement, psychometrics.

Category of the paper: research paper.

1. Introduction

The issue of measuring and analysing psychological and social managerial competences is strongly inscribed in the management process. This measurement and analysis plays an important role in the assessment of competences in the area of leadership, because professional work based on contacts and cooperation with people requires psychosocial competences.

The aim of the article is to show the process of creating and validating a research tool for measuring psychosocial managerial competences, which is the Managerial Competence Test (TKM). The presented tool is a competence test, in which, in principle, the choice of reactions (answers) in the presented dilemmas is conditioned by the level of psychosocial competence.

First, the psychological and social managerial competences are characterised, and the most popular methods of their measurement are presented. Then the procedure for constructing the author's TKM was presented. Once constructed, the test was validated following guidelines for the validation of measurement tools in management sciences (Czakon, 2019). The research was carried out on 200 representatives of management staff, and the results obtained were subjected to statistical analysis.

2. Psychological and Social Management Competencies and Possible Measurements

The diagnosis of psychosocial competences is particularly important for representatives of professions whose essence is to influence others (Matczak, Martowska, 2013), that is, managers at all levels of management. Most often, measurement of psychological and social competences is carried out during the recruitment process, changes in positions within the organisation, employee evaluation, planning, and evaluation of training activities, or when making decisions about promotions and dismissals.

There is no uniform position in the literature on how to precisely define psychosocial managerial competencies and what their components are. Research in this area is characterised by a very diverse methodology, which makes it difficult to analyse it comparatively. The authors' work, although consistent in emphasising the importance of psychosocial competences for the effectiveness of managers' work (see Adler, Rosenfeld, Proctor, 2006; Bjekić et al., 2021; Borkowska, 2012; Boyatzis, Ratti, 2009; Mintzberg, 2012; Penley et al., 1991; Sangha, 2007; Smółka, 2016; Whetten, Cameron, 1996), come to define them in different ways. There are references to personality, abilities, values, skills, experiences, or behaviours. The lists of psychological and social competencies necessary to perform managerial functions are close to management practice.

In the literature, one can find many theoretical models describing psychological and social competences or their connections with other theoretical constructs (Argyle, 1998, 2002; Bar-On, 1997; Harden, Crossy, 1999; Salovey, Mayer, 1990; Schwartzman, 2003). Social competences are also called interpersonal (McClelland, 1973), communicative (Białecka-Pikul, 1993; Kowalik, 1984), relational (Spitzberg, Cupach, 1989), sociological (Nosal, 1997), or social skills (Argyle, 1994, 1998, 2002). Psychological and intrapersonal competences are also often treated as one of the dimensions of social competences. Aspects such as self-

confidence, self-knowledge, critical insight into one's own desires and motives, and self-regulation skills are indicated here (Nosal, 1997; Zwaans, Ten Dam, Volman, 2006). In this area, there are also references to emotional or social intelligence, which are defined by reference to psychosocial competences (Matczak, Knopp, 2013). It is worth emphasising, however, that despite the recognition of the role of emotional intelligence, which has largely contributed to the popularisation of the subject of psychosocial competences in management and leadership (Anand, Udayasuriyan, 2010; Caruso, Salovey, 2004; Cherniss, 2000; Cherniss, Goleman, 2001; Goleman, Boyatzis, McKee, 2002), attention should be paid to the difference in the concepts of competence, and emotional and social abilities, which, although they are predictors of these competences, are not the same as having them.

In this article, the authors assume that psychosocial management competencies include two interpenetrating components. The first one concerns personal, intrapersonal, and psychological competences. It is primarily related to the ability to cope with one's own emotions (emotional control), cope with stress, and self-confidence. The second group – social and interpersonal competences – is an area related to the style of interacting with people. Such an approach seems to be justified not only for the inclusion of both aspects of competence (Smółka, 2016), but also due to its strong genetic relationship and mutual determinants (Konarski, 2006).

Among the methods that are recognised in the field of measuring psychological and social competences, the most frequently mentioned are: assessment and development centre, 360 degree assessment in the workplace, psychometric tests, including personality questionnaires, various forms of interviews or application forms, as well as situational competency tests.

Among the tests, the tool that allows the description of personality in a professional context is the Bochum Inventory of Personality Determinants of Work (BIP) by Rudiger Hossiep and Michael Paschen (2014). It is designed to measure personality dimensions that are important from the point of view of effective professional functioning in various positions. In the definition adopted by the authors of BIP, personality is a set of traits that characterise an individual and manifest themselves in his behaviour, system of values, and motivation. The inventory is used to measure four areas of one's own professional competence, forming 14 scales (Figure 1). The area of Career Orientation includes motivation and professional values, the area of Professional Behaviour analyses the individual's approach to performing professional duties, and the area of Social Competence is an analysis of the characteristics of building interpersonal relationships typical for an individual. The last area of the Inventory is the Psychological Nature. It refers to preferences for psychophysical conditions in the workplace (Jaworowska, Brzezińska, 2014).

The Inventory enables the measurement of psychological and social competences, thus, it was used to validate the author's Management Competence Test.

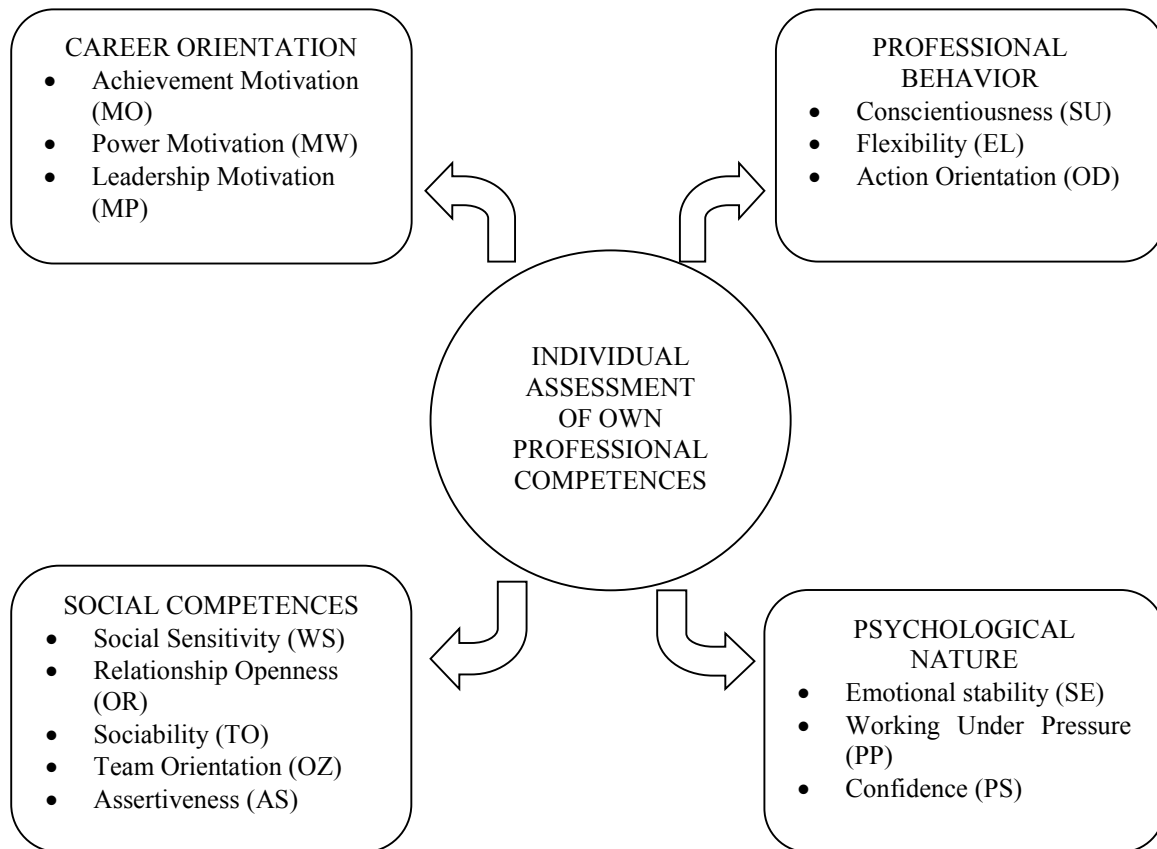


Figure 1. Skale BIP.

Source: based on Jaworowska, Brzezińska, 2014.

The created TKM is a Situational Judgment Test (SJT). These tests have long been used in employee recruitment (McDaniel et al., 2001). These are assessment and selection tools based on a series of dilemmas designed to measure an individual's judgment in situations related to a specific job position. SJT can also be defined as an extensive knowledge test in which the questions are situational (Prokopowicz, Żmuda, Król, 2014). A typical reaction judgment assessment in the SJT measures procedural knowledge of how to act effectively in the occupational situations described by the SJT (Motowidlo, Beier, 2010).

The purpose of using TKM is to identify the most likely behaviour of the person taking the test. The main assumption of SJT is that the statements of the respondent about his or her behaviour in a hypothetical situation are a good predictor of the actual course of action, as they are based on his or her previous behaviours and experiences, tendencies to a specific way of acting (Smółka, 2016).

Competency tests can quickly and reliably measure managerial competences, and what is particularly important is the possibility of reaching the so-called tacit knowledge through their application, characterised by the fact that it is acquired through experience, is procedural in nature, and is used in practice (Nęcka, 2003). Thanks to the use of SJT, it is possible to reach the area of the respondents' behaviour, i.e., how people behave, how they act in their professional roles. Respondents are evaluated here on how they react, act, and behave in the

incidents presented and not on their own opinions, which seems to be a special advantage of competency tests. It is also important to measure many skills, abilities, and knowledge of the respondent, as well as the fact that these types of tests are most often used to assess interpersonal skills and leadership (Christian, Edwards, Bradley, 2010). Not without significance for the choice of this method is also the issue of the ease of application of SJT and its high content relevance, as well as the highly rated façade validity affecting the involvement of the respondents (Motowidlo, Hanson, Crafts, 1997; Salgado et al., 2001).

3. Procedure for constructing the Managerial Competency Test

The author's Charter of Managerial Competences was based on the division of competences of Whetten, Cameron and Woods (1996). These researchers list two groups of competences: psychological (personal, personal) and social, also known as interpersonal competences. The first group consists of individual predispositions related to personal effectiveness, i.e., the so-called personal skills, which include stress management (identifying stressors and preventing them), creative problem solving (a combination of rational and creative thinking), improving self-awareness, identifying one's own goals and values, coping with emotions, time management, self-motivation. On the other hand, in the area of social and interpersonal competences in the work of managers, Whetten, Cameron, Woods (1996) mention the use of one's authority, influencing others, communication, conflict management, and motivation.

Case studies published in the Harvard Business Review Polska (HBRP) magazine were used to create test items and construct the answers. The questions themselves (description of managerial dilemmas) and possible reactions were based on descriptions of these cases with expert comments. To create the test questions, cases containing dilemmas faced by people in managerial positions were used. The cases selected to construct incidents in the test presented difficult problems, the solution of which or the action taken was largely determined by the level of mental resilience (psychological competence) and interpersonal competence possessed by the manager. Selected dilemmas were focused on such problems as building trust, building good relationships in the team while caring for the achievement of business goals, dealing with conflict situations, conducting difficult managerial conversations, taking care of one's authority, and dealing with difficult emotions.

The descriptions of the situation were classified into two areas. The first indicates the need for social competences that allow the building of positive interpersonal relationships; the second refers to those behaviours that are related to the ability to exert influence and mental resilience.

As a result of the conversion of critical incidents into situational dilemmas, a set of 26 test items was created, along with answers and a key to assess the response.

The next stage of the tool development process was its testing. Experts were invited to this part of the work. The group of 10 experts included managers working in various organisations with at least 10 years of experience in managerial positions. Experts assessed to what extent a given dilemma is essential for the test of psychological and social competences of people holding managerial positions in organisations. A three-point scale was used for the assessment: This item is essential for the test; the position is useful, but it is not essential; the position should not be within the test. In order to estimate the façade accuracy of the tool, experts were also asked to assess the fidelity of the situational dilemma, i.e. the degree to which its content is similar to the tasks performed in a given position. They answered the question of whether the situation described in the test reflects real situations that take place in their work (scale: reflects to a large extent, partially reflects, does not reflect), as well as the non-obviousness of the answers. The experts were also asked to choose the most optimal response and possibly generate a new response that did not appear in the set proposed by the authors. They answered the following questions:

- What would be the reaction for you, apart from those indicated in the test:
 - By far the best?
 - Good, but not optimal?
 - The worst, but probable?
- In your opinion, how could an inexperienced employee behave in this situation?

Experts were also asked to assess the comprehensibility of the presented incidents and responses, the neutrality of the responses, and to submit other comments in style or form. During the consultations, experts rejected five cases: three of them were described as exceptional situations, not reflecting typical tasks in managerial positions, and two as too extensive, complicated, and difficult to assess. Experts also reported a lack of neutrality in some of the responses. The result of the consultations was the re-verification of both the incidents and the responses in the test being created. The correct answer to the test was determined by analysing its relationship with the description of the content of the selected scales of the BIP (scales in social competence and psychological nature).

As a result of this work, a set of 23 test questions was created, along with answers and a key to evaluate the answers. Two test items were taken from the literature (Prokopowicz, Żmuda, Król, 2014) and included in the test after slight modification. Four possible ways of reacting were indicated for each test item, from which the subject chooses, indicating the most typical reaction for him/her. The created TKM is a single-choice test. The method to define psychological and social competences in the created TKM was based on the description of selected scales from the Public Information Bulletin. The choice of answers in the presented dilemmas is conditioned by the competences in the area of: noticing emotional signals in the environment and reacting to them, building and developing interpersonal relationships by building a network of contacts, maintaining them and using them as helpful in professional work, the ability to take responsibility for the group process, the ability to achieve one's goals

despite existing difficulties, taking care of one's authority, possibilities in the field of emotional control and self-confidence.

4. Validation of the created Managerial Competency Test

To determine the theoretical validity of the created TCM, BIP (Jaworowska, Brzezińska, 2014) and a questionnaire that allowed the description of the sociodemographic data of the respondents were used. Study participants were informed of the purpose of the study and the planned use of the results. As part of the contract concluded with the respondents, they were assured of the possibility of receiving feedback on the results obtained from the research tools they performed. The examination lasted 1 to 1.5 hours. Respondents filled in the following documents: TKM, BIP, and a prepared questionnaire.

- TKM – contained 23 situational questions on 8 pages of A4 format. In relation to each question, the respondents had to choose one of the four indicated answers, which is the closest to their way of behaving in a similar situation. The questions were scored on a scale of 0 to 1, so it was possible to score 0 to 23 points throughout the test.
- The BIP inventory – question book contained 220 items arranged on 18 A4 pages. Respondents answered directly on the question sheet, each time ticking a circle corresponding to the selected answer. The answers were expressed on a 6-point scale, on which the extreme points mean 1 – completely true and 6 completely untrue.
- The survey included open and closed questions on sociodemographic data.

The respondents are managers, managers of various levels, managing a team of at least 6 people, having decision-making freedom, and bearing responsibility for the implemented projects. The study involved 200 people, 158 men, and 42 women.

The most numerous were people aged 35 to 44 years (54%). Regarding the education of the respondents, 98% of the respondents had higher education, and the remaining 2% had secondary education.

From the point of view of the purpose of the study, it was important that the people who participated in the study had managerial functions. Two groups were the most numerous: managers representing the first and second management levels (42% and 43.5% of the respondents, respectively). Top executives accounted for 14.5% of the sample.

The respondents represented mainly large companies (50.5%). Employees in medium-sized enterprises constituted 38% of the respondents, and in small enterprises, 8.5%. Managers working for micro-enterprises constituted only 3% of the surveyed population.

The largest group of respondents were managers with a total seniority of 4 to 8 years (34%), and the second largest group of people in this category were respondents with 1 to 3 years of seniority (29%). The smallest group of respondents was people whose seniority in managerial positions exceeded 15 years (5.5%).

In TKM, one correct answer was possible in each question, therefore, a maximum of 23 points could be obtained. The average score obtained by the 200 managers surveyed was 15.82 points. The standard deviation was 2.738.

Analysing the results obtained, a test of the normality of Shapiro-Wilk distributions was carried out. This test is used when the exact mean values and standard deviations of the population from which the samples come are unknown. The results of the Shapiro-Wilk test for TKM (standard deviation 0.949, degrees of freedom 200, and significance level 0.000) indicate that in the case of TKM, we cannot confirm the hypothesis of normality of the distribution. However, the fundamental issue in the case of TKM was determining its accuracy, which would justify the possibility of using it in the future as a tool to measure psychosocial managerial competences.

One way to determine the validity of a tool is to estimate the consistency of its results with those of other tools known to measure the same or similar construct. BIP was used to check the validity of TKM. The obtained Spearman rank correlation coefficients between the results in TKM and the BIP scores achieved by the respondents on the scales of psychosocial competences, i.e., WS, OR, TO, OZ, AS, SE, PS, as well as for individual scales of Social Competence and Psychological Strength, are presented in Table 2. The table also shows the correlation coefficient for psychosocial competences of TKM and BIP excluding AS.

Table 1.

Correlations (Spearman rho) between the TKM results and the BIP results – psychosocial scales (N = 200)

	BIP psychosocial competences	BIP psychosocial competence without AS	BIP WS	BIP OR	BIP IS	BIP OR	BIP AS	BIP SE	BIP PS
Result in TKM	0,616	0,654	0,687	0,472	0,504	0,425	n.i.	0,391	0,165 [^]

p < 0.00, [^]p < 0.01, N.I. – statistically insignificant result.

Source: own work.

Analysing the correlation coefficients of TKM with other BIP scales, it can be seen that they take lower values than the correlations between TKM and BIP scales determining psychosocial competences. The BIP scale, which is not a scale in the area of psychosocial competences, which correlates with TKM to the highest degree, is the MP scale (Spearman's rho +0.363 p < 0.000), which suggests that since the authors assume that TKM is a test to measure psychological and social managerial competences, it is related to the BIP MP scale, in which a high score indicates people who find themselves well in professional activity related to leading other people, coordinating their work, influencing them (Jaworowska, Brzezińska,

2014). Therefore, it can be concluded that TKM, apart from the BIP psychosocial scales, correlates with the MP scale because, on the one hand, it is closely related to the TKM test material (various types of managerial problems), and on the other hand, the scale in question - defined as the use of social influence - seems to be strongly related to the functioning of the respondents in social contexts. The results discussed are illustrated in Table 2.

Table 2.

Correlations (Spearman rho) between TKM scores and BIP scores: areas Career Orientation, Occupational Motivation and PP scale from the area of Psychological Nature

	BIP PP	BIP MO	BIP MW	BIP MP	BEEP SU	BEEP EL	BIP OD
TKM Results	0,204	0,191	n.i.	0,363	0,319	N.I.	0,252

$p < 0.00$, N.I. – statistically insignificant result.

Source: own work

The study also conducted separate analyses for two variables – the BIP psychosocial competence scale with AS and the BIP psychosocial competence scale without AS. This procedure is related to the results of research obtained during the work on the Polish adaptation of BIP (Jaworowska, Brzezińska, 2014), where the scale obtained, although similar, does not entirely coincide with the areas identified by the authors of the original version of BIP (German version). The factor analysis indicated that the Social Competences factor does not include the AS scale, which in Polish research co-creates a factor that can be described as Domination.

During the work on TKM, two groups of questions were also distinguished: the first one was to refer to psychosocial competencies, which are related to PS, AS and created a factor related to exerting influence, defined by the authors as Domination (5 questions), while the second referred to relational competencies, which were characterised by a group of scales: WS, OR, TO, OZ (18 questions). The characteristics of the SE were understood as the basic basis for giving the correct answer in each of the TKM questions. The results of the correlation analysis for the first distinguished variable indicate a significant positive relationship between AS measured by the BIP and TKM scores on the Dominance scale (Spearman's rho 0.340 $p < 0.00$), as well as between the PS scale from the BIP and TKM questions intended to correspond to this variable (Spearman's rho 0.345 $p < 0.00$). The analysis of the second factor distinguished in the TCM, Relational competencies, indicates a greater, also positive, relationship with the variables highlighted in the BIP. The highest Spearman rank correlation coefficient was recorded for TKM and WS (rho = 0.673), for TO (rho = 0.520), for OZ (rho = 0.447), and for OR (rho = 0.398). All the results described were statistically significant ($p < 0.00$).

The analysis of these results, as well as the correlation of the overall TKM score with individual scales in the Public Information Bulletin, indicates that TKM is a test of psychosocial competences, which refers mainly to those variables in the area of social competences that are related to the ability to maintain harmonious contacts with the environment, sensitivity to the

emotional states of others, tendency to take into account the needs of other people, or alleviation of tensions. To a slightly lesser extent, TKM refers to characteristics such as self-confidence or the ability to pursue goals despite opposition from others.

5. Conclusion

The result of the research is a tool for measuring psychosocial managerial competences, a situational competence test, which is dedicated to people holding managerial positions.

In light of the analysis, it can be concluded that the constructed TCM can be used as an accurate tool for diagnosing psychosocial managerial competences. This is confirmed by significant correlations between the results of the constructed TKM and the results of the BIP.

Taking into account the considerations concerning two groups of psychosocial competences (influencing others and maintaining harmonious relationships with the environment), TKM is, to a greater extent, related to the latter area. In light of the results obtained, the assumption adopted by the authors about two components of psychosocial competence (psychological and social) seems less adequate and seems more correct to indicate two areas that would focus on the needs of the individual. On the one hand, there is the need for approval and acceptance, and on the other hand, there is the need for status and power. In the first case, we are talking about psychosocial competences, which we could call relational. In the second case, it is about characteristics that describe the ability to exert influence. Such a division seems to be particularly useful in the area of the discussed competences of managers, who should balance these two areas by taking care of their authority, while avoiding excessive directiveness and the ability to build good relationships with subordinates, co-workers, and superiors.

Therefore, the question of the possibilities of harmonious development of these two areas of competence becomes important, for example, by referring to the temperamental and personality variables that affect them (Argyle, 2002; Smółka, 2016; Spitzberg, Cupach, 1989). Further empirical work that would allow us to confirm the assumptions about the difference between these two areas could affect not only their classification but also the understanding of potential difficulties that managers may encounter in the harmonious development of both these areas. This seems to be important not only from the point of view of understanding the specifics of the work of people holding managerial positions but also for designing possible training activities, as well as the possibility of developing managerial competences.

6. Summary

In the work of a leader, substantive competence is indisputably extremely important. However, the importance of psychological and social competences should also be strongly emphasised.

In light of considerations on possible further work to improve the quality of TKM, it is possible to consider the use, in addition to diagnostic items, also buffer items (concerning the work of managers, where decisions are not related to the use of psychological and social competences), as well as an attempt to standardise the proposed answers so that they can be ranked. To achieve greater reliability in the assessment of psychosocial competencies of managers, it is also important to capture the perspective of subordinates.

The constructed TCM can be used as an accurate tool for diagnosing psychosocial managerial competences, but its limitations should also be considered. Undoubtedly, its validation on a larger sample would allow for a more accurate assessment of the test, taking into account, for example, the sociographic data obtained in the survey of the compared groups. It would also be worthwhile for further work on test validation carried out on a larger sample to include a larger number of tests demonstrating the differential validity of the test, for example, using the MTMM matrix method (Campbel, Fiske, 2005).

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THE EVOLUTION OF THE HR FUNCTION – FROM TRADITION TO MODERNITY

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Purpose: The aim of this article was to present the results of a study of the degree of interest in the latest concepts in the HR function in research: the evolutionary change from the HR 4.0 concept to the HR 5.0 concept.

Design/methodology/approach: The study used methods of a systematic literature review conducted using VOSviewer software and content analysis using MAXQDA 2024 software in accordance with the described research methodology.

Findings: In the conducted literature research, one can observe an analysis of the relationship between the HR function and Industry 5.0, hence the considerable interest in the HR 5.0 concept. Many of the texts describe the evolution from the HR 4.0 concept to HR 5.0. Undoubtedly, the most important issue, to which a significant part of the examined references was devoted, is the possibility of using artificial intelligence in HR processes.

Research limitations/implications: The limitation of the presented results is the exclusive use of the Scopus database and its algorithms to collect references, which were then diagnosed according to the methodology of a systematic literature review.

Originality/value: The conducted research involved an innovative assessment of the literature on HR 4.0 and HR 5.0 concepts using an IT program for qualitative data analysis.

Keywords: human resource management, HR function, HR 4.0, HR 5.0.

Category of the paper: Research paper.

1. Introduction

The first stage of research when considering new research initiatives in the discipline of management science and quality is usually a review of the literature. This is because formal approaches and systematic methods are used to locate, select, evaluate, summarise and report the collected references (Snyder, 2019). Exploring research gaps using a systematic review of the literature provides important support in presenting efforts to identify challenges for future empirical research (Kraus et al., 2022).

The main objective of the research process described in this article was to identify the degree of interest in the latest concepts in the personnel function in research. The general changes that are taking place in management processes indicate the need to answer the question of whether HR processes have evolved from HR 4.0 to HR 5.0. It is also important to identify the criteria, manifestations, tools, etc. used in HR processes.

The research tools used allowed an analysis of the existing body of research on the indicated HR topic in order to prepare future empirical research.

2. Methods

The research methodology employed a systematic literature review on the topic of HR 4.0 and HR 5.0 concepts, the main objective of this research process. This made it possible to gather the relevant body of knowledge available on the topic and also to verify and extend the research directions (Denyer, Tranfield, 2006; Kitchenham, 2004).

This theoretical synthesis of dividing the topic under study into key and supporting terms increases methodological rigor and helps to create a reliable knowledge base by gathering information from a range of scholarly sources describing personal functions. To minimize possible bias and error in the study, data extraction methods were used for the systematic review, which required all diagnostic steps to be documented. Data extraction included general information such as title, author(s), year of publication, and publication details included in the abstract (Jabbour, 2013).

The search terms were checked against the Scopus database due to its relevance to the discipline of management science and quality as an online subscription-based service for indexing scientific citations. Only scientific articles, monographs, chapters from monographs, and review articles were retained.

The research process adopted allowed the identification and analysis of references obtained from the coding system, which led to the identification of research gaps in the literature.

In the next step, the articles were analysed using VOSviewer software (version 1.6.20), a tool to build and visualize bibliographic networks. These networks were used to construct and visualize the cooccurrence of relevant terms appearing in the collected references.

The last step was content analysis of the collected references, as it is a reliable social science research method that analyses texts based on their authorship, authenticity, or meaning (Wu et al., 2020). Content analysis, which is a type of inductive analysis, aims to understand the case under study and gain information about the case, while focusing on the theme or appearance of the word, as a method, and highlighting similarities and differences within categories or codes (Joubish, Khurram, 2011; Koçan, Yildiz, 2023). This phase of the research used MAXQDA 2024 software to process qualitative and mixed data. The software works on

the idea of horizontal and layered coding of data, which are displayed in a wide range of visualization tools, word clouds, charts, tables, mind maps, etc. It can also process mixed quantitative and qualitative content. With the help of MAXQDA software, codes can be organized, coded, grouped to construct themes, and retrieve data as required.

Finally, in the analysis process, the interrelated information concerning the HR function in HR 4.0 and HR 5.0 was organized in parts and coded (Kepplinger, 1989), so that all logically possible connections between these areas and statements concerning other factors could be identified later (Elo et al., 2014). The research methodology adopted allowed the collection of source material of relevance for further analysis and designed empirical research.

3. Results

In the first phase of the research, a systematic review of references on the HR function was carried out in terms of the HR 4.0 and HR 5.0 concepts. The search terms were checked in the Scopus database. All research results from this search were then narrowed down by applying refinement mechanisms by domain: to business, management and accounting, economics, econometrics, and finance. Additionally, the search was narrowed to texts in English, as this was the dominant language in all items in the literature.

The study, based on a systematic review of the literature, used a data extraction process that involved individual analyses of the collected references according to the adopted coding system. The result of the search is shown in Table 1.

Table 1.

Results of the search process and articles remaining after analysis

According to the SCOPUS database	HR 4.0	HR 5.0	HR + AI
Subject area, including Business, Management and Accounting Economics, Social Sciences.All documents	109	28	256
Articles	44	11	113
In English	44	11	87
After 2020	38	9	54
Content Verified Based on Abstracts	24	9	26

Source: own elaboration.

The articles were then analysed using VOSviewer software to visualize the cooccurrences of specific terms appearing in the HR field. The summary terms that appeared most frequently in the networks were used to develop the analysis categories. Figure 1 shows visualizations of HR 4.0 concepts, while Figure 2 shows visualizations of HR 5.0 concepts.

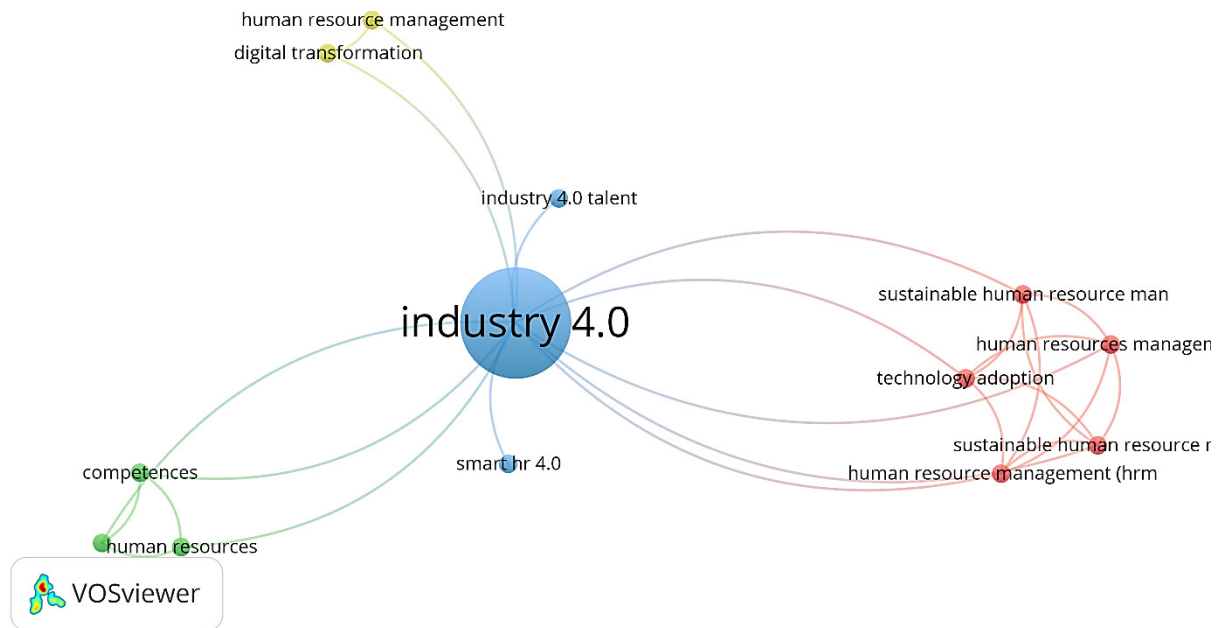


Figure 1. Keyword mapping for the concept of HR 4.0: Network for category development.

Source: own elaboration based on systematic literature review.

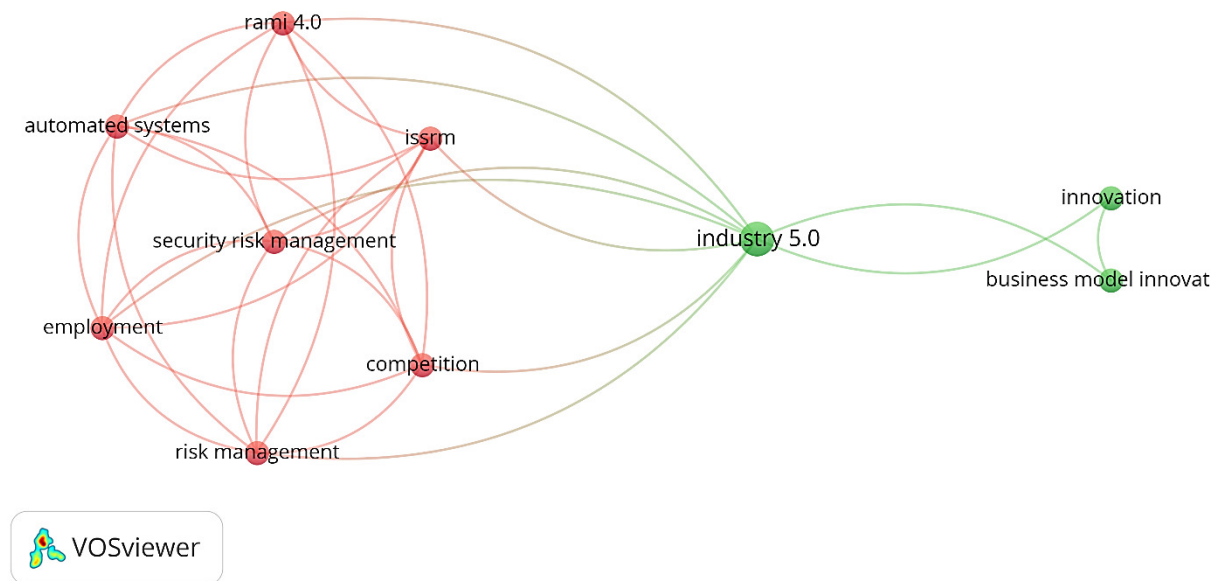


Figure 2. Keyword mapping for the concept of HR 5.0: Network for category development.

Source: own elaboration based on systematic literature review.

After collecting the relevant data, an analysis was carried out to check whether all texts addressed the HR function from the perspective of implementing tools specific to the HR concept. It was noted that the significant placement of the concept of artificial intelligence in both figures above was noted. Therefore, it was considered necessary to extend the systematic literature review in the Scopus database by adding another term. HR + AI (see Table 1). The resulting references were narrowed down analogously as before and then visualized in the figure (Figure 3).

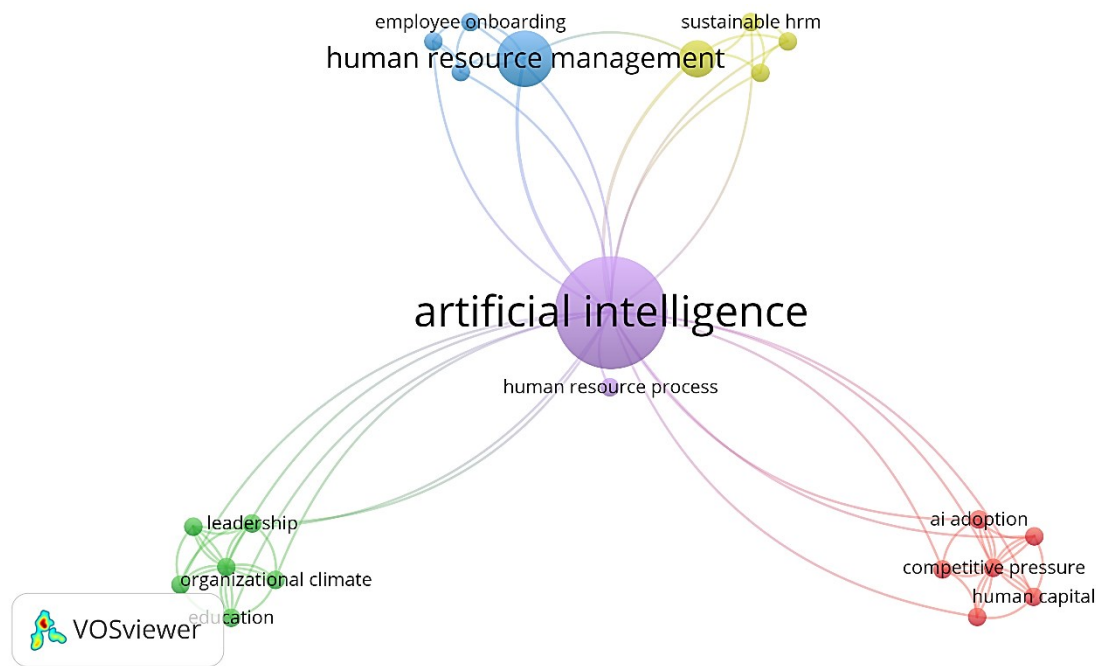


Figure 3. Keyword mapping for the concept of HR + AI: Network for Category Development.

Source: Own elaboration based on systematic review of the literature.

The adopted research process allowed the identification and analysis of references obtained from the coding system, which led to the identification of research gaps in the literature.

In the next step, the collected references were analysed using qualitative inductive content analysis. The MAXQDA 2024 qualitative analysis program was used to analyse and visualize qualitative data (Kuckartz, Rädiker, 2019). An analysis framework was created, and the data were processed according to the thematic framework (Albeladi, 2024). The data obtained in the content analysis were first coded. Then, in a second step, categories and themes were found and organized. Finally, the results were defined and interpreted (Denzin, Lincoln, 2000; Fusch et al., 2018; Seggie, ve Bayyurt, 2015).

The references collected in the earlier stage of the study were uploaded to MAXQDA 2024 as separate files in three sets: 1) HR 4.0, 2) HR 5.0 and 3) HR+AI.

This was followed by coding. Coding means that a selected data segment is assigned to a code or vice versa. A code is assigned to a data segment (Kuckartz, Rädiker, 2019). The coding procedures followed a deductive process, a concept-based approach; codes were developed before the data were displayed, and the phenomena discovered there were then classified and assigned accordingly. The analysis was based on the thematic analysis framework (Braun, Clarke, 2006), which is considered a robust method for identifying and exploring themes in qualitative data (Albeladi, 2024).

The code system identified two main codes, in line with the aim of the research, and then subcodes were created for each code by reviewing the content of the individual publications. The frequency of codes is shown in Figure 4 with the number *n* in brackets.

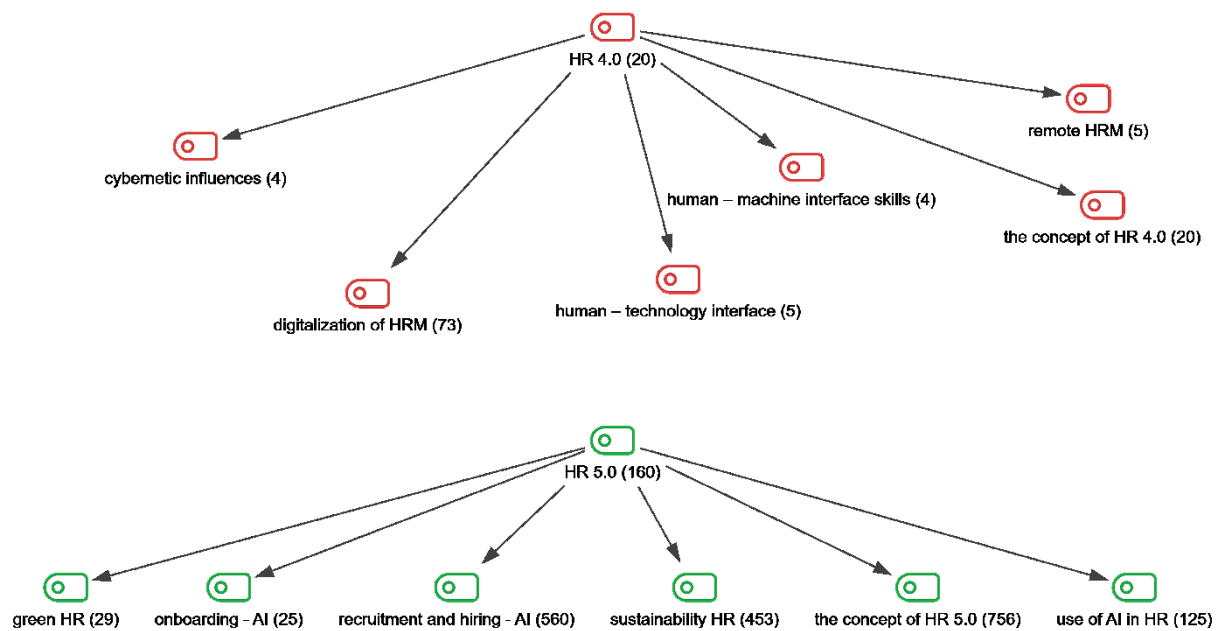


Figure 4. Theme code-subcodes-segments model.

Source: own elaboration based on data from the MAXQDA 2024 program.

Table 2, on the other hand, describes the themes and codes along with the results obtained; this is a key element of the analysis process, i.e. the creation and selection of categories along with the totality of all categories in the form of a coherent system.

Table 2.
Distribution of themes and codes

Codes and Subcodes	Frequency Source	Code Definition	Source
HR 4.0			
The concept of HR 4.0	20	HR 4.0 marks the beginning of a new era in the planning and management of an individual's work. Activities focus on the availability and imminent implementation of new technologies based on artificial intelligence. Qualifications, skills, and an appropriate learning framework are important issues that support the future HR agenda for an organization. HR factors that support the aforementioned elements include stable employment of key staff; long-term training of employees with multiple skills (multitasking); a remuneration system partly based on skill accumulation; internal promotion within the framework of employer branding; cooperative links; inclusion of line managers in group decisions; and generally egalitarian policies regarding corporate welfare, communication, and employee motivation.	(Stuss, 2023) (Stańczyk, Stuss, 2021) (Zwiech, 2021)
Cybernetic influences	4	Challenges facing the HR function include handling massive amounts of data, adapting to the rapid pace of change, adopting new business models, and using intelligent services supported by digital tools. To adopt specific technology and improve software processes, ethical issues must be identified and carefully considered.	(Schultz, 2021) (Rahanu et al., 2021) (Maisiri et al., 2019)

Cont. table 2.

Digitalization of HRM	73	The reviewed literature highlights that HR digitalization will continue to play a key role in building competitiveness. HR processes such as staffing, compensation, employee relations, and development, driven by ICT, will rely heavily on data analytics and metrics. Technological devices and infrastructure such as the internet, data analytics, robotics, and artificial intelligence are expected to facilitate digitalization.	(Nteboheng et al., 2021) (Ganer et al., 2022) (Renkema et al., 2016)
Remote HRM	5	The demand for workspace is driven by employment trends. The nature of work is becoming increasingly flexible and virtual, which may have an impact on the future relationship between HR and employees. Smart communication technologies are enablers for remote HR tasks to be performed remotely. It is essential to have the right balance of office, home office, and third space, along with the right IT tools and behavioral aspects to make remote working effective.	(Schultz, 2021) (Chernyak-Hai, Rabenu, 2018) (De Bruyne, Gerritse, 2018) (Kämpf-Dern, Konkol, 2017)
Human-machine interface skills	4	Change is rapid, and solutions to the human-machine interface are not always obvious, reaching into organizational, socially, and culturally ambiguous paths. Qualifications, skills, and appropriate learning frameworks are important issues that support the future agenda of the organization. The impact of HRM is based on natural and inextricable links between human issues and the adoption of IT practices and trends.	(Nteboheng et al., 2021) (Mefi, Asoba, 2021) (Liboni et al., 2019)
Human-technology interface	5	There is an increased demand for technology proficiency among HR operations due to increased virtualization. In particular, the increased use of technology means that everyone is proficient in information technology to ensure that the required fluidity of network services, communications infrastructure, and other technology accessories is maintained. Technology is also an important element to influence both the processes and outcomes of the overall HR system.	(Nteboheng et al., 2021) (Mefi, Asoba, 2021) (Liboni et al., 2019)
HR 5.0			
The concept of HR 5.0	756	There is still a lack of consensus among researchers on the nomenclature associated with the term HR 5.0. A broad definition should include all HR components associated with artificial intelligence, machine learning, and big data (e.g., AHRM, digital HRM, HR analytics, and e-HRM), some of which may be more appropriate for specific HR activities than others, and all of which may be relevant in an integrated way to ensure the effectiveness and accountability of strategic HRM.	(Rani et al., 2024) (Cameron et al., 2024) (Ganer et al., 2022) (Lu, 2019) (Renkema et al., 2016)
Use of AI in HR	125	There is a wide expectation for the use of AI technology and big data for decision-making and automation in HR applications. Models link the use of AI in HRM to organizational outcomes such as increased organizational productivity, increased employee wellbeing and reduced turnover, increased organizational commitment, and reduced turnover intention among employees, which in turn results in improved cost-effectiveness within the organization.	(Stuss, Fularski, 2024) (Gînguță et al., 2023) (Gélinas et al., 2022) (Chang, 2020)

Cont. table 2.

Recruitment and hiring - AI	560	In the digital age, the recruitment process has undergone a significant transformation, shifting towards innovative candidate sourcing methods. AI applications range from streamlining recruitment processes, where artificial intelligence helps to screen potential candidates based on advanced, predefined criteria, to the integration of AI-powered chatbots designed to handle routine HR queries.	(Stuss, Fularski, 2024) (Figueroa-Armijos et al., 2023) (Nyathani, 2023) (Gélinas et al., 2022) (Said, Khallouk Temsamani, 2022) (Mihova, Ivanova, 2020)
Onboarding - AI	25	Artificial intelligence is being used to automate the onboarding process. It will answer new employees' most pressing questions to help them catch up quickly, such as giving them the names, locations, and contact details of people they should contact within the first week. May advise new employees to check out the new employee website for useful information, including training modules and guidance on the organization's policies.	(Stef, Crisan, 2024) (Gélinas et al., 2022) (Strang, Sun, 2022)
Green HR	29	Green HR includes practices that reflect efforts to prevent pollution and promote environmental management through typical HR activities such as green recruitment and selection, green training, green performance management, green compensation and rewards, and training and environmentally conscious performance appraisals and rewards, while organizational enablers of green HR include green organizational cultures, green teams, and environmentally focused employee empowerment engagement. Green HR systems refer to environmental recruitment and selection, and are environmentally focused.	(Ababneh, 2021) (Chiappetta Jabbour et al., 2019) (Beltrán-Martín, Bou-Llusar, 2018) (Longoni et al., 2018) (Guiyao et al., 2017)
Sustainability HR	453	The integration of AI into HR is not just a technology trend, but a reflection of a broader transformation towards sustainable, human-centered approaches. Central to the sustainable HR philosophy is a commitment to the triple bottom line, which includes economic viability, social responsibility, and environmental protection. Together, these elements define the movement and its goals, ensuring that companies not only focus on economic returns, but also on their wider social and environmental footprint.	(Jia, Hou, 2024) (Kuźniarska, Stuss, 2024) (Lu et al., 2022) (Aust-Before Ehnert et al., 2019) (Zwiech, 2024)

Source: own elaboration.

In the next step, a code cloud was extracted (Figure 5). It provides a quick overview of the most frequent terms in the collected publications. This allowed the verification of the correctness of some codes, but also indicated the relevance of terms such as the concept of HR 5.0 and recruitment and hiring – AI.

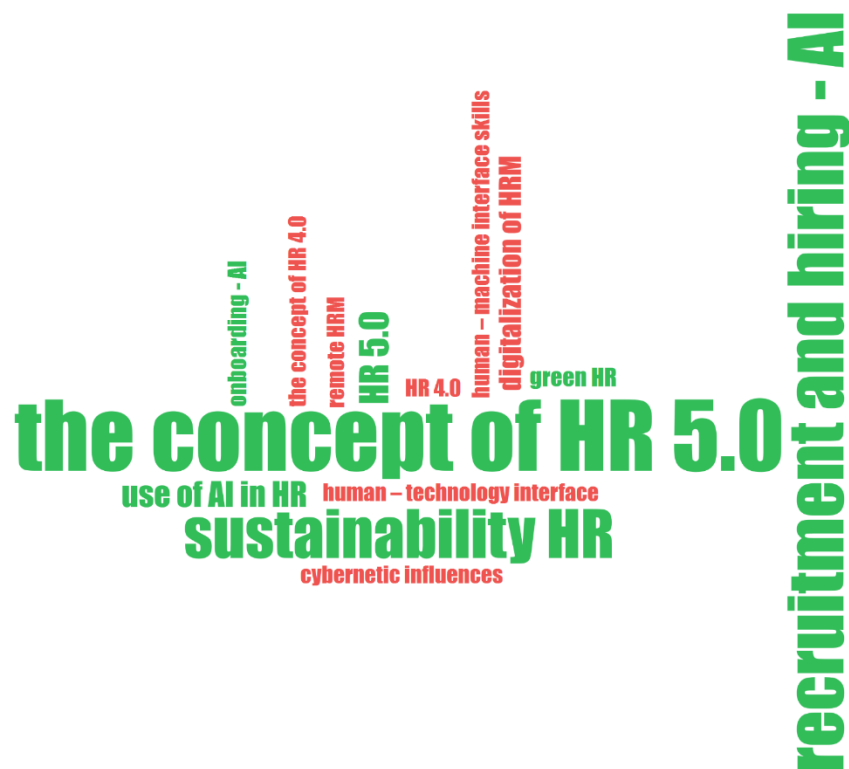


Figure 5. Code Cloud.

Source: own elaboration based on data from the MAXQDA 2024 program.

Analysing the relationships between the codes (Figure 6 shows the code system, including the subcategories and codes belonging to the topics analysed and the relationships between the codes), the most relevant current areas of research within the HR 5.0 concept are recruitment and selection using artificial intelligence. There is also an increase in academic texts on the evolutionary changes of the HR function, i.e., the transition from HR 4.0 to HR 5.0.

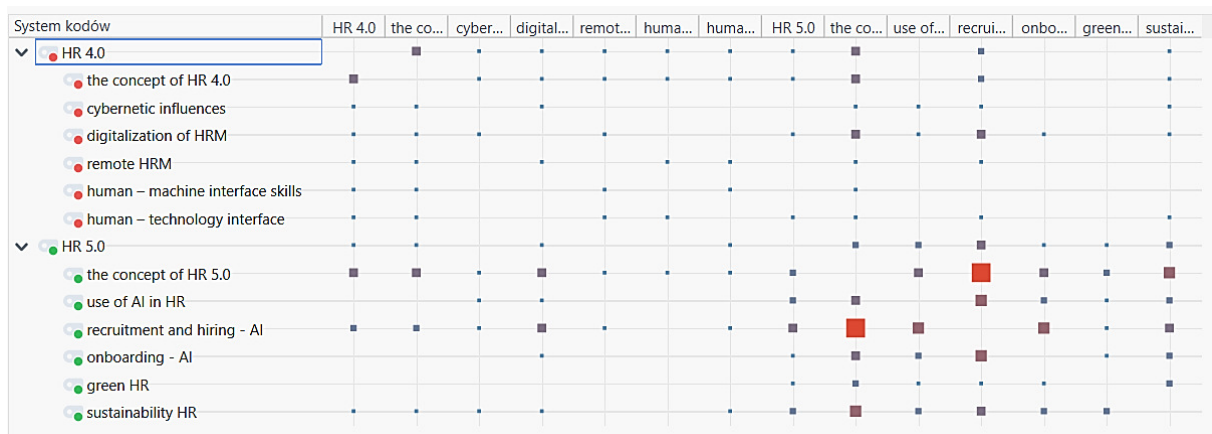


Figure 6. Relationships between the Codes.

Source: own elaboration based on data from the MAXQDA 2024 program.

In the case of the HR 4.0 concept, the academic output to date indicates a significant degree of interest in the topic of the use of enabling tools (Figure 7). In the case of the HR 5.0 concept, on the other hand, publications mainly focus on the concept's assumptions and on the topic of responsible HR.

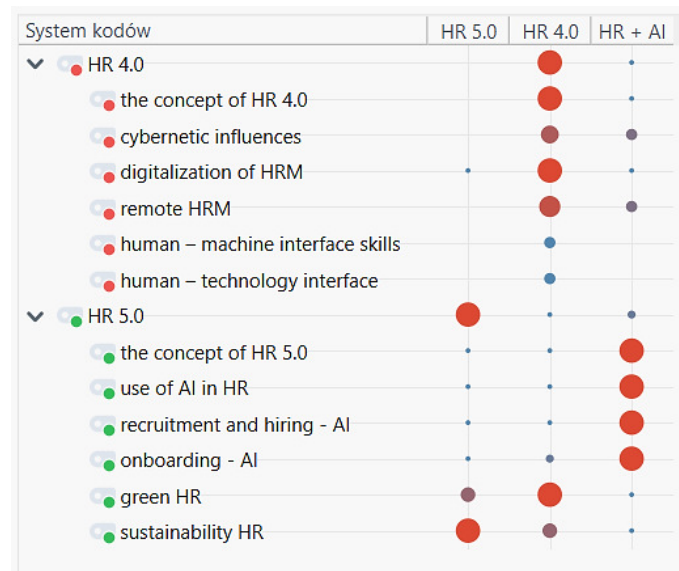


Figure 7. Coding results.

Source: own elaboration based on data from the MAXQDA 2024 program.

However, it is important to point out the increased interest of researchers in the possibility of using AI tools in personnel processes independently of theoretical concepts. In this case, the expectations of practice determine the need for research on artificial intelligence in personnel processes.

4. Conclusion

Previous research conducted in 2022 on the degree of interest in the HR 4.0 concept (Stuss, 2023) indicated that researchers focused mainly on technological tools to support HR management processes, and most references were identified with the e-HRM concept.

The relationship between the HR function and Industry 5.0 can now be seen being analysed, hence the considerable interest in the concept of HR 5.0, although it should be noted that the name itself does not shine through in publications. Undoubtedly, the most important issue to which a considerable amount of text is devoted is the possibility of using artificial intelligence in HR processes. Expectations are high, but it will be important to examine the practice of using AI. To date, empirical pilot studies of only the recruitment and selection function have not yielded satisfactory results (Stuss, Fularski, 2024). It therefore becomes necessary to lay out a much more multi-thematic empirical study.

However, despite the rigorous methodology used in this study, an important limitation of the results presented should be noted, which is the use of only the Scopus database and its algorithms. This assumption excluded other sources, such as monographs and articles from databases other than Scopus. Consequently, the data collected do not provide a holistic representation of the research spectrum in HR 4.0 and HR 5.0.

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FINANCIAL AND NON-FINANCIAL ASPECTS OF ENVIRONMENTAL POLICY OF THE EUROPEAN UNION COUNTRIES USING THE CLUSTER ANALYSIS METHOD

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Purpose: The aim of the article was to create homogeneous groups of European Union countries with similar characteristics of applied environmental policy - fiscal and non-fiscal

Design/methodology/approach: In order to group countries according to their environmental policy, the author selected variables based on Eurostat data and then applied the Ward method, which is one of the cluster analysis methods.

Findings: The method divided the EU countries into six clusters. The degree of homogeneity of the resulting country groups is still under discussion.

Research limitations/implications: The results of the F-test for variance show that it was not possible to achieve complete homogeneity of the groups created. In practice, it is very difficult to meet this criterion for all variables, and in turn, the separation of a larger number of country groups would be contrary to the assumptions of the cluster analysis method. The selection of a set of diagnostic variables, which is always a subjective choice, also remains a contentious issue.

Originality/value: The countries of the European Union have been divided into groups according to their environmental policy based on the proposed criteria.

Keywords: environmental policy, cluster analysis, Ward's method.

Category of the paper: Research paper, Literature review.

1. Introduction

The European Community is facing complex environmental problems. These range from climate change and biodiversity loss to resource depletion and environmental pollution. To solve these problems, European environmental policy has as its basis the principles of precaution, prevention, removal of pollution at the source, and the "polluter pays" principle. In 2019, Commission launched the European Green Deal and put environmental issues at the forefront of its policy (Kurrer, Petit, 2024).

Each of the 27 European Union countries also has its own policies (fiscal and non-fiscal) in the area of environmental protection. This is primarily due to the specific characteristics of the economies of these countries, the natural resources and protected areas they possess, the degree of energy transition to date, but most importantly, to their wealth and current financial capabilities. It seems particularly interesting to find Member states, which have similar approaches to the measures they apply, so that it will be possible to see if they have any common features and create their classification.

One of the statistical methods to implement this type of classification is cluster analysis. The concept of cluster analysis actually includes several different systematization algorithms. The general problem for researchers in many disciplines is to divide data into logical structures or grouping of data (Statsoft, 2024). In other words, cluster analysis is a tool for exploratory data analysis, the goal of which is to arrange objects into groups in such a way that the degree of association of objects with objects belonging to the same group is as high as possible, and with objects from other groups as low as possible (Gatnar, Walesiak, 2004).

The main purpose of this paper is to group European Union countries by the characteristics of their environmental policies.

The first part of the article will present the current areas of research that researchers are dealing with in the context of environmental policy. In the next part, the author will characterize the research material, and then make a grouping of the European Union countries due to the environmental policy pursued by the public authority using the Ward method (which is one of the methods of cluster analysis).

The study was based on an analysis of the literature on the subject and Eurostat data from 2018-2021. The selection of just such a period was due to the availability and completeness of data for all European Union member states.

2. Environmental policy – a review of the literature

The environmental policies of state governments are attracting considerable interest among the public as well as among environmental organizations, understandably and largely due to rapid climate change. In recent years, there has also been growing interest in the subject among scientists. For the purpose of this paper, the latest research related to environmental policy was reviewed, in order to identify current trends and research directions in this area.

Prominent among the 2018-2023 global studies is the interest of researchers in: the impact of environmental policies applied by national governments on reducing greenhouse gas emissions, the impact of environmental policy variability on business investment, the impact of environmental policies on renewable energy sources, the use of cluster analysis to analyze greenhouse gas emissions-see Table 1.

Table 1.*Research in the area of environmental policy - foreign authors*

Authors	Year	Research topics	Applications
Yongbum Kwon, Hyeji Lee, Heekwan Lee	2018	Using cluster analysis to analyze greenhouse gas emissions in Asian countries.	A division of Asian countries into 6 groups with different characteristics was made. Emission areas requiring urgent corrective action were identified.
S. Almeida Neves, A. Cardoso Marques, M. Patrício	2020	Determinants of CO ₂ emissions in European Union countries: do environmental regulations reduce pollution?	Environmental regulation is effective in reducing CO ₂ emissions in the long term. The study was based on data from 17 EU countries.
Y. Wolde-Rufael, E. Mulat-Weldemeskel	2021	Do environmental taxes and restrictive environmental policies reduce CO ₂ emissions in developing economies?	There is an inverse relationship between the multiplicity of CO ₂ emissions and the stringency of environmental policy.
Dan Zhang, Mingbo Zheng, Gen-Fu Feng, Chun-Ping Chang	2022	Does environmental policy bring green innovation to renewable energy?	Restrictive environmental policies increase renewable energy production. Studies also show that strict environmental policies bring "green innovation".
C. Albulescu, M. Boatca-Barabas, A. Diaconescu	2022	Asymmetric impact of environmental policy stringency on CO ₂ emissions in OECD countries.	Pursuing strict environmental policies is more effective in countries with lower greenhouse gas emissions.
Yingde Hu, Wensong Bai, Muhammad Farrukh, Chun Kwong Koo	2023	How does environmental policy uncertainty affect green business investment?	The study found that environmental policy uncertainty can significantly inhibit companies' green investments.

Source: own elaboration based on: (Kwon, Lee, 2018; Almeida Neves, Cardoso Marques Patricio, 2020; Wolde-Rufael, Mulat-Weldemeskel, 2021; Zhang, Zhang, Feng, Chang, 2022; Albulescu, Boatca-Barabas, Diaconescu, 2022; Hu, Bai, Farrukh, Koo, 2023).

Among Polish scientists, there is also interest in environmental policy issues - these are mainly: studies on environmental taxes, surveys of opinions regarding Poland's climate policy, a study of the importance of environmental policy in the context of ecological innovation, and analysis of national and international environmental legislation- see Table 2.

Table 2.*Research in the area of environmental policy - Polish authors*

Authors	Year	Research topics	Applications
A. Baran	2024	Environmental governance in the European Union – an overview of environmental policy actions	The article reviews the most important environmental management activities in the European Union by reviewing European policies, programs and regulatory frameworks, and identifies issues of concern in this area.
M. Paradowska, J. Platje, A. Suchecka	2023	Polish climate policy in the opinion of young Poles – pilot survey	The results showed respondents' awareness and relatively high interest in the risks of climate change, but lacked in-depth knowledge of climate change, climate policy and its socioeconomic implications. The advancement and effectiveness of climate policy in Poland was also rated rather negatively.

Cont. table 2.

J. Godawska	2024	Impact of environmental taxes on NO _x and SO _x emissions	The results show that revenues from environmental taxes have a negative and statistically significant, but rather symbolic, effect on SO _x emissions, while these revenues have no effect on NO _x emissions.
J. Godawska	2024	Does environmental policy matter for eco-innovation? Evidence from EU countries	The higher rigor of technological support and market instruments has a positive impact on patents related in EU countries.
R. Marushkin, J. Bednarek	2024	Climate protection in European Union law and in Polish law	The article discusses the provisions on climate protection contained in acts of European Union law and in Polish law.
K. Tomaszewski	2024	Global Climate Policy and Religion – the Case of Pope Francis	The fusion of political and religious activities contributes to the promotion of environmental and climate goals and the growth of public awareness
W. Szymański, J. Węgrzyn	2024	Fiscal efficiency of the green transformation of the tax system on selected examples of European Union Member States	The authors indicate that the most appropriate group of taxes that can be an effective instrument to support the green transformation policy are indirect taxes.

Source: own elaboration based on: (Baran, 2024; Paradowska, Platje, Suchecka, 2023; Godawska, 2024a, 2024b; Bednarek, Maruszkin, 2024; Tomaszewski, 2024; Szymański, Węgrzyn, 2024).

3. Characteristics of the research material

The initial dataset for the analysis of spatial variation in environmental policies pursued by European Union countries in 2018-2021 included all values of environmental and environmental policy indicators for the 27 European Union countries available in the Eurostat database.

Due to the large number of variables, substantive verification was carried out. Variables were divided into those that show the specific actions of governments (financial and non-financial) in the area of environmental policy and those that are the result of such actions - the selection was made from among the variables that define the actions of public authorities - examples of variables that were analyzed in the selection process are presented in Table 3.

Table 3.

Environmental policy actions and their effects - analysis of sample variables

Variable	Variable that determines the actions of the public authority in the area of environmental policy	Variable determining the effects of environmental policy	Comments
Net per capita greenhouse gas emissions (financial)		X	The volume of greenhouse gas emissions from the so-called "Kyoto basket" is the result of the environmental policy adopted

Cont. table 3.

Average air temperature (non-financial)		X	Climate change is the result of environmental measures taken
Share of protected areas in the country's area (non-financial)	X		The creation of legally protected areas is part of the environmental policy of the state and the EU and can contribute to more effective environmental protection in the future and to counteract environmental degradation
Average electricity price per kWh (financial)	X		The price of energy for households is an element of regulation at the national and European level, which can influence the decisions of consumers energy in the context of choosing more ecological (usually cheaper) energy source.
The amount spent from the national budget to contribute to the international commitment of \$100 billion a year to finance activities related to combat climate change under the United Nations Framework Convention on Climate Change per capita (financial)	X		The contributions are part of the governments' global environmental policies showing commitment to the process.
Share of revenue from environmental taxes as a percentage of GDP (financial)	X		The environmental tax policy adopted is part of a "penalty and incentive system and incentives," which is designed to change the behavior of taxpayers.

Source: own elaboration based on: Eurostat (2024).

Environmental policies pursued by individual EU countries were characterized by the following variables after substantive analysis:

- X₁ - Average price of electricity in euros per kWh, including taxes and fees in effect in the first six months of the year for medium-sized households (annual consumption of 2500 to 5000 kWh) in 2018-2021 - financial type variable.
- X₂ - Share of environmental tax revenues¹ in GDP - average value in 2018-2021 - financial type variable.
- X₃ - State budget expenditures on environmental protection as % of these expenditures in total state budget expenditures - financial type variable.
- X₄ - Nationally designated protected areas and Natura 2000 sites, as a percentage of protected areas in the national area - average value for years 2018-2021 - non-financial variable.

¹ Environmental taxes are in this case: energy taxes, taxes on means of transportation, taxes on emissions/owned resources.

X₅ - The total amount disbursed from the annual state budget for the international commitment of \$100 billion per year to finance climate change measures under the United Nations Framework Convention on Climate Change per capita in 2018-2021 - a financial type variable.

X₆ - Employment in the environmental goods and services sector, as a percentage of the employed in the sector relative to the country's active workforce - average value for 2018-2021 - non-financial variable.

The possible reduction of variables in the first phase was based on an analysis of their variability, and in the next phase the basis for the selection of diagnostic features was a matrix of correlation coefficients.

Table 4.
Coefficients of variation of diagnostic characteristics

Diagnostic features	Volatility factor
X ₁	29,40%
X ₂	27,50%
X ₃	38,87%
X ₄	38,42%
X ₅	146,49%
X ₆	47,60%

Source: own elaboration.

In the first phase of reducing the set of diagnostic characteristics, the task was to eliminate quasi-constant variables. In the adopted set of variables, the average value of the coefficient of variation was 54.71%. Thus, the value of this coefficient exceeded the critical value of 10% for all selected 6 diagnostic features - see Table 4.

The further part of the selection procedure was aimed at eliminating variables yielding similar information and was carried out using the parametric method. The critical value of the correlation coefficient was taken as 0.7. The parametric method used allowed to select the final list of representatives on the basis of the matrix of modules (absolute values) of correlation coefficients - see Table 5.

Table 5.
Matrix of moduli of correlation coefficients between diagnostic features

Variable	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
X ₁	1	0,22628	0,23055	0,215854	0,507522	0,027404
X ₂	0,22628	1	0,159891	0,114942	0,306229	0,128501
X ₃	0,233055	0,159891	1	0,236163	0,13058	0,289398
X ₄	0,215854	0,114942	0,236163	1	0,076955	0,155462
X ₅	0,507522	0,30623	0,136058	0,076955	1	0,313278
X ₆	0,027404	0,1285	0,289398	0,155462	0,313278	1

Source: own elaboration.

In the analysis of financial and non-financial aspects of environmental policy of community governments, the final group of diagnostic characteristics includes a total of the following six variables: X₁, X₂, X₃, X₄, X₅, X₆. These were used to determine the number and composition of the segments of countries with similar environmental policies in 2018-2021.

4. Grouping EU countries according to their environmental policy using the Ward method

Based on the research carried out so far, the particular usefulness of the Ward method of one of the many possible methods of cluster analysis is confirmed, which is included in the group of hierarchical methods. Clustering by Ward's method consists in combining into clusters (groups) those objects that, when combined into a single cluster, ensure the minimization of the sum of squares of the deviations of all elements from the center of gravity of the new cluster they formed. Thus, it can be said that this method involves grouping those objects that cause the smallest increase in variance in all the clusters formed, and thus ensure the greatest possible homogeneity of the clusters formed (Gatnar, Walesiak, 2004). The clustering procedure was preceded by standardization of variables, available in the Statistica 13 package, and was carried out according to the formula (Zalewska, 2017):

$$u_{ij} = \frac{x_{ij} - \bar{x}_j}{S_{x_j}},$$

where:

x_{ij} - empirical value of the j -th variable in the i -th country,

$\bar{x}_j$ - arithmetic mean of the j -th variable,

S_{x_j} - standard deviation of the j -th variable.

As a measure of similarity between objects, the Euclidean distance, calculated according to the formula (Zalewska, 2017), is most often used here:

$$d(x, y) = \sqrt{\sum_{i=1}^p (X_i - y_i)^2}$$

Euclidean distances are heavily influenced by differences in units between the dimensions from which distances are calculated. Therefore, the standardization of variables carried out beforehand is necessary in order to have data of comparable scale (Statsoft, 2024). The result of the study is a dendrogram, which is a graphical interpretation of the results obtained - see Figure 1.

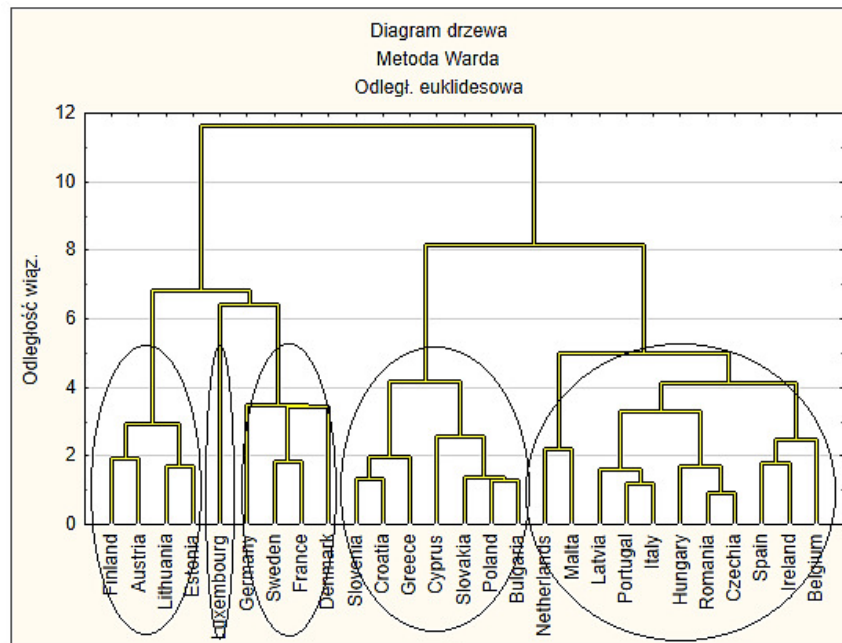


Figure 1. Dendrogram of hierarchical cluster analysis using Ward's method.

Source: own elaboration.

An important part of the cluster analysis is the dendrogram cutoff, allowing to determine the number of clusters in the analyzed study. The following six groups of countries were obtained from the Ward clustering procedure based on the evaluation of the amalgamation curve (see Figure 2):

- A Luxembourg.
- B Austria, Estonia, Finland, Lithuania.
- C Denmark, France, Germany, Sweden.
- D Bulgaria, Croatia, Cyprus, Greece, Poland, Slovakia, Slovenia.
- E Belgium, Czech Republic, Hungary, Ireland, Italy, Latvia, Malta, Netherlands, Portugal, Romania, Spain.

Hierarchical methods of cluster analysis, which include the Ward method applied in the study, allow to divide objects into groups, but do not give a clear answer to the question how to determine their optimal number. The basis for assessing the correctness of the clustering carried out is the analysis of homo- and heterogeneity of the groups. In order to be able to check the correctness of the obtained solution, the evaluation carried out in terms of homogeneity of groups and diversity between them, can be carried out on the basis of simple measures. These include such parameters as the average or maximum distance between objects in a given cluster, the average or minimum distance between groups.

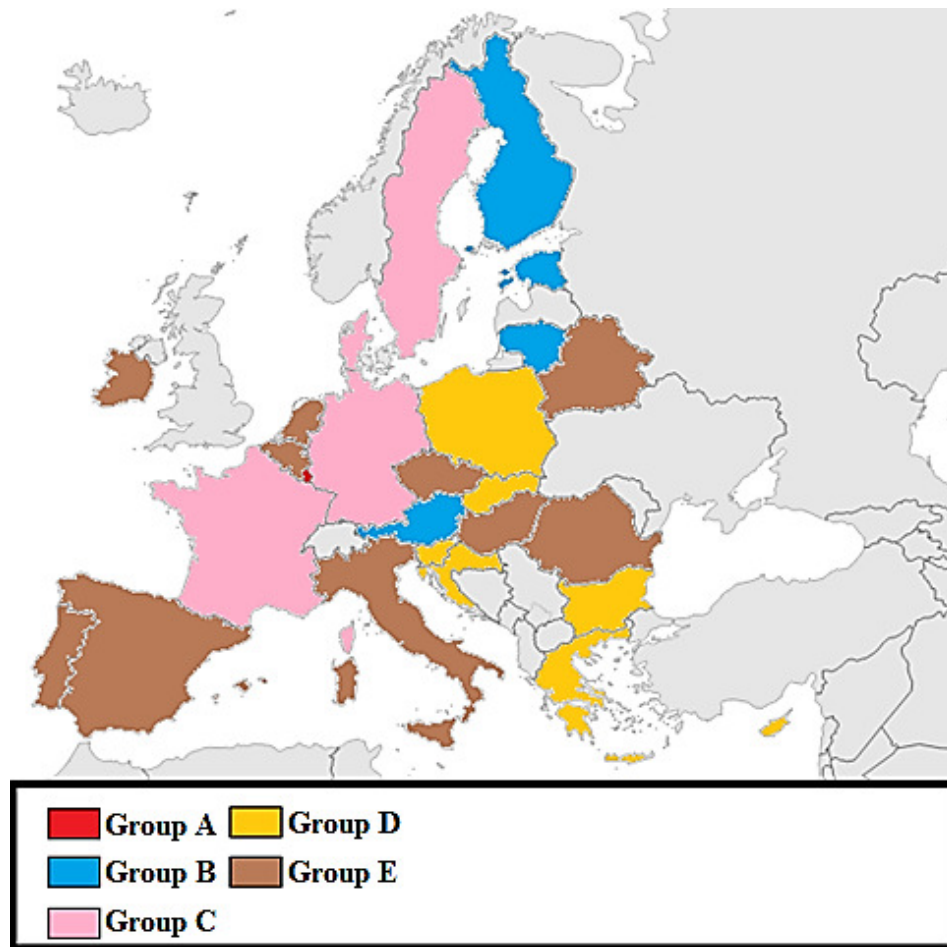


Figure 2. Grouping EU countries based on their environmental policies using the Ward method (2018-2021).

Source: own elaboration.

However, a fundamental shortcoming of these measures is the difficulty of establishing a critical value to determine what results can be considered satisfactory. Among the measures for assessing the homogeneity of the groups formed, measures based on the analysis of variance, such as the F test of the variance quotient, attract attention first of all. The results of this test indicate that of the six variables analyzed, four (at a significance level of 0.05) significantly differentiate the separated groups of countries - see Table 6.

Table 6.

F-test values and mean values of variables in groups of countries separated by Ward's method

	The mean values of the variables in each group						
	Groups						
Diagnostic feature	A	B	C	D	E	F-test value	p-value
X_1	0,186	0,16	0,247	0,152	0,187	2,61970187	0,062656
X_2	1,57%	2,38%	2,31%	3,16%	2,36%	2,74071413	0,054527
X_3	2,15%	1,04%	1,19%	1,70%	2,00%	2,96933914	0,042070
X_4	55,80%	20,13%	23,83%	38,44%	21,96%	16,1598749	0,000003
X_5	65,83	13,35	72,74	0,57	8,79	28,6266701	0,000000
X_6	6,77%	4,32%	2,67%	2,13%	1,99%	23,8148334	0,000000

Source: own elaboration.

The country grouping shows that in Luxembourg (Group A) in 2018-2021, the average price of electricity was 1.8% higher than the average, the share of revenue from environmental taxes in GDP was 38.2% lower than the EU average, budget expenditures on environmental protection accounted for 29% more of total budget expenditures as in the EU countries on average, the areas covered by environmental protection are 44.2% smaller than the average for all the countries surveyed. Luxembourg is a country that is committed in the implementation of a \$100 billion per year project to combat climate change. Per capita contributions to this effort are nearly 348% of the average. It is also a country where employment in the environmental sector is 255.5% of the average. This is a cluster that diverges from the others both in terms of numbers (it is the least numerous) and values of individual variables. This is primarily due to the peculiarities of the country of Luxembourg. It is a country with the highest value of GDP per capita at purchasing power parity in the EU.

In Group B (Austria, Estonia, Finland and Lithuania) - average electricity prices for households during the period under review were on average 12.6% lower than the EU average. The share of environmental tax revenues in GDP was 6.3% lower than the average among the countries studied. Budget expenditures on environmental protection in the countries of group B were, on average, 3.8% higher than the average among the surveyed countries. Protected areas are 27.8% less compared to the average of the 27 countries in the community. Group B countries are far less committed to the \$100 billion initiative for the environment - their per capita contributions are almost 30% lower than the average. Employment in the environmental sector, on the other hand, is significantly higher as the for most EU-27 countries - it is more than 163% of the average. Group B countries are not homogeneous in terms of the size of GDP per capita at purchasing power parity. They are united by the fact that these countries joined the structures of the European Union in 1995 and 2004. They are countries with a relatively small area (only Finland is larger) and have relatively small population.

In cluster C (Denmark, France, Germany and Sweden), electricity prices for households were 35% higher than the average for the whole community from 2018 to 2021. The share of environmental taxes in the structure of budget revenues was nearly 10% lower than the average for the period under review, while budget expenditures on environmental protection were 20% higher compared to the average for all countries surveyed. The area of the country covered by environmental protection accounted for in Cluster C countries 13.4% less than the EU-27 average during the period. Countries in cluster C are heavily involved in the \$100 billion per year initiative for climate protection. Their per capita contributions to this goal are nearly 385% of the average. Countries within Cluster C are characterized by high level of GDP per capita at purchasing power parity - all above the EU average - Denmark, Sweden and Germany are among the most prosperous European countries.

In cluster D (Bulgaria, Croatia, Cyprus, Poland, Slovakia, Slovenia), electricity prices were 16.6% lower than the average for all countries EU over the 2018-2021 period. The share of budget revenues from environmental taxes in total revenues was more than 24% higher than

the average, and the share of environmental expenditures in total expenditures was also higher - nearly 170% of the average. Unlike the other clusters, Group D is characterized by an above-average share of protected areas in the country's total area - in the period under review it was 39.8% higher than the average. In terms of per capita contributions relating to the \$100 billion per year initiative for climate protection, countries in cluster D were characterized by very low values of this indicator - it was only 3% of the EU average. Compared to clusters A, B and C, countries in cluster D also had lower than average employment in the environmental sector. All countries forming cluster D joined the European Union relatively recently, in the 21st century, and are characterized by GDP per capita at purchasing power parity below the EU average.

The last of the designated clusters - E (Belgium, Czech Republic, Hungary, Ireland, Italy, Latvia, Malta, Netherlands, Portugal, Romania and Spain) is the most numerous group - 11 and the least homogeneous. This cluster was characterized by a slightly higher-than-average household electricity price (by 2.3%), comparable with clusters B and C shares of environmental tax revenues in generated GDP (92.9% of the average). Expenditures on environmental protection in countries in cluster E were double the EU-27 average in their budgets. The share of protected areas in the total area of the country was 20.1% lower than the average in the countries constituting cluster E. These countries were also characterized by significantly lower contributions under the \$100 billion per year initiative to combat climate change (46.4% of the average), as well as by 25% lower employment than the average in the community countries in the environmental sector.

5. Summary

The environmental policies of the European Union countries in 2018-2021 were very heterogeneous. In order to be able to group countries in this category, the author selected variables on the basis of data collected by Eurostat, and then applied the Ward method, which is one of the methods of cluster analysis. The aim of the study was to create homogeneous groups with similar characteristics of applied environmental policies - fiscal and non-fiscal. Using the method, 27 countries were divided into 6 clusters. However, the question of the degree of homogeneity of the obtained groups of countries remains a subject of discussion. The results of the F test of the variance quotient show that it was not possible to achieve complete homogeneity of the groups formed. In practice, it is very difficult to meet this criterion for all variables, and in turn, the separation of more groups of countries would contradict the assumptions of the cluster analysis method. The selection of a set of diagnostic variables, which is always a subjective choice, also remains an issue. Due to the existence of a gap in Polish literature on environmental policy, the author plans to conduct further research and expand the presented issues using other statistical methods.

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ECONOMIC ORTHODOXY AND CRISIS IN THE 21ST CENTURY

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Purpose: The paper aims to identify and critically assess theoretical and practical aspects of economic orthodoxy in euro area in the context of the global financial crisis.

Scientific gap: Most studies stick to either theoretical or practical aspects of the current version of capitalism. This paper aims to fill this gap. The paper also tries to enliven the debate on the socio-economic performance of the EMU peripheral countries over 16 years after the collapse of Lehman Brothers.

Design/methodology/approach: Philosophical discussions and critical assessment of literature, comparative studies, case study/ historical and institutional approach.

Findings: Economic policy conducted in the euro area after the collapse of Lehman Brothers fully complied with neoliberal orthodoxy. In the case of peripheral countries it proved ineffective.

Practical implications: Keynesian policies are better suited to fight with these type of crises.

Originality/value: The paper combines theoretical and practical aspects of global financial crisis in the EMU. It is addressed to scholars, students and a wider audience interested in economics.

Keywords: global financial crisis, euro area, neoliberalism, the peripheral countries, austerity.

Category of the paper: conceptual paper and case study.

1. Introduction

More than 16 years passed since the collapse of Lehman Brothers in September 2008 which marked the symbolic beginning of the global financial crisis. It was the biggest financial crisis since the Great Depression of the 1930s. Hence, the recession that followed the turmoil in the financial sector in the US and later in European countries was dubbed Great Recession. It is beyond doubt that “Europe was long headed for economic stagnation because of its embrace of the neoliberal economic model that undermined the income- and demand-generation process. That stagnation was serially postponed by a number of developments, including the stimulus from German re-unification and the low interest rate convergence produced by creation of the euro” (Palley, 2013, p. 48).

The first part of the paper focuses on the theoretical aspects of the current neoliberal paradigm. The second part investigates the economic situation of selected ‘peripheral’ European countries before, during and after the crisis. This part demonstrates that the orthodox policy of internal devaluation and drastic austerity measures extend socio-economic woes in these countries.

2. Neoliberalism as a new paradigm

‘The term neoliberalism, in the modern sense, probably appeared for the first time in 1925 in a book entitled *Trends of Economic Ideas*, written by the Swiss economist Hans Honegger’ (Plehwe, 2009, p. 10). In the 1930s the neoliberalism was propagated by a loose group of economists, philosophers, and sociologists located in Paris who organized the Walter Lippmann Colloquium, while after the Second World War its influence was reinforced by establishment of the Mont Pèlerin Society (MPS) at a conference organized by Friedrich August von Hayek in a village close to Lake Geneva in April 1947.

As noted by Ratajczak (2021, p. 20) only several years after Richard Nixon’s famous speech ‘we are all Keynesians now’ in 1971 ‘took place a radical turn in the direction to what is popularly described by the term neoliberalism, the emanation of which in scientific sphere was the creation of the so called mainstream economics which was related to liberal tradition of neoclassical economic’. In fact, already “on August 15, 1971, the U.S. President Richard Nixon stunned the world by closing the gold window (ending the ability of foreign central banks to convert their dollar holdings into gold) and slapping a 10 percent surcharge on imported goods” (Irwin, 2012, p. 1). ‘The U.S. decision to suspend gold convertibility ended a key aspect of the Bretton Woods System. The remaining part of the system, the adjustable peg disappeared by March 1973” (Bordo, 2017, pp. 24-25).

According to Harvey (2005, p. 2) ‘neoliberalism is in the first instance a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade’. Mirowski (2013, p. 42) notes that ‘David Harvey propounds the Marxist position that it is straightforwardly a class project masked by various versions of “free market” rhetoric. For him, the ideas are far less significant than the brute function of serving the interests of finance capital and globalized elites in the redistribution of wealth upward’. Philip Mirowski and Wendy Brown share the view that ‘neoliberalism became a “constructivist” project, no matter how much it was a term against which Hayek often railed (Mirowski, 2013, p. 41). Indeed, economic capitalism becomes progressively unmoored from any social principles and financial profit becomes an end in itself, mainly via the use of debt as a weapon’ (Crockett, 2021, p. 2).

According to Söderbaum (2019, p. 192) “the present kind of capitalism is largely made legitimate through the domination of neoclassical economics as economics paradigm and neoliberalism as ideology”. He also claims that neoclassical economics and neoliberalism are not totally separate but rather overlapping. Mainstream is a neoclassical school comprising neoclassical orthodoxy, welfare economics, monetarism, public choice theory, supply-side economics and New Institutional Economics (Czaja, 2012). Mainstream (orthodoxy) has been going in the direction of the New Neoclassical Synthesis which merges the classical and New Keynesian elements. The latter substantially differs from Post-Keynesian heterodox school. This implies that neoliberalism is a dynamic and in certain spheres flexible system which has the ability to adapt to challenges faced in real capitalist economy.

Macher (2023, p. 2) utilizes the Lacanian psychoanalytical concept of fantasy to maintain that “neoliberalism revolves around a central fantasy narrative, in which the “free market” functions as the crucial object of desire, constructed as uniquely able to deliver transcendental freedom, order, and material prosperity. Further, the neoliberal fantasy determines a priori that all historical and material progress is necessarily a result of the free market, and that any failings can be blamed on its binary opposite, the transgressive state”.

In most cases, this criticism is unfounded as the main causes of crises in the last 40 years are deregulated financial markets which breed speculation and massive asset price bubbles. Such events can be explained by the Minsky crisis (not by orthodox efficient market hypothesis).

“Mainstream economics reduces “society” to being an aggregation of individuals who act purely out of individual self-interest (i.e. maximising their own personal utility) and are basically identical (both ethnically and psychologically). As such it cannot explain the historical variety in social provisioning systems – production and consumption patterns – throughout history and across contemporary cultures” (Spash, Guisan, 2021, p. 208). In this atomistic environment comprising of identical representative agents there is no place for power relations.

In real life, however, production could be dominated by oligopolies or even monopolies, while individuals are highly varied for example in terms of wealth, earnings, education, etc. Generally, ahistoricism is a typical feature of economic mainstream. In neoclassical economics and neoliberalism historical aspects are marginalized and the maxim “life's teacher” is ignored (Pysz, 2013, p. 506).

This could prove instrumental for maintaining fantasy or myth that suits advanced economies and multinational companies. Thus, colonization of the Global South, profiting from slave labour or the environmental damage resulting from industrialization (deforestation, elevated greenhouse gas emissions¹, etc.) could be forgotten.

¹ Greenhouse gas emissions per capita in a number of African countries for decades have been even ten times lower than in European advanced economies. Interestingly, according to the UN data from 1970 till late 2010s net greenhouse gas emissions per capita in the Netherlands and Germany were higher than in Poland.

Underlying neoliberal orthodoxy, in turn, focuses mainly on future in order to portrait itself as progressive force building unified, smoothly-functioning modern society. Individualism and ahistoricism is fully consistent with Margaret Thatcher's political philosophy according to which 'there is no such thing as society' (Thatcher, 1987) what marked an important and debatable break with the one-nation conservatism of her predecessor (Campbell, 2011). Shortly after becoming British Prime Minister M. Thatcher declared (Thatcher, 1981): Economics are the method; the object is to change the heart and soul'.

The evolution of new neoclassical synthesis and neoliberalism was further reinforced by the fall of communism and the Washington Consensus which cemented the dominance of capitalism based on the deregulation of markets, privatisation, the increasing role of financial sector and changing anti-trust laws in favour of big companies. The Second Chicago School carried further the antipathy of the First toward government involvement in the marketplace, rejecting any antitrust policy beyond a prohibition of collusion and mergers to monopoly or near-monopoly (Posner, 1979, p. 928), rejecting government regulation of natural monopoly, and certainly rejecting public enterprise (Martin, 2007). Posner (1979, p. 932) also writes that opposition to cartels was "partly, perhaps, for tactical reasons (not to seem to reject antitrust policy in its entirety)"². Employment and wages, by contrast, "are only assessed as a category of costs (which should be reduced), not as a way of boosting demand, social justice and social welfare" (Polak, 2012, p. 198).

The inclusion of the new Keynesian school into the orthodoxy was possible only because it accepted key elements of monetarism and new classical macroeconomics. As labour market need not clear and small transaction costs result in significant monetary nonneutrality, changes in monetary policy, even if expected, may result in changes in equilibrium output and employment (Ball, Mankiw, Romer, 1988, p. 66). New Keynesians do give much greater weight to the stabilizing role of the monetary policy compared to the old Keynesian view, hence New Keynesian school could also be dubbed 'new monetarist economics' (Mankiw, Romer, 1991; De Long, 2000).

New Keynesians do not hold a unified view on the desirability and feasibility of activist (discretionary) stabilization policy (Snowdon, Vane, 2005, p. 364). At the same time, they advocate rough tuning (as a response to massive changes of production and employment and, above all, to the bursting of the asset price bubble) rather than fine tuning. Neoliberalism rejected the idea of smoothing business cycle via market demand (Sadowski, 2014, p. 153) what provides an opportunity for implementation of modernization doctrine based on shock therapy (Szydło, 2014). Therefore, the mop up strategy – the massive injection of liquidity in order to avert economic catastrophe (Issing, 2009) is consistent with economic orthodoxy.

² Adam Smith (1776), in contrast, harshly criticized monopolies.

Consequently, big companies may expect to be bailed out as they are ‘too big to fail’. This type of government or central bank intervention is wholly legitimated by the orthodoxy, unlike Keynesian or Post-Keynesian-type fiscal policy focusing on boosting effective demand by public works or its modern incarnations like the so-called helicopter drop. In effect, neoliberalism is a system that socializes costs and privatizes profits (Berger, 2017).

Systemically vital companies amass high profits during boom years while in the rainy days (during crises) benefit from hefty bailouts from government or central bank. Crises, as in the case of global financial crisis, are often referred to as Black swan (i.e. extremely rare) events, therefore massive bailouts of private companies by central banks and government are either silently accepted or after sufficient time-lag intelligently criticised for being the (old) Keynesian-type intervention. In this context the definition of neoliberalism as an “extreme business and market ideology” (Söderbaum, 2019, p. 192) is not precise as it does not take into account an active role of government, central bank and other public institutions in propping up big business especially at the time of crisis.

It is hard to escape the obvious conclusion that “neoliberalism is not just an economic theory or policy approach, but a coherent system of economic ideas and economic, social, and political institutions, as well as a particular form of the capital-labor relation and of relations within capital” (Kotz, 2015). More precisely, ‘neoliberalism is a new stage of capitalism (...) [which] expresses the strategy of the capitalist classes in alliance with upper management, specifically financial managers, intending to strengthen their hegemony and to expand it globally (Duménil, Lévy, 2011, p. 1).

4. Neoliberalism and crisis

As markets are allegedly ‘free’ and self-regulating there is little room for public institutions to assess possible excesses in these markets. National statistical offices and mass media are preoccupied with public sphere, particularly budget deficits and public debts. The existence of other types of debt such as private company debt (both non-financial and financial companies) and household debt for years were not present in popular debate. According to this rhetoric rising private debt is a natural phenomenon, such as natural unemployment rate.

To illustrate this point it is worth quoting Alan Greenspan who served as the 13th chairman of the Federal Reserve from August 1987 to January 31, 2006 – the second-longest tenure in the position (Friedman, 2008): ‘generally I do not recollect a decade free from fear connected with rising household and company debt. These types of anxieties ignore fundamental fact of the contemporary life: in market economy rising indebtedness goes hand in hand with development’. Greenspan maintains that ‘debt will almost always rise relative to incomes so long as we have an ever-increasing division of labor and specialization of tasks, increasing

productivity and a consequent rise in both assets and liabilities as a percentage of income. Thus, a rising ratio of debt to income for households, or of total nonfinancial debt to GDP, is not in itself a measure of stress' (Greenspan, 2007)³.

Already on August 9, 2007, shortly after the publication of the Greenspan's book, 'traders in New York, London, and other financial centers suddenly faced a dramatic change in conditions in the money markets' what was qualified as one of those highly unusual "black swan" events (Taylor, Williams, 2008, p. 1). The situation further deteriorated what led to the collapse of the Lehman Brothers on September 15, 2008.

Little regard to private sector nonfinancial debt proved to be a serious mistake. In 19 European countries this kind of debt jumped over 30% of GDP in 2000-2008, while in 13 countries it shot up by over 50% of GDP. At the same time, only in one country (namely Portugal) the public debt increased by more than 20% of GDP in the same period. In many peripheral countries (Ireland, Spain, Cyprus) and Central and East European countries (such as Bulgaria, Croatia, Czechia, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) public debt was well below the Maastricht treaty threshold of 60% of GDP. This did not insulate these countries from the global financial crisis. The majority of once very popular debt clocks were and still are merely public debt clocks. It is a clear display of the neoliberal fixation on public debt. It is entirely consistent with the neoliberal fantasy narrative according to which the government and public sector as a whole are to blame for the crisis (the government failure narrative). At the same time, market failures are not at all recognized. In fact, the expansion of both public and private debt serve the financial markets which are favoured by neoliberal doctrine. The budget surpluses in the US at the turn of the century were cause for concern as they could lead to the diminishing of the bond market and falling effectiveness of central bank's short term interest rate policy. In contrast, higher debt to GDP ratios usually translate to higher costs of servicing debt and higher profits of banks and financial market. In consequence, the power shifts from indebted governments and non-financial private sector to the financial sector.

According to the popular narrative neoliberal policymakers aim at lowering public debt. The performance in this sphere in the last four decades contradicts this rhetoric. The real focus of economic orthodoxy is to cut taxes for the rich, safeguard access to tax havens (despite massive scandals such as Panama papers and Pandora box) and maintain sufficiently large market for government bonds which jointly provide ample investment opportunities for the rich. The existence of relatively high public debts is an inherent feature of neoliberal system. However, orthodoxy is very successful in portraying high budget deficits and public debts as a consequence of ostensibly excessive welfare spending.

³ Greenspan (2007) notes that nonfinancial debt includes the debt of households, businesses, and government but excludes the debt of banks and other financial intermediaries.

The process of financialization (excessive growth of the financial sector) is characteristic of the current neoliberal system. Within macroeconomic modelling in the 1990s, central bank activity came to be represented solely by an inflation target pursued by control of the official interest rate by an independent central bank (Crowe, Meade, 2007; Cukierman, 2008). This ‘new consensus’ approach to the theory of central banking shared with its predecessors (i.e. Monetarist and then New Classical theory) a neutral-money (closed-system) ontology (Fontana, 2007). ‘Within this approach, money is simply a technical input into exchange, financial, markets are efficient, inflation is a monetary phenomenon and it is in the power of central banks to control it’ (Dow, 2017, p. 1541). ‘The central bank managed the creation of liquidity with the objective of sustaining the continuous increase in asset values; it also assured the viability of the ‘shadow’ banking system and financial intermediaries’ (Bellofiore, 2013, p. 501). This was fully compatible with the originate-to-distribute model conducted by banks and other financial institutions leading to the unprecedented creation of complicated derivatives (ABSs, MBSs, etc.) and expansion of derivative markets. ‘Through Greenspan, quantitative monetarism stepped down, being replaced by a policy where money was made available in unlimited amounts at any interest rate established by the central bank. The money supply became flat and was finally recognised as endogenous even within the mainstream’ (Bellofiore, 2013, p. 501).

Indeed, the orthodox money multiplier model is nowadays discarded not only by Post-Keynesians but also central bank economists. Hence, the neoliberal concept of exogenous money becomes obsolete as money is endogenously and *ex nihilo* created by banks. Yet, higher private debt levels strengthen the power of a central bank to shape disposable incomes of indebted households and companies and thus enable it to target inflation by manipulating interest rates. The orthodoxy, however, has problems with imported cost inflation as during recurrent commodity prices booms in the 21st century. The effectiveness of ultra expansionary monetary policy proved very limited. Several years after the collapse of Lehman Brothers R.C. Koo (2013) noted ‘today private sectors in the US, the UK, Spain and Ireland (but not Greece) are undergoing massive deleveraging in spite of record low interest rates. This means that these countries are all in a serious balance sheet recessions. The private sectors in Japan and Germany are not borrowing, either. With borrowers disappearing and banks reluctant to lend, it is no wonder that, after nearly three years of record low interest rates and massive liquidity injections, industrial economies are still doing so poorly’.

Orthodox economists entered the Global Financial Crisis with a conviction that monetary policy was nearly omnipotent in its capacity to achieve macro stabilisation. Fiscal policy was seen as irrelevant (Fiebiger, Lavoie, 2021, p. 55). The crisis in the European Monetary Union (EMU) shows that fiscal policy was, in fact, pro-cyclical, especially in the peripheral countries. The austerity measures favoured by the Troika (the consortium of the European Commission, the ECB and the IMF) deepened and prolonged recession.

During the global financial crisis and subsequent Great Recession in Europe neoliberals coined the term ‘debt crisis’ to indicate that the crisis was caused by excessive public debts in the EU peripheral (especially South-European) countries. This explanation, however, does not stand to facts as high public debts were generally the consequence of the global financial crisis not its causes. Greece with its public debt at 109.4% GDP in 2008 has been perceived as a perfect example of fiscal profligacy. The country of 10.4 million inhabitants has been accused of causing the crisis in the Eurozone or even in the EU (with the current population of 448.8 million). Along with four other EMU peripheral countries it was stigmatized by a number of economic commentators (mostly from the core countries) who devised acronym PIIGS referring to Portugal, Italy, Ireland, Greece and Spain.

The medicine administered by the Troika was internal devaluation and harsh austerity measures. Typical improvement of competitiveness via external devaluation was not possible as the countries in crisis remained in the euro area. Keynesian or Post-Keynesian policy to boost demand in order to end recession was also rejected. Austerity turned out to be the only option under neoliberal regime. The consequences for most peripheral countries were dire.

It is clear that neoliberals avoid the problem of rising private sector debt (i.e. the debt of households and private companies⁴) and prefer to put the blame for various crises on ostensibly rising public indebtedness. High household indebtedness is instrumental in keeping labour in check (reduces bargaining power of workers). It also reinforces the effectiveness of central bank short term interest rates to stabilize inflation, especially when it is affected by demand-side factors (for example high demand caused by sudden surge of household incomes). Under neoliberalism the power is skewed in favour of capitalists, either directly or indirectly (i.e. via public institutions), at the cost of labour. In such an environment, the work by Polish Post-Keynesian economist M. Kalecki which deals with “the general case of imperfect competition, without assuming any particular market structure” (Szyborska, Toporowski, p. 109) proves invaluable. Lavoie (2015, p. 59) points out that Kalecki “has stressed the importance of excess capacity, arguing that firms would not be operating at full capacity utilization, even in the long run.” This stands with stark contrast with the economic orthodoxy which takes pride in creating mass consumption society (especially in developed countries) and at the same time criticises the population for creating various crises (environmental, economic and financial).

For neoliberals, as well as for the Austrian school (Krasiuk, 2014, p. 146), the labour market should be flexible. New Keynesians prefer to use the term ‘NAIRU’ (non-accelerating inflation rate of unemployment) concept, rather than Friedman’s ‘natural rate’ when discussing long-run unemployment. NAIRU ‘takes into account inertia in the system which allows a protracted response of the economy to various economic shocks’ (Snowdon, Vane, 2005). This persistence of high unemployment could be complementarily explained by ‘hysteresis’ theories which state

⁴ Private companies comprise non-financial and financial companies.

that the natural rate of unemployment or NAIRU partly depends on the history of the equilibrium rates. Hence, the return to equilibrium in the labour market at NAIRU with hysteresis effects takes much longer time than according to natural rate hypothesis. Potentially higher social costs of various shocks (including disinflation policies) are well recognised by economic orthodoxy. This does not change the neoliberal priority to keep inflation low, rather than actively fight with (persistently) high unemployment as in the case of Greece and Spain.

‘The inability of the governments of the member states to coordinate a policy response that could serve the interests of the people of the Eurozone as a whole has been the key reason for the abysmal performance of the Eurozone economy, and the unbalanced distribution of crisis-related costs among different member states’ (Orphanides, 2014). Undoubtedly, the Deauville meeting on 18 October 2010 shows a lack of coordination between top policymakers in the EMU. In consequence the long term-treasury bond spreads increased exponentially in peripheral countries (especially in Greece). Already in 2012 Pitelis (2012, p. 84) claimed that “there is now a widely held view among many Greeks that the apparent lack of vision by European leaders may be better explicable in terms of them aiming to establish economic spheres of influence – of the neo-economic colonialism type, revanchist policies by Germany, and buying the country on the cheap (the Greek stock market lost 51.88% of its value in 2011, and 10% of the Greek telecoms company was already purchased by a German company for a fraction of its recent past price)”. Tooze (2018) describes Deauville as Europe’s “Lehman moment”. Hence, it was practically impossible to reduce public debt to GDP ratio in peripheral countries (table 1) as numerator was boosted by mounting costs of servicing debt (especially after the Deauville meeting), while denominator was decreasing due to prolonged recession. The core countries such as Germany and the Netherlands did not have these problems. Young (2015, p. 79) claims that “there is little hope that the ordoliberal values and ideas still dominant in the Bundesbank and the Federal Ministry of Finance will shift to a more Keynesian type of demand-led growth model”. It could be reasonably argued that “the EMU constituted at Maastricht embodied a neoliberal theory of interstate federalism. Most eloquently elaborated by Hayek in 1939, this constitutional imaginary seeks to narrow the confines of governmental capacity with regard to economic affairs at all levels of government” (Lokdam, 2023, p. 296). Hence, the dominance of monetary policy conducted by the ECB over fiscal policy performed by individual countries.

Table 1.
General government gross debt (Percent of GDP)

	CYP	GRC	ITA	PRT	ESP	AUT	DNK	DEU	NLD	SWE
2008	44.1	109.4	105.8	75.6	39.6	68.7	33.2	64.6	54.4	37.7
2019	93.0	185.5	133.6	116.6	97.6	70.6	33.8	58.6	47.6	35.7
2024	70.6	159.0	136.9	94.4	102.3	78.7	28.2	62.7	44.3	36.4

Note: Peripheral countries in bold.

Source: IMF.

Generally, the economic growth in the euro area has been unsatisfactory since the collapse of Lehman Brothers. Between 2008 and 2024 the real GDP grew by 15% in Spain, 16.4% in Germany and fell by 17% in Greece. In contrast, it increased 39% in the US, 54% in Romania and 75.8% in Poland. Therefore, the average annual GDP dynamics amounted to mere $g_{\text{Spain}}=0.83\%$ in Spain and more pronounced $g_{\text{Poland}} = 3.37\%$ in Poland.

Table 2.

GDP per capita, constant prices (purchasing power parity; 2017 international dollar). Pre-crisis peaks in 2007 or 2008

	2007	2008	Above peak after (years)	Change (%) since peak pre 2020	Change (%) since peak pre 2020
CYP		45722.76	8	2.68	15.21
GRC	41967.37		(-)	-21.11	-11.79
ITA	53650.06		17	-6.33	0.04
PRT		37251.19	6	8.16	16.31
ESP	45101.31		7	3.57	7.49
AUT		62653.41	1	5.1	2.6
DNK	63819.71		6	5.4	15.1
FRA	53423.68		4	6.5	8.6
DEU		56854.19	1	11.5	9.8
NLD		64538.92	5	6.7	11.1
SWE	56883.82		2	7.8	11.0
CZE		42352.28	4	17.7	17.8
JPN	42487.34		3	6.2	9.9
KOR		37180.34	no recession	34.3	49.0
POL		25868.89	no recession	48.4	75.6
USA	61170.17		3	13.6	24.6

Source: Author's calculations based on IMF.

Real GDP growth per capita (purchasing power parity; 2017 international dollar) was also very slow (table 2). In 2024 this indicator in Greece was still below the pre-crisis peak in 2007 by 11.79%. It took 17 years for Italy to marginally break the 2007 peak by 0.04%.

For an extended period of time several peripheral countries were in a serious balance sheet recession. Deleveraging deepened the recession. ‘Although shunning fiscal profligacy is the right approach when the private sector is healthy and is maximizing profits, nothing is worse than fiscal consolidation when a sick private sector is minimizing debt’ (Koo, 2013, p. 53). Deleveraging in the EU core economies and the CEE countries did not help the peripheries to boost economic growth. It seems that export-led model was imposed on the whole European Union. However, major importers, such as the US, may no longer be willing to import. This will pose challenge especially for the core countries.

5. Conclusion

Neoliberalism as an all encompassing individualistic and ahistorical ideology and the New Neoclassical Synthesis as an economic orthodoxy complement each other perfectly. On the one hand, the neoliberal framework utilizes attractive, relatively simple and at the same time productive myth of the free market which explains the world for curious non-specialists. On the other hand, orthodox economists are preoccupied with sublime representative agent models which comply with Friedman dictum ‘the more significant the theory, the more unrealistic the assumptions’.

Internal devaluation was the method to solve the crisis in the euro area peripheral countries. Drastic austerity measures were administered by the Troika (which resemble structural adjustment programs imposed on developing countries which apply for a loan from the IMF or the World Bank). Fiscal policy was thus pro-cyclical. This flawed strategy combined with the lack of coordination between top politicians and the ECB (as in the case of the Deauville Franco-German compromise in October 2010) drastically worsened financial and in consequence socio-economic situation in peripheral countries. Expansionary monetary policy also proved ineffective due to deleveraging which contradicts mainstream exogenous money supply theory. Neoliberal policy led to the drastic increase of unemployment.

The core countries continued their self-centred export-led growth strategy which hampered demand for imports of goods and services from the peripheral members of the EMU. Therefore, the South European economies found it more difficult to recover from the crisis. ‘Neoclassical economics and neoliberal doctrine poorly manage complexities of global economy. Inadequate regulation of the financial sector created the problem of financialization. In this situation one can observe the need to change the economic paradigm’ (Mączyńska, Pysz, 2014, p. 243). However, Mączyńska, Pysz (2014, p. 243) correctly maintain that this change will take time given that economics has been subject to neoliberal doctrine for decades. One has to agree with Palley (2013, pp. 49-50) that Europe needs a structural Keynesian model that “can restore full employment with shared prosperity”.

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INNOVATION FOR SUSTAINABLE DEVELOPMENT THROUGH THE LENS OF THOMAS KUHN'S PARADIGM SHIFT

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Purpose: The study investigates a paradigm shift in innovation policy driven by the increasing integration of sustainability principles. Using Thomas Kuhn's theory of scientific revolutions, it examines whether the transition constitutes a paradigm shift.

Design/methodology/approach: The study includes a historical-comparative analysis of EU innovation policy, tracing the transition from traditional neoclassical models to evolutionary and sustainability-oriented approaches and examining how the framing of innovation evolved in response to sustainability-related challenges.

Findings: There has been a shift from growth-oriented to sustainability-oriented frameworks, which displays features of a Kuhnian paradigm change, including anomalies (e.g., climate crisis, inequality), competing research traditions, and redefinition of problem-solving standards. However, the transformation is uneven and coexists with older paradigms.

Research limitations and implications: The study adopts a conceptual approach, which limits the assessment of the extent to which innovation frameworks integrating sustainability goals are implemented in policy and practice. Further research should explore how these frameworks operate in various institutional and national contexts and how they interact with or challenge traditional economic models that continue to support mainstream innovation policy.

Practical implications: A paradigm shift in innovation policy requires adjustments in policy design, evaluation metrics, and funding mechanisms to support innovations that address environmental and social challenges. While the study does not propose specific commercial applications, its findings imply that aligning innovation policy with sustainability goals may influence how enterprises assess value creation, risks, and societal impact.

Social implications: The study contributes to understanding how innovation can support societal transformation beyond economic growth. It emphasises the potential for innovation policy to address systemic environmental and social challenges, such as climate change and inequality. The research may inform public debate and policymaking.

Originality/value: The paper reinterprets Kuhn's framework, highlighting the emergence of sustainability as a transformative force. It is particularly relevant to scholars in innovation policy, economic theory, and sustainability transitions, as well as policymakers interested in understanding the structural changes influencing innovation governance.

Keywords: sustainability, innovation policy, paradigm shift, economic models, Kuhn.

Category of the paper: Conceptual paper.

1. Introduction

High social and environmental costs are prompting humans to accelerate socio-economic systems restructuring (Hepburn et al., 2020; Piketty, 2020). This process is mainly related to the redefinition of the relationships between production dynamics, development, and well-being (Ferrannini et al., 2021). This study examines the departure of innovation policy from traditional economic models in response to sustainability challenges. Specifically, it aims to identify the emerging pattern of innovation policy that aligns with sustainable development and evaluate whether this shift marks a paradigm shift, as defined by Thomas Kuhn. The research seeks to answer the following questions: What characteristics define the paradigm shift in innovation policy towards sustainability? How does this shift reflect broader changes in economic paradigms? What evidence can be drawn from Kuhn's theory? We argue that the paradigm shift in innovation policy towards sustainability represents a fundamental transformation in economic theory from traditional growth-driven models to a more integrative approach focusing on environmental sustainability and social equity. This shift responds to global challenges like climate change and a new scientific approach where innovation is seen as a tool for societal and environmental progress. However, the change has been overshadowed by the parallel presence of older paradigms.

To maintain our reflections within a coherent conceptual framework, we use the concepts presented by Kuhn in the *Structure of Scientific Revolutions*, except for the Postscript, which he wrote seven years later. Although Kuhn refined his theses in response to debates, the original statements retained their explanatory value (Richards, Daston, 2016). We propose, however, some reformulations to consider this study's topic.

We analyse the innovation–sustainability relationship under the framework of Kuhn's paradigm and paradigm shift for his approach to the historical perspective, as it lends meaning to comparisons with past findings (Bird, 2005). Kuhn directs the attention of researchers towards the impact of external factors and human interests on a given phenomenon, alongside internal laws, logic, and human self-reflection. Moreover, his approach to science as a non-linear development sheds new light on the search for scientific truth, creating space for various solutions to research problems in social sciences existing in parallel (Fekete, 2021). Finally, by bringing “revolutionary” changes to science, i.e. paradigm shifts, he helps us better understand problems that cannot be adequately addressed under the old conventions. The “space” Kuhn created for scientific inquiry that extends beyond the theory's core also motivates us to seek a foundation for economic considerations within the Kuhnian tradition. For Madej (2011), for example, this space encompasses the ideological layer, which this researcher considers necessary to understand findings from his paradigm-based research on different phenomena.

Interestingly, while Kuhn (1991) was sceptical about applying his theses to the “human sciences”, his work inspired some studies in social sciences (Barnes, 1982), and economics was among these disciplines (Kindi, 1995). Kuhn points to economics next to psychology as disciplines mature enough to apply the paradigm concept (Fekete, 2021). Fekete (2021), referring to Kuhn's presentation of the differences between natural and humanistic sciences, indicates two main limitations of the applicability of Kuhn's theory to social sciences. First, in the framework of social sciences, researchers do not discover the laws of nature. Second, the subject of social research is unstable. For this reason, the mechanistic or teleological approach substantially reduces the modelled social processes.

This paper is structured as follows: First, we critically read the Kuhnian concepts to transpose his framework into the discussion of innovation and sustainability. Next, we explore the background of dominant innovation economics and its evolution. Finally, by analysing two seminal studies in innovation economics and policy, we track the trends in innovation research and the adjustments that address sustainable development challenges.

2. Adapting Kuhnian concepts: Paradigm and paradigm shift

Of Kuhn's two approaches to “paradigm”, we are more interested in the broader one. The paradigm understood as a discipline matrix includes the exemplar - the element that guides scientists through theory and rules, and the components critical to paradigm shifts. The latter include values, beliefs, and symbols shared by research communities. On the other hand, exemplars are scientific practices, solutions to “puzzles” accepted by research communities. Shared puzzle solutions are the basis of “normal science”, within which scientists model their solutions and perpetuate them in textbooks. This theory becomes a paradigm, which is considered superior to competing theories.

Madej (2011) calls the Kuhn's paradigm “monistic”. He sees the presence of such tight, monistic paradigms in the existing schools of economics. He gives them a “medium rank” in the hierarchy of paradigms he creates. A “large rank he assigns” to a paradigm covering the entire discipline, and “small paradigms” would be about particular scientific problems or research methods in economics. Fiedor and Gorynia (2020) offer another interpretation, highlighting the multifaceted understanding of efficiency in economics, encompassing the relationship between inputs and outputs across various forms of human activity. They take the paradigm as a set of the most important theoretical problems related to the research problem and discuss the parallel functioning of many paradigms as a specific market for approaches or, following H. Koontz (1961), the “theory jungle”.

Shiller (2020) provides a distinctly critical perspective on the mechanism of economic ideas, arguing that ideas in economics, much like epidemics, spread through contagion, destabilising economies as people 'infected' by an idea begin to alter their behaviour. Dembinski (2019) similarly critiques the dominant economic paradigm, noting its reliance on false assumptions of rational behaviour. He laments (Dembinski, 2009) the disconnect between economists' sophisticated abstract models and the reality of economic practice. Let us note that the assumption about the rationality of action became a showcase of economics half a century ago. This can be seen in the phenomenon described by Blaug (2019) in the mid-1970s: the so-called intellectual imperialism of economists. It involves applying economics to non-economic phenomena.

Rapprochement with Kuhn's approach can be seen in Hausner's understanding of cognition in social sciences. In Hausner's *Economics and Social Imaginary* (2020), simple accumulation does not create social knowledge. Hausner brings into play *Institutions and the Environment* by Ostrom (2012), where she formulates, according to her words, the most important observation about the non-existence of universal optimal solutions. Based on her recommendations, Hausner presents two components that define the decision-making situation of the subject: the perception of reality ("Imaginary") and the possibilities.

As Kuhn explains, the paradigm shift is triggered by the emergence of an awareness of the existence of an anomaly and its gradual recognition by scientists on an empirical and theoretical basis. Kuhn sees symptoms of a crisis in the proliferation of versions of a theory and research conducted in competing schools. The resistance to change is so profound that Kuhn sees good candidates for scientific revolutionaries as young scientists not previously associated with the field. The claim plays a vital role in the Kuhnian paradigm shift, stating that the differences between consecutive paradigms are irreconcilable because they cover different problem scopes, methods, and solution standards. Even more, the two traditions of normal science are incommensurable. The paradigm shift means, as Kuhn argues, changes in the criteria based on which the selection of problems and their solution is justified. We could speak of a quantitative anomaly if questions and research problems cannot be answered under the current convention. The appearance of a qualitative anomaly should be associated with a situation where the traditional approach worsens the current state of affairs and threatens economic stability.

The tension between old and new paradigms, when viewed through reinterpretation of Kuhnian concepts, is echoed in a recent systematic review by Weckowska et al. (2025), which observes that actors within innovation systems frequently hold divergent, and at times conflicting, views regarding sustainability challenges, solutions, and the pace or direction of transition.

3. The innovation bias and traditional approaches supporting innovation in the economy

Innovation occupies a central place in economics as one of the primary drivers of economic growth and competitiveness. If we use the division of discourses on innovation presented by Godin (2008), economics recognises innovation as progress. This has its consequences. Researchers have focused mainly on insight into managerial processes, how to acquire innovation capacity, etc. For the less developed, diffusion of innovation has become a measure of the impact of development programmes. Fougère and Harding (2012) find a recreation of the sense of superiority of Western societies in Rogers' *Diffusion of Innovations*, whom they recognise as a pioneer of the sociological approach to innovation.

The existence of innovation bias, but with a different cause, is stated by Nowotny (2006). According to her, we live in pursuit of innovation because it enables us to construct a shared vision of the future. Innovation is good material with the interplay of culture, society, and technology. In the prominence researchers and politicians attached to innovation at the beginning of the twenty-first century, Nowotny sees a way of dealing with an uncertain future.

The innovation-oriented mindset in science can also be rooted in politics. This phenomenon is described by Godin (2008), who illustrates this with economists offering expert services to governments and gathering around think tanks. According to the researcher, financing innovation research is an essential channel through which the impact of politics on science takes place. Godin points to the symbolic shift in names that accompanied this tightening relationship: from "science policy" through "science and technology policy" to "innovation policy" (Godin, 2008, p. 41). Owen (2018) draws attention to the sphere of political artefacts, citing the example of the European Union's commitment to developing the responsible research and innovation framework announced in 2011.

Reflections on development supported by innovation were initiated by neoclassical economists. They endogenised innovation and technological progress in economic models, and the entrepreneur-innovator became an essential element of their approach. The latter, operating in the conditions of free market access and complete information, entirely used the factors of production and favourable conditions to maximise profit (Nelson, 1959; Arrow, 1962).

In the neoclassical model, information equates with universal and readily available knowledge, and enterprises can use it equally. The specificity of knowledge limits the optimisation of innovators' decisions and profits. Therefore, conducting research and innovative activities under this model is burdened with high risk and costs, but the results are available free of charge to other entities, including competitors. This way, knowledge becomes a public good (Foray, 2004). As a result, innovators' propensity to conduct research and innovative activity is much lower than it would result from the public interest (Chaminade, Edquist,

2006a). In such conditions, the knowledge market turns out to be imperfect, and the resulting inefficiencies of market mechanisms require correction by the state as part of the innovation policy.

The neoclassical approach to supporting innovation and development is based on linear innovation process models: the supply model, the science-driven innovation model, the demand model, and the market-driven innovation model. Due to their simple linear logic, the neoclassical paradigm of supporting innovation shows the highest levels of internal continuity and cohesion. This allows for the definition of clear and straightforward assumptions regarding state intervention, the selection of tools, and effects.

However, the simplicity of linear models began to be perceived as a drawback. They did not allow reflection on the specificity of research and innovation activities and the relations and dependencies between science, technology, the market, and business. The response to the criticism of the neoclassical approach to the innovation support policy was the emergence of a new paradigm in the 1990s derived from the evolutionary economic theory. The authors referred to Darwin's theory of natural selection and evolution and Schumpeter's (1960, 2009) innovation and entrepreneurship theory (Nelson, Winter, 1982). By placing innovations and enterprises at the centre of the economic development theory, Schumpeter was the first to introduce the concept of innovation into economic sciences.

Knowledge in the evolutionary approach is not a public good to which there is complete and unlimited access. It can be general or specific and particular to a particular user: individual, enterprise, or industry (Smith, 2000; Drelichowski, 2004). Access to knowledge is expensive, and its creation no longer takes place in isolation by a single researcher or entrepreneur-innovator. It results from joint activities within the enterprise or cooperation of various actors in the innovation process (Edquist, 1997; Cohendet, Meyer-Krahmer, 2005).

The innovative process, which begins with the crystallisation of an idea for innovation and ends with its commercialisation, is understood under this perspective as numerous interactions and feedback loops between opportunities, market needs and entities. Such relations and dependencies are illustrated in interactive models such as the chain-linked innovation model of Kline and Rosenberg (1986) or the coupling model of Rothwell and Zegveld (Dodgson, Rothwell, 1994). Hence, innovation is a path-dependent process in which knowledge and technology are produced through the interaction between various actors and other factors. R&D is no longer the most crucial stage in the innovation process. It is implemented when a given entity cannot solve a problem or implement a new solution using the available knowledge and techniques. Optimisation and market failure lose relevance in the evolutionary approach (Bryant, 1998).

According to Metcalfe (2000), problems appear if access to the necessary knowledge is limited due to the lack of an appropriate organisation allowing access to this knowledge or missing or blocked communication channels between the relevant organisations. As the most critical systemic problems, Lundvall and Borras (1997), Smith (2000), and Chaminade and

Edquist (2006b) indicate: 1) restructuring problems most often related to technological issues; 2) infrastructure problems related to transport, communication and research infrastructure; 3) blocking problems resulting from blocking the entity in existing technologies; 4) institutional problems related to the difficulties associated to formal and informal regulations/institutions; 5) learning ability problems, 6) intra-network problems resulting from too weak or too strong connections in the system, innovation; 7) and issues related to the complementarity of the elements of the innovation system. Therefore, the need to solve problems within the innovation system is a cardinal argument favouring the state intervening in innovation policy. Moreover, state intervention creates conditions for developing appropriate selection processes and diversity, ensuring the system's evolution along the best trajectory (Bach, Matt, 2005).

4. Climate for innovation vs innovation for the climate

Flagship examples of standards adopted at the national and international levels include the report of the US Panel on Invention and Innovation, known as the Charpie Report (United States Department of Commerce, 1967) and the OECD guidelines for collecting and interpreting technological innovation data known as the Oslo Manual (OECD, 1992). Despite a quarter of a century separating them, both showed an interest in technological innovations and their significant impact on the company's competitive performance. The definition of innovation in this framework is consistent with innovation's economic objectives. In the Charpie Report, innovation translates the invention into the market. The Oslo Manual 1992 understands innovation as implemented technological changes. The Oslo Manual continues to see the essential function of innovation as a drive for productivity, growth, and prosperity (OECD, 1992, 2018). It considers supporting economic and social changes in response to national and global challenges an additional issue. It states that users of innovation data may be interested in innovation's social and environmental impacts, but it lists them after productivity, profits and jobs. It also explains that the very definition of innovation does not require positive consequences. In particular, the innovation may harm safety, health, or the environment (OECD, 2018, p. 69). At the same time, these areas are listed among the performance targets for which management is responsible and in which managerial abilities to innovate are manifested (OECD, 2018, p. 108). Another modification observed in the analytical interpretations of data on innovation by the OECD concerns the status of the environment. It is no longer considered a public policy category. "Society and the natural environment" has become a separate fifth component of the external environment for business innovation (OECD, 2018, p. 147). Among the channels through which this element directly or indirectly impacts the company's innovative activity is public acceptance of innovation, corporate social responsibility, system-wide social changes, such as the transition to a low-carbon economy,

and changes in the area of the impact of business activities on the environment, such as "green" innovations and adaptation to climate change (OECD, 2018, p. 148).

Fougère and Harding (2012) define the instrumental approach in the Charpie Report and Oslo Manual as "managerial," contrasting it with the "sociological" approach proposed by Rogers in the early 1960s. Rogers (2003) links innovation with human behaviour. According to him, for an idea to be considered a technological innovation, a potential adopter must perceive it as new.

In contrast to mainstream economic thinking, Rogers highlights the consequences of innovation for diffusion participants, which he analyses across three dimensions: 1) the functional effects of innovation; 2) its potential to trigger a chain reaction; and 3) how quickly it is recognised by members of society. Consequently, he distinguishes three categories of innovation impact: 1) desirable/undesirable, 2) direct/indirect and 3) anticipated/unanticipated. However, the researcher mentions ecological research conducted by some rural sociologists after 1975 only in the context of various currents' contributions to the development of innovation diffusion theory. Rogers references environmental protection issues mainly in several case studies in his book. One of the examples is particularly insightful. Rogers uses it to illustrate the steps in the innovation decision-making process, pointing to the shift in standards fifty years after he began studying innovation diffusion. A farmer once considered a "laggard" for refusing to use chemicals due to their environmental impact is now regarded as a "super innovator" as their activity represents organic farming.

When sustainability is established as a criterion, innovation is assessed on a spectrum, ranging from those innovations that hinder sustainable development to those that actively contribute to it. The ends of the scale illustrate the two opposing roles that innovation can play in sustainability. Comparing the science and policy agendas in innovation over the past decades, we see a shift in focus from mitigating "bads" to creating "goods". The development of research and the scientific community around the relationship between innovation and ecological and social aspects of human life that occurred over the last two decades has led to "the responsible innovation" trend (Prest et al., 2002). In the organisation management discipline, sustainable innovation has been integrated with the spirit of entrepreneurship into the company's development strategy mainly through network activities, mobilising stakeholders or changing the business model (Lazaretti et al., 2020).

Governing innovation as part of sustainability is a challenging issue. One example is the diffusion of green technologies through government subsidies, which have a regressive effect, exacerbating income inequality (Vona, 2021). Moreover, the tension between sustainability's environmental and social dimensions overlaps with the cost increase caused by green regulations and the resulting loss of competitiveness, a central issue in management analyses. Furthermore, even if it is possible to harness environmental standards to achieve the company's performance goals through innovation, there is a cost on the social side, as evidenced by the decline in labour contribution, as described by Porter and Linde (1995). Other key aspects of

the sustainable innovation-economy relationship include spatial, temporal, and sectoral differentiation in the distribution of the effects of innovation. An empirical analysis of the Norwegian coastal shipping sector illustrates this differentiation (Bach et al., 2021). The study shows how low- and zero-carbon technologies, such as biodiesel and liquefied biogas, face structural and institutional barriers despite their technical compatibility with existing fossil fuel systems. These include high costs, limited fuel availability, and insufficient policy incentives, which hinder broader adoption. The case demonstrates that technological alignment alone does not guarantee sustainability transitions without supportive innovation policies.

It is important to note that, at the level of global political agreements (such as the declarations and action plans undertaken by the United Nations), the natural environment has been considered essential for the enjoyment of fundamental human rights since the beginning, i.e., for nearly half a century (United Nations, 1973). A similar perspective on the natural environment is shared by economists within the ecological trend, as evidenced by the declaration from the late 1980s that introduced the then-niche journal *Ecological Economics* (Constanza, 1989). Regrettably, when the “symmetry” between various forms of capital is assumed, it complicates the search for solutions to conflicting goals.

Innovation directly serving sustainability resonates with the choice of strong sustainability over weak, a distinction the reader found in the literature on sustainability (Skene, Murray, 2017). It starts with the conviction that when combining nature with society’s governance, we should prioritise matters of nature (Ehrlich, 1989). Skene and Murray (2017) position “sustainable development” between the economics of the environment and ecology.

Oswald and Stern (2019) urge the economics community to focus on researching growth driven by rapid technological change, which will help mitigate climate risks and the existential crisis. In their view, economics should remain open, incorporating significant social and ecological challenges into its subdisciplines and drawing on ideas from other social sciences, such as ethics and philosophy. For them, innovation represents an opportunity on which the necessary changes depend. Without an explicit emphasis on the pace of change, as advocated by Oswald and Stern, the transition towards sustainability, though shown by Lobo et al. (2025) to be facilitated through activities of intermediaries within existing socio-technical regimes, might pose a risk to fulfilling urgent sustainability goals, especially those with deferred outcomes.

5. Conclusions

In economics, multiple paradigms are recognised that reflect the diversity in interpreting human behaviour. Some economists challenge this perspective. We observe efforts to define universal laws in economics. In this context, we can notice a convergence with Kuhn’s broader

concept of paradigms or interpretations so vast that any scientific revolutions seem impossible within them.

Assumptions are central in economics, where fundamental laws are not as in the natural sciences. This foundation inevitably leads to competing research methods supported by institutions and various schools of thought. The multidimensional nature of economics also results in parallel interpretations, with different scientific communities operating within diverse conceptual frameworks and engaging in puzzle-solving efforts that focus on limited research interests. Furthermore, there is no precise sequence to the paradigmatic differentiation. Therefore, adapting Kuhn's vision to this challenge necessitates accepting the possibility of paradigms' coexistence, both in its concept's narrow and broad senses. One should remain sceptical about the likelihood of a shared paradigm emerging, given the fragmented nature of "normal science" and, conversely, the limited potential of mainstream economics.

Evidence from Kuhn's theory suggests that the paradigm shift in innovation policy displays characteristics of a scientific revolution, characterised by the emergence of anomalies (sustainability challenges) that prompt recognition of new solutions and the gradual adoption of a new economic framework despite resistance from established norms. The positivist ideal of an economy free from value judgments and the accumulation of "real" knowledge on managing the economy more efficiently was confronted with ecological and social imperatives. Viewing the shift through the broad Kuhn paradigm facilitates understanding the transition towards sustainability and its meanings and implications. As there is a shift in the disciplinary matrix of beliefs and symbols, the paradigm shift encounters resistance. This change encompasses the entire discipline of economics. In the context of innovation, the innovation bias obscures the radical nature of the transition. Not all its sources have become obsolete, but new ones have emerged to realise the goal of sustainability. The scale of the change is immense, as highlighted by the example of the farmer from Rogers' work. We can also observe that politics is crucial in the relationship between innovation and development.

We are facing a qualitative anomaly regarding a shift in the innovation paradigm. As we observe, the traditional approach endangers economic stability. The foundation of the new approach involves rethinking the three primary dimensions of sustainable development. The model illustrating the relationship between the economic, social, and environmental dimensions of development, which offers three binary options, should transition to a model resembling a nested system where the economic sphere (financial and manufactured capital) is encompassed within the social sphere (intellectual, social relationships, and human capital), which, in turn, operates within the confines of the ecological sphere (natural capital).

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DON'T WRITE, MANAGE! RESEARCHER AS MANAGER OF SYSTEMATIC LITERATURE REVIEW PROCESS IN MANAGEMENT

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Purpose: This article proposes a methodological procedure for integrating Generative Artificial Intelligence (GAI) into the process of preparing systematic literature reviews (SLRs) for management. It addresses a gap in the literature related to the researcher's evolving role, from executors to managers, in AI-assisted academic writing.

Design/methodology/approach: This study adopted a conceptual and methodological approach. Building on the literature on SLRs, process management, and AI, this study introduces a model in which the researcher manages the SLR process, supported by GAI tools such as ChatGPT, Elicit, and SciSpace. The model follows the sequential stages of SLRs and adapts each step to collaboration with AI.

Findings: This article presents a detailed step-by-step framework, showing how GAI can support scoping review, research problem formulation, literature selection, data extraction, and synthesis. The study illustrates that GAI can improve efficiency, transparency, and accessibility, while emphasizing the critical role of the researcher in quality control and decision-making.

Research limitations/implications: This study is methodological-conceptual, and does not empirically test the proposed framework. Future studies should validate its effectiveness in various academic disciplines and examine the ethical challenges related to AI-generated content, authorship, and academic integrity.

Practical implications: The proposed model could serve as a practical guide for researchers and institutions seeking to integrate GAI into their research workflow. This may be particularly useful for early career scholars and non-native English speakers seeking support in literature review processes.

Social implications: GAI may democratize access to academic publishing by simplifying complex systematic literature review processes. However, it also raises societal questions about intellectual labor, transparency, and responsibility in scholarly communication.

Originality/value: This article is among the first to conceptualize the researcher as a manager of AI-driven writing processes in SLRs. It provides an innovative, structured approach for integrating GAI into academic research and is relevant to management scholars and those interested in innovation in research methodology.

Keywords: generative artificial intelligence, large language models, academic writing, systematic literature review, ChatGPT.

Category of the paper: Conceptual paper.

1. Introduction

Generative Artificial Intelligence (GAI) technology operates at a level never observed before. Mustafa Suleyman (2024) called it a "new species". It is no longer just a provider of modern solutions but is becoming a new intermediary in the relationship between the individual and the problem. It plays a servant role, allowing problems to be solved faster and more effectively than humans. However, it must be controlled, as it is not a decision-making center in itself (Alshami et al., 2023; de la Torre-López et al., 2023).

Systematic literature reviews (SLRs), on the other hand, shape science in many disciplines as they function as an objectified and verifiable method of synthesizing the results of existing considerations and scientific research from various angles. This justifies the need to apply modern technologies to further improve the efficiency of their development (Denyer, Tranfield, 2009; Tranfield, Denyer, Smart, 2003; Tsafnat et al., 2013).

Conducting a systematic literature review using artificial intelligence involves changing the traditional role of the researcher from that of a doer/executor to that of a manager of the writing process. In management, managers plan, organize, coordinate, and control work (Sommerville et al., 2010), and employees perform specific tasks. By applying this logic to the process of creating a systematic literature review, a manager can plan its course, organize the work, coordinate the use of AI applications as employees, and control their impact on the work. The entire process was carried out according to the logic of a systematic literature review (see Denyer, Tranfield, 2003; Vrontis, Christofi, 2021).

This review aims to propose a procedure for integrating GAI into the SLR development process. The literature is dominated by a technical approach, focusing on the capabilities of individual applications, while there is a lack of in-depth reflection on the change in the role of the researcher himself, from the executor to the manager of the research process (Tomczyk, Buggemann, Vrontis, 2024). Meanwhile, the use of GAI tools in the process of creating a scientific publication requires planning, organizing, controlling, and making strategic decisions, which leads to the need to redefine the competences of the scientist. This study fills this gap by presenting a conceptual model of the researcher as a GAI-assisted SLR process manager. In the application dimension, the proposed approach can be a starting point for building new academic practices in the field of the effective and responsible use of GAI tools in scientific research.

In this study, I attempt to formulate a proposal for future cooperation between humans and artificial intelligence based on current technological developments in the field of scientific literature. This development is moving away from the use of technology as a tool (supportive model) and towards human-machine collaboration (collaborative model) (Przegalińska, Triantoro, 2024). The collaborative model allows for manager-employee relationships and artificial intelligence to be treated as a task performer. Giving commands and receiving

responses in natural language allows the process manager to control the quality of the effects and technology to improve according to the manager's comments. The introduction of the collaborative model has become possible on a large scale since 2022, with the introduction of genetic artificial intelligence in the form of ChatGPT. The introduced solution was a breakthrough and the basis for the creation of dozens of generative artificial intelligence applications dedicated to learning (Tomczyk et al., 2024). With reference to the purpose of the study, I formulated the following research question connected with the aim of the article:

How can artificial intelligence support the process of preparing a systematic literature review in collaborative management?

To answer this question, I used my knowledge of generative AI tools dedicated to scientific research. The following considerations are an attempt to answer the research question posed in the form of a proposal for the procedure to be followed.

This study is methodical in nature. Its aim is not to develop theories or present the results of empirical research but to propose a practical approach to managing the SLR process using GAI. In this approach, the researcher primarily plays the role of manager in the research process, not only its executor. This article aims to support scientists in the integration of GAI tools in the various phases of preparing a literature review, from planning, through analysis and synthesis of sources, to reporting results. This approach could be particularly useful for researchers in fields where systematic literature reviews are gaining importance, such as in management science.

2. A systematic literature review in management and its phases

To describe the process of the systematic literature review, I used the procedure developed by Vrontis and Christofi (2021). I chose it because it is embedded in the classic management scheme for creating a systematic literature review described by Tranfield and Denyer (2003, 2009). This procedure consists of the following steps:

Scoping analysis: This analysis defines the limits of scientific cognition in a given area, defines the research field and potential problems to be solved, and identifies major research trends and gaps (Vrontis, Christofi, 2021).

Identifying the research objective and research question: In this step, the researcher identifies the research objective and research question, defining the scope and subject of the study. On this basis, he formulated the research hypotheses (Pereira et al., 2023).

Context analysis: This involves an analysis of the environment, conditions, or background in which the study takes place. It includes the industry being studied, cultural characteristics of the participants, geographical location, time periods, and all elements that may influence the

topic of the study or its results. Its inclusion may increase the attractiveness of the research question (Vrontis et al., 2020).

Literature identification: This is the process of pre-searching for publications and scholarly research related to a given topic or issue. It is usually performed based on a keyword search in databases such as Scopus or Web of Science (Jain et al., 2022).

Literature selection: In this step, the researcher selected adequate publications from the collection acquired at the above point. This process involves establishing selection criteria (inclusions and exclusions), such as the time range, type, and quality of sources. Thus, the researcher identifies and selects the most valuable sources for further research (Christofi, 2017).

Data extraction and synthesis: Data extraction is the collection of relevant data from selected articles or other scientific papers, according to predefined criteria. This includes identifying and recording specific information such as publication details, author details, article type, methods used, key findings, and other relevant variables., data synthesisa synthesis, involves the analysis of the collected material in terms of patterns, relationships, or common themes in the literature (Christofi et al., 2021).

Report preparation and recommendations: The authors summarize and synthesize the results of peer-reviewed studies in a structured and transparent manner. The main results, themes, and conclusions drawn from the literature were organized and presented in a comprehensive way. The authors of the review propose future directions and recommendations for scientists and practitioners based on an analysis of selected studies (Christofi et al., 2017; Pereira et al., 2023).

Based on the presented procedure, a model for preparing a systematic literature review using artificial proposed. The model has the same stages at which AI agents are "employed". By agents, I understand the applications dedicated to performing specific tasks.

3. A new approach – a researcher as a manager of the process of writing a SLR

The manager talks to the artificial intelligence as a research collaborator, consults, controls, and accepts the results of the algorithm's work.

At the initial review stage (*scoping analysis*), the manager's job is to talk to applications such as Elicit, SciSpace, ResearchKick, Consensus or Scopus AI. These applications offer access to metadata databases of scientific publications from around the world (e.g., semantic scholars). They quickly accessed article summaries on a specific topic, without defining keywords. As a result, the researcher received a list of articles with a short, one-sentence answer to the research question. Thanks to this, he quickly acquired general knowledge on a specific

topic. In addition, the consensus prepares a chart showing the distribution of answers to the questions asked. For example, if a researcher asks, 'Does customer satisfaction affect customer loyalty?', the app will show a distribution of "yes", "no" or "probably" answers based on the metadata of scientific articles found. The downside of this phase is the incomplete selection of articles and the lack of reproducible results (Tomczyk et al., 2024). At the initial stage, however, this approach allows the researcher to familiarize themselves with the literature on the subject to formulate an initial research question.

The researcher proposes a *research question*, discussing the legitimacy and possibility of its verification with the application, being open to the algorithm's suggestions. If a researcher asks the question again in consensus: "Does customer satisfaction affect customer loyalty?" and receives a 100% answer "yes", it probably means that there is no basis for conducting research in this area. In this case, it makes sense to expand the question to a specific market (B2B vs. B2C) or area (Western Europe vs. Eastern Europe) to obtain a greater variety of results. In this way, the researcher identified the research gap and formulated the purpose of the study. The researcher selects a specific problem based on consultation with the algorithm.

Context analysis requires asking questions regarding the background of the problem being studied. Using the same category of applications, the researcher asks, for example, 'In which industries has research been conducted on the relationship between customer satisfaction and customer loyalty?' What are the prospects for the development of loyalty-based marketing strategies?" What are the barriers to the impact of customer satisfaction on loyalty?" etc. Analysis of summaries offered by applications (e.g., Scite, Elicit, or SciSpace) allows the researcher to quickly understand the possibilities of the development of the studied area. In addition, the researcher in this phase can also use classic text analysis tools that speed up the process of assessing the context (da Silva Júnior, Dutra, 2021; Sundaram, Berleant, 2023).

The researchers then instructed the algorithms to search for sources (*literature identification*). At the current stage of development, AI applications do not guarantee that they will find all items on a given topic (Tomczyk et al., 2024). Therefore, researchers should use classic applications for scientific queries (SCOPUS, Web of Science), using artificial intelligence algorithms only as an auxiliary at this stage. AI co-creates keywords and queries for classic applications to identify literature. Notably, Scopus introduced its AI version in 2024, which works in a manner similar to Elicit and SciSpace. Its advantage is that it uses a clearly defined set of articles (Scopus database). Other applications provide examples of databases they use on their websites, which means that the range of searched articles is not limited to them (they mainly use Semantic Scholar, an open metadata database containing, according to the prodecent's declaration as 18.01.2025, over 223 million scientific items). To supplement the identified resources, the researcher enters queries into applications that use natural language queries (e.g., Elicit and SciSpace). Research indicates that, at this stage, the results of work in AI applications and desktop applications complement each other (Tomczyk et al., 2024).

Subsequently, using the same applications, the researcher selected the literature based on specific criteria of inclusion and exclusion (*literature selection*). It uses natural language to determine preferences, and the algorithm returns specific results. In case of doubt, the researcher performed manual verification.

Next, the algorithm uses metadata to prepare a database of articles for analysis (*data extraction and synthesis*). The database is in the form of a spreadsheet with records of selected texts in rows and variables in columns, and is readable in Excel. Applications such as Elicit and SciSpace automatically prepare this database. The manager checked the titles and abstracts with ChatGPT and verified them manually, if necessary. In addition, at this stage, the researcher obtains the full texts in PDF format, as automatic downloading of PDF files is not possible because of the copyright of the publishers. The researcher becomes acquainted with them and controls the work of the AI at further stages. Then, to extract and synthesize the data, the manager consults the algorithm on the scope and structure of the thematic part. ChatGPT can be used to analyze Excel files created in the previous stage for repeated threads in abstracts or other elements (e.g., summaries generated by applications). Subsequently, the researcher evaluates the threads in terms of their substantive value and uniqueness and proposes a list of key threads. Thus, a detailed structure of the thematic part of the systematic literature review was created. It should then be filled with content.

Filling a structure with content in the SLR procedure involves *reporting and making recommendations*. From a creative perspective, this is the most interesting stage. It also raises the most controversy because it is at this stage that the AI de facto prepares a thematic analysis project. The algorithm fills the structure with content and prepares an introduction and an abstract. The researcher then verifies and accepts or rejects the proposed content. In the case of content rejection, the researcher suggests modifications. The algorithm prepares a new version and the process repeats until the researcher accepts the version proposed by the algorithm. The most interesting applications for this purpose were ChatDOC, NoteBookLM, and AnswerThis. Once the draft is ready, the manager can add individual paragraphs using applications such as Scite. This is how a draft of the thematic review (draft and pre-writing) was created. The researcher then completed the sketch with footnotes (Mendeley, Zotero, etc.) and prepared his own version based on it. Therefore, he treated the draft as a starting point for preparing the final version of the text. It then analyzes the content of the AI plagiarism. It is important to note that the final form is his work. However, the use of AI to draft a text is controversial, as publishers generally limit the use of AI to source search or proofread (Ganjavi et al., 2024). What is extraordinary, however, is that such work is now possible, and the quality of the resulting prose is satisfactory (Alshami et al., 2023).

Table 1 summarizes the role of the researcher as a manager in the process of creating a systematic review of the literature, which I have proposed in this study, based on the functionalities of currently available AI tools for writing scientific articles.

Table 1.*Roles of AI and researchers in SLR phases*

SLR phase	The role of artificial intelligence	AI tools	The role of the researcher
Scope Analysis	Talks to databases using natural language for initial research field.	Elicit, SciSpace, Consensus	Discusses, suggests and approves of content found by the algorithm.
Identification of the research objective and research questions	Validates the proposed research questions. It presents current research results.	ChatGPT, Research Kick, Consensus, Scopus AI	Accepts the algorithm's proposals.
Context analysis	It verifies whether the topic is worth studying in context.	Consensus, Scite, Elicit, SciSpace	Accepts the final version of the research question.
Literature identification	Uses natural language to contribute keywords and queries for Scopus/WoS, looks for additional literature.	ChatGPT, Scopus AI, Elicit, SciSpace, Consensus	He accepts sophisticated literature.
Literature selection	Analyzes titles and abstracts. Creates an Excel database.	Scopus AI, Elicit, SciSpace, ChatGPT	Accepts the selection results.
Data extraction and synthesis	Talks to summaries to identify plots. Classifies and codes articles.	ChatGPT, Claude, Elicit, SciSpace, Consensus	Accepts data extraction and synthesis results.
Preparation of the report and recommendations	Writes, adds separate sentences, paraphrases, detects AI abuse, formats to specific requirements of the journal.	ChatDOC, AnswerThis, Scite, SciSpace, Quilbot, DrPaper	It accepts, paraphrases and prepares the final content.

Source: Author's own study based on the author's practical experience in conducting systematic literature reviews using AI tools as well as on the analysis of the literature discussed in the article. The table is an attempt to synthesize the observed applications of AI in the individual stages of SLR and may be a starting point for further empirical research. It is worth noting that the presented table is not a complete or closed catalog of the AI functions in the research process. Its purpose is to illustrate a new approach to the role of the researcher as a process manager rather than a formal classification of tools. In this sense, it has a conceptual function rather than a normative one.

Table 1 shows the SLR procedure with the proposed use of AI as a research collaborator, and the controlling role of the process manager. The tools they contained were created after November 2022 as a result of the generative artificial intelligence revolution (ChatGPT) and large language models (*LLMs*). The idea of cooperation between artificial intelligence and humans in this process is that the researcher discusses the implementation of individual stages with the algorithm as if they were implementing them with a human. This has given rise to new opportunities and numerous challenges.

4. A new paradigm of a researcher?

With the introduction of advanced AI tools into the process of creating systematic reviews, the role of the scientist is fundamentally transformed from a performer of literature analysis to a manager of its course. This shift in function can be interpreted as part of a broader research

paradigm in which technology not only supports, but also co-creates knowledge. So far, the role of the researcher has been to independently acquire, select, and synthesize sources, and he now manages an automated process, assuming a function similar to that of a research process manager. This is consistent with the theory of process management, in which the key role is not execution but the design and supervision of the system (Sommerville et al., 2010). Although it is too early to speak unequivocally about the full paradigm of AI-driven research, this shift deserves careful tracking and analysis, as it redefines both research practices and principles of scientific responsibility (Gao et al., 2023; Masukume, 2024).

The discussion on the use of GAI in science is gaining intensity, but it still remains insufficiently explored, especially in the context of the impact of GAI on the role of scientists and the formation of a new paradigm of research work. Although it cannot be denied that GAI provides real support in the process of conducting SLR, we should be cautious about forecasts that assume a radical transformation of the researcher's role in managing the process. Such a re-evaluation assumes the readiness of the scientific community to delegate some of its traditional prerogatives, such as analysis, synthesis, or interpretation of data, to algorithms. Meanwhile, many voices in the debate raise the limitations that come with it – technical, epistemological, and ethical (Masukume, 2024; Chemaya, Martin, 2023).

Among the most frequently indicated concerns are problems with the transparency of generative processes (the so-called "black box"), the risk of hallucinations of content, unethical use, or difficulties with attribution. GAI can support, but not replace, the critical thinking and research accountability that underpins science (Spillias et al., 2024). Therefore, rather than discussing a complete paradigm universal, it seems more reasonable to point out that scientists today face the challenge of redefining their own role, not as being replaced by technology, but as those who can manage the research process in a reflective and responsible way, using GAI as a tool – not as a partner in the full sense of the word (Wagner et al., 2022).

In this context, we can speak of evolution rather than revolution: the scientist in the new model does not give up his function as an intellectual leader but expands it with technological competence and the ability to critically cooperate with the machine (Christofi et al., 2021). This also raises new questions: Who is responsible for erroneous conclusions based on data processed by the GAI? How can the integrity of the research process be maintained when an increasing number of elements are partially automated? The answers to these questions are not unambiguous today, but they must certainly be part of a reflection on the future of systematic literature reviews and on the role of the scholar as creator, curator, and manager.

5. Summary

This review aims to propose a procedure for integrating GAI into the SLR development process. In this article, I present the concept of the researcher as a manager of the research process, and then, based on the literature and the practice of SLR automation in health sciences, I propose a framework for the integration of GAI in individual phases of the review. The achieved goal not only allows for a theoretical arrangement of possible applications of AI but also provides researchers with tools for conscious management of the review process with its participation. Future research should empirically analyze how the proposed procedure is implemented in practice, how it affects the quality and transparency of research, and how it changes the competences and role of the researcher in the AI-supported science ecosystem.

Systematic literature review can become an automated task for data analysis. Currently, no one is surprised by the use of IBM SPSS Statistics or RStudio software for data analysis, and in the future, no one may be surprised by the use of AI algorithms to write scientific articles under the supervision of researchers. An article created in this manner is usually produced faster and consumes fewer resources. It also contains elements that it would not contain if it were created entirely by man.

However, the proposed procedure faces numerous challenges, including procedural, substantive, and mental. Key concerns relate to the lack of compliance with the applicable moral norms of attribution to a researcher who only controls the process of generating content and the limited cognitive value of AI-generated content. In addition, articles created by artificial intelligence are often devoid of individual characters, which can lead to a decrease in the cognitive competence of researchers who overdelegate AI tasks. Ethical issues, including publishing policies restricting the use of AI, are also a significant challenge in the implementation of this model. Ultimately, although AI cannot be considered a co-author, it remains a tool with great potential, the proper use of which can improve the quality of scientific research.

Acknowledgement

As an English non-native speaker, I used the ChatGPT, Quillbot, and PaperPal applications to improve the quality of English. These applications use AI technology to analyze and correct the grammar and syntax of texts.

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EXPLORING PREMISES AND CHALLENGES IN THE REALISATION OF CONTINUOUS IMPROVEMENT IN MANUFACTURING ENTERPRISES

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Purpose: The purpose of this article is to identify the underlying premises behind improvement initiatives as seen by selected managers, to examine the challenges they observe during the realisation of continuous improvement activities, and to explore their expectations regarding the improvement of CI execution.

Design/methodology/approach: The study employs a qualitative case study methodology, based on structured interviews conducted with production directors, CI managers, and shift supervisors. The research was carried out in two manufacturing companies with a long-standing commitment to continuous improvement.

Findings: The research results demonstrate that the managers under study have different perspectives on the identification of premises, perceived problems, and expectations for organisational support, which correlate with their roles within the organisation. A commonly reported issue is the declining employee engagement in CI activities over time, influenced by various factors and events, as well as insufficient support for the production department from other departments in the realisation of CI.

Research limitations/implications: This research is exploratory in nature and should be considered a pilot study. The limitation of study to two case studies naturally restricts the generalisability of the findings. Further research is required across a broader group of manufacturing firms and should also be extended to organisations in other sectors – such as services or retail – for the purpose of comparative analysis.

Practical implications: Organisations engaged in continuous improvement must focus on sustaining these initiatives over time. It is essential to identify and address emerging challenges and identify the expectations of managers creating the conditions for CI practices. This requires ongoing refinement of existing systemic CI approaches, with particular emphasis on collaboration across organisational units and effective coordination of improvement efforts.

Originality/value: The research offers a perspective on the studied issues of continuous improvement from the viewpoints of selected managers involved in creating the conditions necessary for its realisation.

Keywords: continuous improvement, lean management, kaizen, CI drivers, CI barriers.

Category of the paper: Research paper, Case study.

1. Introduction

The Toyota Production System (TPS) revolutionised manufacturing management in the automotive sector nearly a century ago, propelling Toyota to the forefront of the industry and inspiring other companies to redesign their own production and management systems. The success of Toyota's approach can be largely attributed to the consistency and continuity of its improvement efforts, embedded in the TPS through the principle of continuous improvement – known in Japanese as *kaizen* and commonly referred to as CI. Toyota's philosophy, experience, and achievements have served as a source of inspiration for many other organisations, prompting the development of their own complex management systems built around the principles of continuous improvement.

The effective realisation of continuous improvement relies on the engagement of all members of an organisation in the search for efficiencies and the resolution of problems. Achieving this, in turn, requires the establishment of suitable conditions that enable such engagement. While numerous studies have sought to identify key success factors for implementing and sustaining CI, awareness of the barriers and challenges that can hinder its realisation is equally crucial for achieving the desired outcomes.

Theoretical and empirical research on CI success and failure factors has predominantly focused on systematic literature reviews, the development of "CI success factor" models, or analyses based on narrow viewpoints (e.g. Arpin et al., 2023; Chaple et al., 2021; O. Connor, Cormican, 2022; McLean et al., 2015). Less attention has been paid to studies that explore the perspectives of different stakeholders within organisations. A broader, more nuanced understanding – particularly one based on in – depth qualitative research and comparative analysis of responses across stakeholder groups – seems both necessary and valuable. Notable examples of such multi – perspective research include studies by Arnaiz et al. (2022), Cano et al. (2017), Garcia-Sabater, Marin-Garcia (2011), and van Beers (2022).

The review of relevant literature therefore reveals a research gap in this area – one that this study aims to address.

The aim of this article is to identify the drivers behind improvement initiatives from the perspective of various stakeholders involved in creating the conditions for CI, as well as the challenges they encounter during its implementation. The study is guided by the following research questions:

- What are the underlying reasons for initiating continuous improvement activities within the company?
- What challenges are perceived by the stakeholders during the implementation of CI?
- What expectations do these stakeholders have regarding the organisation's support for improved CI implementation?

To address these questions, the study employed a qualitative case study approach, using interviews as the primary data collection method. Interviews were conducted with production directors, CI managers, and shift supervisors in two selected manufacturing companies. These investigations should be considered pilot research.

This article is structured as follows: introduction, theoretical background, research methodology and characteristics of the studied companies, presentation of the research findings, and a concluding summary.

2. Theoretical Background

The concept of continuously improving organisational performance has long been recognised, but as noted in the introduction, it was popularised in the last century by Toyota. Continuous improvement (*kaizen*) became a core element of the Toyota Production System (TPS) – a management framework that gave Toyota its competitive advantage and allowed it to become a global leader in the automotive industry. Optimisation of activities, processes, and work in accordance with Toyota's philosophy is achieved, among other things, through the elimination of waste (*muda*), enabling cost reductions, a focus on quality, and the resolution of problems arising within the company.

Such efforts must not be one – off or ad hoc; they should be continuous and systematic, embedded in an unending cycle of improvement in line with Deming's PDCA (Plan–Do–Check–Act) cycle, carried out through the joint efforts of employees and managers at all organisational levels.

TPS has served as a model and source of inspiration for many companies. However, as practice has shown, management concepts rooted in Japanese cultural traditions must be adapted to local cultural conditions and the realities of the labour market in order to be effective in other regions. Research on the effectiveness of continuous improvement initiatives has typically focused on identifying so – called "critical success factors for CI realisation" (e.g. Arnaiz et al., 2022; Cano et al., 2017; Formento et al., 2013; Gonzalez Aleu, van Aken, 2016). Less attention, however, has been paid to the factors that hinder the realisation or sustainability of CI efforts (e.g. Baier, 2024; Garcia-Sabater, Marin-Garcia, 2011; McLean et al., 2015; Sanchez-Ruiz et al., 2019).

The success of improvement activities also depends on a clear understanding of their necessity and the ability to base decisions on sound and rational premises. This issue is highlighted, among others, in the recent work of Baier (2024).

This leads to a critical question: what challenges in CI realisation are identified by members of the organisation, and to what extent are they aware of the reasons behind improvement initiatives? While the ultimate responsibility for achieving strategic goals lies formally with top

management, this does not absolve other stakeholders involved in organisational processes from responsibility. It is therefore both valid and intellectually valuable to explore how various stakeholders – those who contribute to shaping the conditions for CI – perceive the drivers and limitations of CI, what expectations they hold, and whether there is alignment in how these factors are identified and assessed.

3. Research Methodology and Characteristics of the Studied Companies

To achieve the objective of this article, original research was conducted using structured interviews as the primary data collection technique. Interviewees were selected from among production directors, continuous improvement (CI) managers, and shift supervisors. This selection aimed to capture the perspectives of various stakeholders who contribute to creating the conditions necessary for the realisation of continuous improvement.

The study was carried out in two manufacturing companies with a long – standing history of practising CI. At the request of the interviewees, the companies remain anonymous and are referred to here as Company A and Company B:

- Company A is a foreign – owned enterprise operating in the food industry. Its first production facility was established in the 1940s. The company currently employs around 400 people and has been pursuing CI for 13 years.
- Company B is a foreign – owned enterprise in the automotive industry, founded in 2006. It currently employs over 350 people and has been engaged in CI activities for 19 years.

The limitation of the study to two case studies naturally imposes restrictions on the generalisability of the findings. The research should therefore be considered exploratory in nature. Data collection took place in November and December 2024.

4. Research Findings

4.1. Company A

4.1.1. Rationale for the Realisation of Continuous Improvement

Production Director

The respondent emphasised that continuous improvement within the company is largely driven by external pressures. “The company must be more price – competitive, which requires cost optimisation”. Maintaining market position means adapting to the evolving needs of current clients and competing for new ones. Additional external drivers include growing quality

requirements and pressure from ownership to improve performance. As for internal factors, the director pointed to the significant improvement potential of the workforce – many employees have long tenure and in – depth knowledge of the organisation, along with numerous ideas for improvement. However, there was previously no “channel” to facilitate the flow and implementation of these ideas.

CI Manager

The manager explained that the initial driver behind implementing CI was the ambition to “move towards becoming a European or global – level organisation, where CI is a standard”. Over time, however, it became evident that these efforts truly delivered benefits, and now CI is part of the company’s everyday operations. Employees recognise that CI helps in solving problems, delivers tangible results, and supports their day – to – day work.

Shift Supervisor

“Thanks to CI, we are constantly developing and seeking new solutions to make our work more efficient, more effective, and less burdensome. We don't accept the status quo”. According to the respondent, CI enables employee development and unlocks the potential within people. “We’re currently in an employee – driven labour market. CI allows us to offer more than just a job – we can also offer growth and motivation, not just money”.

4.1.2. Barriers to the Realisation of Continuous Improvement

Production Director

The director pointed out challenges related to bottom – up employee engagement in CI activities. A considerable portion of employees submits a *kaizen* suggestion only once or twice a year, typically because “the boss says they have to,” with more active engagement usually coming from more senior staff. Younger employees tend to be less involved. “I often have to push the topic forward myself”. He also noted a shortage of leadership figures willing to say, “Okay, I’ll take responsibility, organise a team, and move this forward”.

He highlighted a lack of support from the HR department: “There’s a clear absence of an HR Business Partner (HRBP) who understands the needs of production and could support CI efforts”. Further, he reported difficulties securing support from other departments – particularly Maintenance and Logistics – when it comes to delegating staff to *problem solving* (PS) teams. At times, even communication at the managerial level proves challenging. “What gives me hope is that frontline staff, who work directly with production, do seem to understand these needs”.

CI Manager

The manager expressed concern over occasional stagnation in *kaizen* submissions in certain production areas, attributing this to declining employee engagement. There is also limited participation in problem – solving teams, mainly due to time constraints. Another recurring issue is the implementation of suggestions – often hindered by weak influence of team leaders on key individuals such as operators or maintenance staff.

A further obstacle is the lack of formal authority over employees from other departments, which necessitates “going through their supervisors”. This is compounded by a lingering silo mentality: “There’s still a lack of understanding that we are one organisation and should all be working together” – with the Maintenance department again cited as an example of weak collaboration during PS initiatives.

He also echoed concerns about the lack of HR support: “I believe we need an HRBP who could take over certain responsibilities like training or recruitment. That way, the CI department wouldn’t have to invest time in those areas”. Staff turnover also poses a challenge, as new, often younger employees are less engaged in CI efforts.

Shift Supervisor

The supervisor voiced frustration over poor collaboration with other departments – particularly Maintenance – noting a lack of feedback on joint CI initiatives. “It’s about being able to inform my team about what’s going on, to show them we’re taken seriously. Otherwise, it’s demotivating – for them and for me”.

Another issue is the lack of time to properly support young leaders, train employees, or ensure effective communication. “There’s constant pressure to meet production targets – that’s always the top priority. We’re constantly dealing with urgent matters”.

Finally, the respondent was concerned about the general lack of awareness regarding the importance of problem – solving, the value it offers, the methods involved, and the absence of systemic solutions to support it.

4.1.3. Expectations Regarding Required Support

Production Director

The respondent expects support from the company president in encouraging other departments to engage in CI activities and in ensuring accountability for the realisation of those efforts. He emphasised the need to standardise the idea submission system across departments.

Additionally, the director expects the HR department to provide support in training leaders in so – called “soft skills” such as team management and communication (e.g. providing feedback), and to appoint an HR Business Partner who understands the realities of production.

He also sees a need to make the *kaizen* submission process more attractive – specifically, by developing a new digital tool or application appealing to younger employees. He noted the necessity to enhance the methodology and tools used for problem – solving initiatives.

CI Manager

The respondent expects more time and financial resources to be allocated to the promotion and popularisation of CI. He believes the suggestion system must be revitalised, including an increased budget for *kaizen* initiatives and for rewarding employees involved in CI.

He also anticipates greater involvement from the HR department, including relieving the CI department of responsibilities such as recruitment. He expects better availability of personnel from other departments – such as Maintenance – who are needed to support CI activities.

“If there’s a problem with implementing an idea, we later have a problem with maintaining motivation”.

He stressed the need for more direct involvement of managers from various departments – especially in interdisciplinary problems – such as Logistics, Quality, and Maintenance. This includes “going to the shop floor, observing the problems firsthand, talking with employees, and providing support”.

Shift Supervisor

The supervisor expects feedback from support departments such as Maintenance regarding the timing and progress of CI – related activities.

From her direct supervisor, she expects feedback on the feasibility of resolving specific issues and support in forming PS teams. She stressed the need for dedicated time for communication and employee training – “There should be time for that in the schedule”.

In her view, shift supervisors should have an influence on shaping the suggestion system, because “they and their teams are the ones directly involved in realising the system, and they are responsible for motivating employees to submit suggestions”.

4.2. Company B

4.2.1. Rationale for the Realisation of Continuous Improvement

Production Director

The respondent emphasised that a production system such as theirs cannot function effectively without continuous improvement. “Changes happen constantly – new products are introduced, supplier – related variables shift, and these changes force us to adapt our production processes. We have to keep up, and CI tools help us do that”. He noted that the price of their components has dropped significantly in recent years, necessitating cost savings in order to remain competitive. “The world is moving forward, and we need to move with it. Improving processes, solving problems, and systematising activities help us keep pace with change. I can’t imagine working without CI”.

CI Manager

According to the CI manager, continuous improvement is an embedded element of the company’s operational philosophy. “CI helps us function – it shows us what can be improved and how we can continuously enhance our processes, products, and even our own work. It supports our daily activities and contributes to our development as individuals”.

Shift Supervisor

The shift supervisor identified several drivers for CI in their organisation: improving workplace safety, enhancing work organisation, maintaining high product quality, and achieving production performance targets.

4.2.2. Barriers to the Realisation of Continuous Improvement

Production Director

The main issue, according to the director, is the “lack of sustained employee engagement”. While some employees remain actively involved in CI, others – especially those with longer tenure – appear to have become disengaged. Younger employees are often difficult to motivate. “At some point, people run out of ideas”, he noted. “We need to constantly refresh the suggestion system and reward schemes to keep them inspiring”.

He also pointed to superficial problem – solving practices: “Problem – solving teams sometimes focus on short – term fixes rather than asking why the problem occurred in the first place. They concentrate on symptoms, not causes”. Despite repeated explanations, this mindset persists, mainly due to the daily pressure to meet production targets. “The goal is for today to go well, and everyone is focused on that”.

CI Manager

The CI manager reported organisational barriers, particularly at the interface between departments. “Even when employees are willing to help, we often have to go through their supervisors first – because they may already be assigned to other tasks”. She highlighted that she doesn’t have the authority to delegate CI – related tasks directly to employees and must seek approval instead.

Further challenges include a lack of time to encourage employee participation in CI activities, difficulty in reviewing *kaizen* suggestions, and limited capacity to provide timely feedback, especially when submission volumes are high.

Shift Supervisor

The supervisor cited time pressure as a key obstacle, especially during peak production periods. “We don’t have time to train employees, to communicate properly, or to support problem – solving initiatives when order volumes are high”.

Another concern was the lengthy implementation time for some *kaizen* suggestions, often due to the complexity of issues or limited access to necessary resources. In his view, this can lead to employee demotivation.

4.2.3. Expectations Regarding Required Support

Production Director

The director expressed hope that CI workshops led by the CI manager could help process and utilise the vast amount of data and information gathered. He also sees value in off – site training sessions, which may offer a fresh perspective and generate new ideas by stepping away from the regular work environment.

He expects the Maintenance department to take a more hands – on approach to addressing root causes of problems – not “solving them from behind a desk”.

CI Manager

The CI manager would like direct supervisors to play a more active role in motivating their teams and to make it clear – particularly to more resistant employees – that CI is not the responsibility of the CI department alone, but of everyone in the organisation.

She hopes for greater support and understanding from other department heads, particularly since she has no dedicated team and relies on staff from other areas. This includes improving communication between managers when assigning employees to cross – functional CI projects. She also called for IT support in improving the *kaizen* submission system.

Shift Supervisor

The shift supervisor believes that periodic off – site training for production workers and front – line managers would contribute significantly to CI knowledge and awareness.

He also hopes for continued in – house training on CI practices, regular leadership development sessions focused on CI, and better communication and collaboration between departments. Finally, he called for more dedicated time in the schedule for operator workshops – and for those workshops to be held more frequently.

5. Discussion and Conclusions

The interviews conducted reveal that the organisations studied hold varying perspectives on the drivers, challenges, and expectations surrounding the realisation of continuous improvement (CI) – perspectives which are closely aligned with the respondents' respective roles within their companies. Their responses support the formulation of the following conclusions:

Drivers:

- All respondents demonstrated awareness of the reasons behind the realisation of CI activities in their organisations.
- Production directors tended to adopt a broader view, placing greater emphasis on external drivers.
- CI managers and shift supervisors primarily focused on internal motivations and organisational dynamics.

Reported challenges:

- A frequently mentioned issue was the gradual decline in employee engagement with CI activities, influenced by time and various internal and external factors. This highlights the need for efforts to sustain – or at times, revive – employee motivation. Similar findings have been reported by Brajer-Marczak (2021), van Assen (2021), and Yang et al. (2024).

- Another common challenge was the lack of effective collaboration with departments intended to support production, especially the Maintenance department.
- Shift supervisors expressed concerns over the lack of time to properly engage in CI – related initiatives, citing high pressure to meet production plans and KPI targets as the main constraint.
- CI managers, on the other hand, identified a lack of formal authority to influence staff involved in CI activities and to ensure their follow – through. They also noted insufficient support from line managers.

Expectations:

- Respondents across both companies expect greater collaboration and support from departments that are meant to assist production – most notably, the Maintenance department.
- In Company A, all respondents also expressed a clear need for more support from the HR department, including the introduction of an HR Business Partner (HRBP) who understands the specific needs of production.
- CI managers from both companies hope for stronger influence from line managers over employees involved in CI, as well as improved communication and cooperation among departmental leaders.
- Production directors and CI managers alike highlighted the need for new approaches to engage both younger employees and longer – tenured staff who may have become disengaged.

The research objective set out in this article has been achieved. The study successfully identified the drivers behind CI, the challenges encountered in its realisation, and the expectations related to improving its execution – thus answering the research questions posed.

It must be noted, however, that the conclusions presented are based on two manufacturing case studies, and the findings should be regarded as pilot in nature. Future studies should aim to include a larger and more diverse sample of manufacturing companies. It would also be valuable to expand the research to service and retail sectors in order to carry out a comparative analysis. Broadening the range of respondents – e.g. to include team leaders, operators, or Maintenance supervisors – could further enrich the findings.

The results of this study indicate that the drivers of CI reported by respondents are thoughtful and grounded in a rational understanding of organisational needs. CI initiatives are not undertaken merely in response to “management trends”, but rather stem from genuine challenges, emerging opportunities, and the necessity of resolving operational problems.

Respondents identified a variety of challenges depending on their role in the organisation. These findings are consistent with those of Baier (2024), Cano et al. (2017), and van Beers et al. (2022), who also noted role – specific perceptions of CI barriers.

The results also highlight the importance of collaboration and coherence across the organisation in the realisation of CI. Respondents repeatedly emphasised that managerial support – at all levels – is a critical enabler of successful CI. This aligns with prior research highlighting the role of leadership in CI, including studies by O. Connor and Cormican (2021), Holmemo et al. (2023), and Oon et al. (2021).

Several respondents also noted the importance of “refreshing” current CI systems – revisiting older ideas and exploring new approaches to meet changing circumstances (e.g. engaging younger employees). As one respondent put it, “the world is changing, and CI needs to change with it”. Adopting this perspective appears essential to sustaining CI over the long term and ensuring its continued relevance and effectiveness.

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THE APPLICATION OF TRANSACTIONAL ANALYSIS IN IMPROVING TEAM WORK

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Purpose: The topic addressed in this article concerns the potential application of transactional analysis in the processes of managing people within organizations, particularly for enhancing team effectiveness.

Design/methodology/approach: The described research was conducted as complex case study using the following research methods: analysis and compilation of literature in management and social psychology, participant observation and questionnaire surveys.

Findings: The study revealed a lack of consistency between the ego states diagnosed at any stage of the transaction sequence and the predominant ego states identified both in the self-assessment of the subjects and in the opinions of their co-workers.

Research limitations/implications: The research sample size does not allow for generalization of the findings. They only concern the presented case studies and are not of a general nature. Moreover, the use of functional analysis involves potential cognitive biases on the part of the researcher, which may affect both the results obtained and the way they are interpreted. Future research could expand on these findings by including a larger number of cases and conducting the transaction analysis independently by at least two researchers, followed by a comparison of their results.

Practical implications: The author hopes that the study presented in this article will spark interest in the tools offered by transactional analysis, while also raising awareness among those deciding to use this theory in team management.

Originality/value: Managers willing to implement transactional analysis tools must be aware of the imprecision of the described techniques. This study can therefore be treated as a cautionary tale against blindly adapting methods of influencing employees based on the shape of their ego-gram.

Keywords: team work, transactional analysis, work effectiveness, interpersonal communication, case study.

Category of the paper: Research paper.

1. Introduction

The aim of this article is to present how transactional analysis tools can be used to shape team relationships and collaboration, while also pointing out the limitations of these methods. Currently, 70% of European organizations operate using various forms of teamwork, the dominant form of which (54%) is management-led teams. Attempts to popularize self-directed teams, undertaken in 15% of the surveyed institutions (Eurofound, Cedefop, 2020), are also worth noting. Additional challenges are provided by the increasing number of virtual teams, especially since the COVID-19 pandemic, whose functioning is inextricably linked to the spatial dispersion of members and communication via modern information technologies.

What distinguishes a work group from a team is the occurrence of a positive synergism effect, i.e. a situation in which individuals, as a result of joint action, achieve a level of efficiency higher than the sum of their individual inputs (Galata, 2006; Winkler, 2019). This explains why modern enterprises are so enthusiastic about developing a culture of work teams in their structures. Thanks to the synergy effect, it is possible to increase the efficiency of processes without increasing inputs, which is associated with a business benefit for the enterprise.

In the context of group work, the term “effectiveness” is commonly used. From a praxeological point of view, effectiveness of an action means that valuable results have been obtained as a result of it. In this work, the adopted definition states that an effective team is one capable of achieving the organization’s intended goals (Pyszka, 2015).

The literature predominantly holds that the leader plays the most crucial role in shaping team effectiveness, specifically through the way this individual influences other team members (Cooper et al., 2017; Buchelt, Knop-Sapała, 2020; Dehghanan et al., 2021). This is because the leader’s impact extends to almost all aspects of team functioning. The person in this role possesses resources, including both formal and informal authority, essential for setting goals, determining team size and composition, establishing norms and rules, shaping the environment and fostering team cohesion. Additionally, due to their informal authority, the leader has the capacity to shape interpersonal relationships, both among team members and between the team and the external environment.

The situational leadership model assumes that there is no universal leadership style, and therefore, the leader-manager should adapt their behavior to the requirements of the current situation, which is determined by, among other things, the level of experience of their subordinates (Goleman, 2000). Balancing between task orientation and people orientation requires an accurate assessment of colleagues' experience levels, which includes their readiness to pursue increasingly ambitious goals, tackle more challenging tasks and accept the associated responsibilities. Employee attitudes toward tasks can shift due to various factors, such as training in a specific field, commitment to organizational goals and alignment of outcomes with

individual value systems (Cooper et al., 2017). Therefore, it is so important that the decision to adopt one of the leadership styles is preceded by the recognition of situational conditions that may affect the attitude of employees.

This introduces a challenge for managers: accurately diagnosing the needs and expectations of colleagues to offer the best possible support. Leaders have direct access to some of the information they need, including previous achievements of the employee, qualifications or declared level of proficiency in a given field. However, a less visible but equally important factor remains the psychophysical condition of individuals, about which the team can only infer. A perceptive leader will thus value any tools that enable them to assess the current disposition of colleagues and respond thoughtfully within the communication process.

In the 1950s, the American psychiatrist E. Berne developed an innovative therapeutic approach called transactional analysis (TA). Its assumptions refer to Freudian psychoanalysis, but the author himself saw the justification for its separation due to its accessible conceptual layer and universality of application. In one of the first published studies on transactional analysis, E. Berne (1977) described it as an approach based on the distinction and study of three ego states (exteropsychic, neopsychic and archeopsychic). According to the current definition of the International Society for Transactional Analysis, TA is considered a theory of personality and a system of psychotherapy focused on personal development and personal change (Erskine, 2009).

The theoretical achievements of TA constitute an exhaustive guide to human behavior in various environments, including the professional environment. The particular usefulness of TA in the area of interpersonal communication encourages attempts to apply its theory to teams, as structures in which the efficiency of the communication process has a special business significance. Knowledge of ego states can be used for (Hall, 2019; Szymanowska, Sękowska, 2000; Tassabehji et al., 2024):

- improving communication with individual team members - the ability to recognize the ego state from which the interlocutor communicates allows you to adjust your own ego state in such a way that the conversation achieves the expected result;
- conflict management - knowledge of ego states and different types of transactions makes it easier to prevent communication noise, and in the event of their occurrence allows you to efficiently explain the essence of the dispute,
- motivation - knowledge of the employee's dominant life attitude allows managers to adjust the methods of influence in order to strengthen commitment,
- change management – awareness of the needs of employees who adopt specific Ego states in conditions of uncertainty makes it easier for leaders to adapt their leadership style to the requirements of the situation,
- self-development and self-improvement – transactional analysis offers tools designed to examine the structure of one's own personality, and insights from such analyses can be applied to relationships with colleagues,

- supporting and promoting diversity – the differences in personality structure between individuals highlighted in TA can inspire employees to treat each other with respect and build understanding for different reactions or attitudes.

2. Methodology

The area of so-called organizational transactional analysis includes the use of TA tools in the professional environment, including the study of interactions between employees. Functional analysis consists in the diagnosis of the ego state of the subjects by the researcher (Harris, 2020; Stewart, Joines, 2021), which creates a research problem regarding the consistency of attitudes exhibited by employees in the opinion of their co-workers with the attitudes identified by the researcher and the self-assessment of the subject. This research problem has led to the formulation of the study's aim, which is to verify the effectiveness of using transactional analysis mechanisms in shaping relationships and fostering teamwork collaboration. The following research questions were posed:

- Is there alignment between the ego-state profile developed based on an individual's self-assessment and the ego-state profile developed based on the opinions of their colleagues?
- Is there consistency between an individual's behavior in a specific situation and the ego-state profile developed based on their self-assessment?
- Is there consistency between an individual's behavior in a specific situation and the ego-state profile developed based on the opinions of their colleagues?

The study was conducted using a mixed method, due to the difficult to quantify aspect of interpersonal relations and the need to perform an in-depth analysis in order to gain new knowledge related to the subject of the study (Czakon, 2015; Samul, 2016). In accordance with Podgórski's classification (2007), the author used a combination of the sociopsychological field research method with the sociometric method. The exploratory nature of the study is emphasized by its structure - the study was constructed as a comprehensive case study, enhanced by five techniques: observation, functional analysis of the material collected during observation, a sociometric test using the classic J. Moreno technique and the "Guess who?" technique, and the Personal Style Questionnaire psychometric test.

The study aims to determine the usefulness of selected theories and tools of TA in enhancing team effectiveness. The participants were selected employees of a company located in south-eastern Poland, responsible for overseeing production areas, who collaborate within an organisation. According to the author, an accurate diagnosis of ego states requires familiarity with the characteristic behaviors of the individual being studied. Therefore, in the present study, the functional analysis was preceded by participant observation. Due to the in-depth nature of

the observation, it was necessary to limit the sample size. Table 1 presents a summary of demographic data for those who participated in the study.

Table 1.

Presentation of the research sample members by gender, position, age and work experience

Person	Characteristics			
	gender	job position	age (in years)	work experience (in years)
A	Male	Production Director	30-40	> 15
B	Male	Production Planner	30-40	10-15
C	Male	Production Planner	30-40	< 5
D	Female	Logistics	30-40	< 5
E	Female	Buyer	50-60	> 15
F	Female	Buyer	40-50	> 15
G	Male	Production Manager	30-40	10-15
H	Female	Production Manager	30-40	10-15

Source: Own study.

As part of the described study, a questionnaire consisting of four parts was prepared. Respondents filled out the sheets in writing, and then the obtained data was processed electronically by the researcher.

The first part of the questionnaire was a sociometric test constructed using the classic J. Moreno technique. The questions contained in it concerned interpersonal relations between members of the studied team. Two sociometric criteria were adopted - professional and non-professional situation. The aim of the test was to learn about the sociometric structure of the team and to determine the position of individual units.

Parts II and III of the questionnaire contained another sociometric test, prepared specifically for the needs of the study, consisting of 30 statements in Part II and 20 descriptions in Part III. The descriptions given had to be matched with one person from among the team members who best met the criterion included in the statement (sociometric technique "Guess who?"). The wording in these parts of the questionnaire was constructed in such a way that, based on the answers, it was possible to determine the dominant ego state adopted by each of the team members. When formulating the criteria, the author used the following tools:

- "Egogram Strukturalny. Kwestionariusz Samooceny Stanów Ja" by A. Pierzchała, A. Sarnat-Ciastko (2011).
- "Egogram EFP" proposed by J. Jagieła (2011),
- "Kwestionariusz Stylów Osobistych" by E. Szymanowska, M. Sękowska (2000).

Part IV of the questionnaire was a psychometric test prepared on the basis of the "Kwestionariusz Stylów Osobistych" by E. Szymanowska and M. Sękowska (2000). Respondents performed a self-assessment according to 40 statements, so that it was possible to compare the assessments obtained from other group members with the subject's own assessment.

The research procedure of the empirical part assumed conducting the study in two stages. The first stage was an observation, conducted from July 2021 to July 2023. During this time, the author noted observations regarding situations in which the effectiveness of the work of the studied team could be disrupted. Eight people supervising production processes were subjected to observation. The choice of the research group was purposeful. The second stage included a questionnaire survey, to which seven of the eight people mentioned above were subjected - it did not include person A, due to the hierarchical dependence in the organizational structure to which the author belonged as part of the participant observation.

3. Results

The result of the observation was a description of five situations, for which the interviewees' ego states were then indicated. In turn, Parts II and III of the questionnaire examined how the respondents perceived the behavior of other team members in the context of the theory of ego states of transactional analysis. Data analysis from the sociometric study allowed for the creation of a matrix indicating the intensity of dominant ego states within the team (see Table 2). Primarily, the analysis identified "sociometric stars", that is employees who, according to other respondents, most strongly exhibit characteristics of a particular dominant ego state.

Table 2.

Matrix of the Intensity of Dominant Ego States Based on Respondents' Choices in Parts II and III of the Questionnaire

Ego State	B	C	D	E	F	G	H
Controlling/Critical Parent (CP)	7	10	5	5	17	4	20
Nurturing Parent (NP)	14	4	13	1	11	13	4
Adult (A)	15	8	9	8	7	14	6
Compliant Child (CC)	9	5	7	12	6	6	9
Rebellious Child (RC)	10	17	4	4	20	12	4

Source: Own study.

The analysis of the respondents' answers in Part IV of the questionnaire allowed the development of an egogram for each of the surveyed persons. Then, line graphs illustrating the answers from Parts II and III of the questionnaire were plotted on the constructed histograms. In this way, an individual profile of ego states was developed for each of the surveyed team members, taking into account the self-assessment of the surveyed person and the opinions of their colleagues. The creation and interpretation of individual profiles of ego states of the surveyed team members allowed the illustration of the potential for influencing the effectiveness of their work. Figure 1 presents a graphical interpretation of the surveyed answers using histograms.

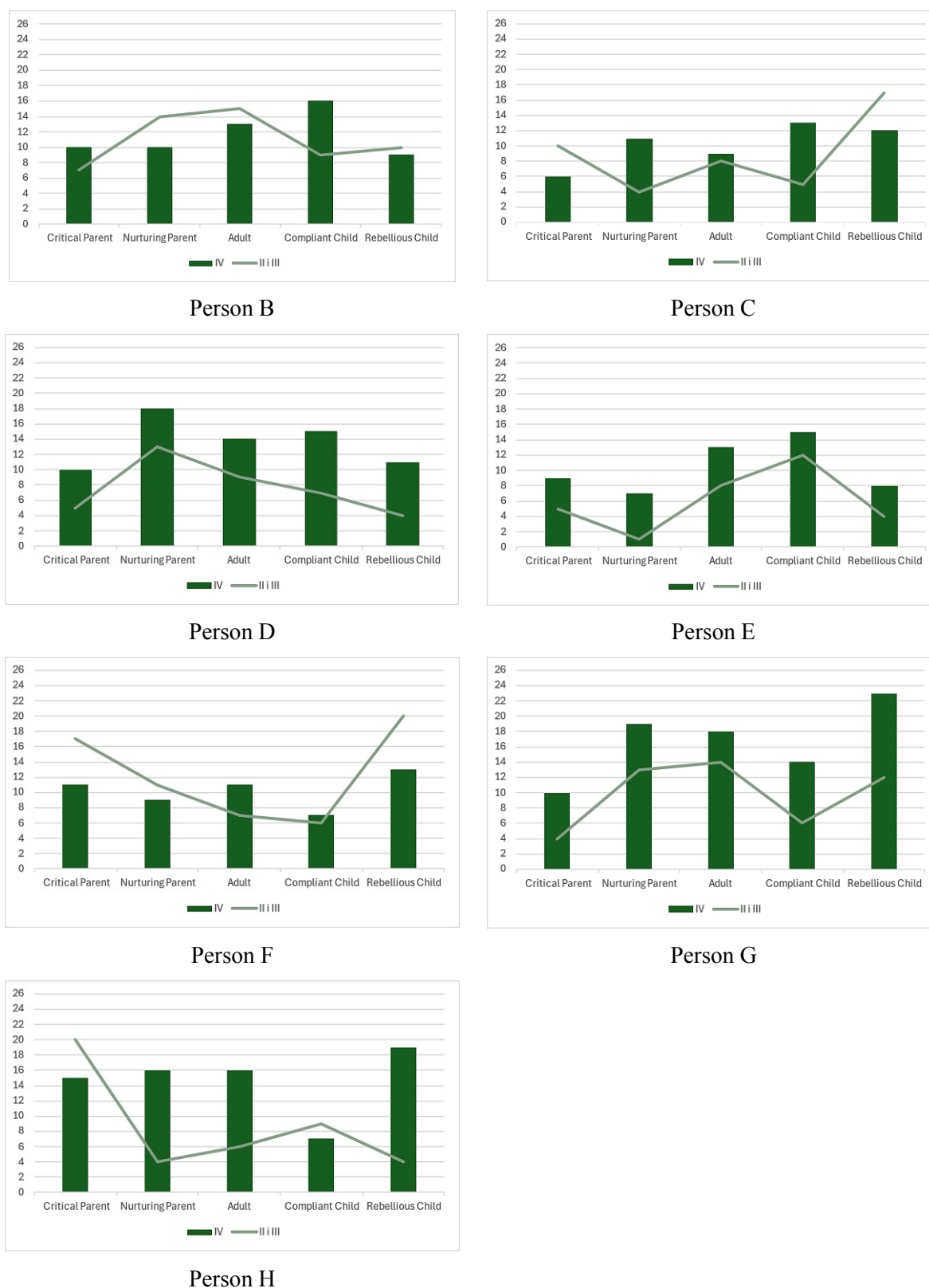


Figure 1. The intensity of traits associated with each ego state of research participants based on sociometric and psychometric assessments.

Source: Own study.

4. Discussion

Comparison of the highest and lowest rated ego states reveals that only two out of the seven participants show consistency between their self-identification results and the opinions of others. It can therefore be concluded that there are significant discrepancies between the profiles based on self-assessment and those based on the sociometric technique, making it impossible to clearly determine which method of perceiving an individual's behaviors should provide insight into the adequate mechanisms of transactional analysis.

The above-mentioned discrepancies in the way an individual's behavior is perceived as manifestations of specific ego states provide a starting point for verifying the consistency of the functional analysis results with:

- the ego state profile developed on the basis of self-assessment,
- the ego state profile developed on the basis of co-workers' opinions about the individual.

For this purpose, three key moments were identified for five selected situations from the material collected during participant observation and subjected to functional analysis. These situations, according to the author, posed a threat to the effective work of the team under study. The three key moments are:

- the beginning moment, when the behavior of the interlocutors is most often spontaneous, natural and unthoughtful,
- the turning point, when transactions usually cross and both the agent's and respondent's behaviors may have been premeditated,
- the end of the transaction sequence, when the interlocutors adopt the most comfortable postures for them.

For each of the stages listed, the ego state from which the message was sent was indicated. Then, the consistency of the identified attitudes with the results of the study of dominant ego states conducted using a questionnaire was checked. 30 transactional stimuli were analyzed (for three stimuli, there was consistency in both self-assessment and in colleagues' opinions). In 16 cases, there was a lack of consistency, which constitutes 53% of all stimuli considered. For 9 situations, it is possible to indicate consistency between the identified ego state and the dominant ego state from the sociometric study (opinions of co-workers). The remaining 8 cases are consistent with the result of self-assessment. Additionally, no observed consistency was related to the stage of the transaction sequence. For example, the ego state initiating the conversation was consistent with the self-assessment in only 2 out of 10 cases, and with colleagues' evaluations – in three cases.

The above analysis of five situations shows a lack of consistency between the ego state diagnosed at any stage of the transaction sequence and the dominant ego states defined both in self-assessment and in the opinions of others. Based on the conducted study, it can therefore be stated that a thorough knowledge of the mechanisms of transactional analysis, especially the

ego states of team members, does not allow for a direct translation of this knowledge into improving the work of teams. However, it should be noted that in this study the ego state diagnosis was not carried out by a trained transactional analyst, and therefore it would be premature to dismiss transactional analysis as ineffective in the context of team management. It would be more appropriate to accept the interpretation that the use of TA tools by non-experts, such as ambitious managers seeking innovative ways to influence their colleagues, should be accompanied by an awareness of the imprecision of the described techniques. The variety of interpretations, compounded by the different perceptions of each analyst, creates a broad scope for drawing incorrect conclusions. This study can therefore be treated as a cautionary tale against blindly adapting methods of influencing employees based on the shape of their egogram.

5. Summary

Teams operating in times of unpredictable crises, dynamic economic changes and increasing competition face numerous challenges, among which the key to survival seems to be continuous improvement of efficiency. Innovative ways to enhance cooperation and strengthen interpersonal relationships are being sought to contribute to the success of the organization. Transactional analysis, offering a unique approach to interpersonal relations, provides exceptional techniques dedicated to shaping relationships, including among employees.

In the described study, an attempt was made to test whether the mechanisms of transactional analysis constitute an effective tool for improving team performance. The synthetic conclusions from the conducted research can be summarized as follows:

- the study showed a discrepancy between the self-assessment of the behaviors undertaken by the employee and the opinion of others about them,
- the study showed a lack of consistency between the ego states diagnosed during the functional analysis at different stages of the transaction sequence and the results of the dominant ego states from self-assessment,
- the study showed a lack of consistency between the ego states diagnosed during the functional analysis at different stages of the transaction sequence and the results of the dominant ego states from the sociometric study.

Based on these findings, the use of only the “Kwestionariusz Stylów Osobistych” to determine tendencies in employee attitudes can be questioned. The essence of using this tool is for the respondent to make a self-assessment of their behavior. This is therefore associated with the risk of giving thoughtful, cautious answers, often adjusted to an imagined pattern of desired attitude. The way colleagues evaluate the behaviors of others is also influenced by their subjective understanding of a given statement in the questionnaire and by their personal likes and dislikes towards the individual.

On the other hand, the reason for the lack of consistency between the ego states identified during the functional analysis and both the self-identification and the colleagues' evaluations may lie in the problematic nature of the selected situations. Participants in the described cases faced a professional challenge, which undoubtedly influenced the intensity of their reactions. In such situations, individuals may prefer to use mechanisms consistent with the organizational culture, including implicit norms or their own learned and proven ways of coping with discomfort. Furthermore, the way ego states are manifested through behaviors may change under the influence of situational factors, including the environment, professional relationships, and potential consequences of the behavior, etc.

The author hopes that the research results achieved will make all those interested in the subject of transactional analysis aware that, despite the accessible conceptual framework, the use of the proposed techniques is associated with the subjectivity of perception and interpretation, and therefore carries a significant risk of cognitive distortions, both on the part of the researcher and the individuals being studied. The results should be of particular interest to managers considering implementing the TA methodology in their daily work.

The study described in this article leaves space for more detailed and extensive research, such as those based on the analysis of a larger number of cases and repeated observations of a given employee. In addition, a way to minimize the likelihood of distortions and cognitive errors could be conducting transactional analysis by at least two researchers.

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COMPARISON OF THE DEMAND FOR GREEN COMPETENCES IN VARIOUS INDUSTRIES

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Purpose: Green competences are a more and more popular topic in academia. Researchers are trying to describe them in detail and connect them with the economical results of mostly business organizations. The EU approach also strengthens the concept by introducing the rules of non-financial reporting (ESG) obligation for SME from 2026.

Design/methodology/approach: The goal of this study is to determine whether green competencies are a part of labour market demand and what are the differences between four selected industries: medical, creative, business and IT. The web-scraping allowed for quantitative analyses of the competence demand.

Findings: Only in 1% of the job offers there is direct information on green competences. It is then justified to analyse the labour market based on pre-green competences such as communication, teamwork, openness, and creativity, thus those are the ones both strongly connected with the green competence theories and already widely introduced to the labour market.

Research limitations/implications: The research is due to some limitations. First of all, it allowed for comparison only 4 industries. The industries were chosen based on their attractiveness in national intelligent specializations, but do not show the whole picture of a labour market. All the data was scrapped from the pracuj.pl portal, which is mostly the source of job offers for specialist and middle management form business related industries. The last limitation worth mentioning is that the research is based on a quantitative approach.

Originality/value: The surprising results of the lack of green competences in labour demand draws the gap between research and theoretical approach and the business demand.

Keywords: green competence, labour market, pre-green competence, ESG.

Category of the paper: research paper.

1. Introduction

As the global economy changes toward sustainability and innovation, understanding the role of green competencies in the labour market becomes increasingly important. Industries such as modern business services, ICT, creative industries, and the medical industry are aligning workforce capabilities and policies with the goals of a green economy. By analysing job advertisements and identifying both green and indirectly related pre-green competencies, the research aims to assess how deeply these values have been embedded into recruitment practices and the labour market itself. The study also assesses the degree to which each industry is prepared to integrate green competencies into its workforce, offering information on the current gap between theoretical discourse and practical application in the labour market.

1.1. Modern Business Services

The modern business services sector includes Shared Service Centres (SSC), Business Process Outsourcing (BPO), Information Technology Outsourcing (ITO) and Research and Development (R&D). Business processes include all kinds of administrative, human resources, and billing functions, as well as customer relations and R&D work. The analyses indicate that people who started their career in this sector have a wide range of opportunities to advance in the labour market and are perfectly suited to any organisation (Wiśniewska, Dolot, 2017).

The modern business services sector in Poland has grown rapidly in recent years. The consequence of the quantitative and qualitative development of the sector is a continuous dynamic increase in the level of employment. Krakow, Wroclaw, Tricity, Lodz and Bydgoszcz have a clear local specialisation, which results from a particularly high share of jobs in the modern business services sector concerning total jobs (Kuźmicki, Linkiewicz, 2021).

The data presented in the ABSL report also confirm that the modern business services sector is entering a stage of rapid transformation. With the growth of knowledge-based services, which account for more than 55.5 percent of all services, and the increasing role of mid-office processes, the share of which exceeded 50% for the first time, the attention of companies is shifting from growth understood mainly as employment growth to qualitative factors - productivity, sophistication, automation, and innovation. Nearly 75% of respondents to the ABSL survey confirmed that by the end of the first quarter of 2025, they plan to implement a transformation strategy. In most cases, this strategy is geared toward automating processes (91.3%), standardising them (79.8%), and implementing or expanding AI (70.2%). In most cases, this strategy is geared toward automating processes (91.3%), standardising them (79.8%) and implementing or expanding AI (70.2%). At the same time, more than 80% of those surveyed confirmed that the transformation of the current business model will be significant, very significant or fundamental, with the biggest changes expected in terms of increasing the use of AI and virtualisation. At the same time, more than 80% of those surveyed confirmed that

the transformation of the current business model will be significant, very significant or fundamental, with the biggest changes expected in terms of increasing the use of AI and virtualisation. Thus, upskilling trends, although already strong, are gaining momentum (ABSL, 2024).

1.2. Information and Communications Technology

Information and Communication Technologies (ICT), interchangeably referred to as information and communication technologies, ICT, or information technology, is a family of technologies that process, collect, and transmit information in electronic form. ICT is one of the elements that plays an important role in every sector of the economy. CT is one of the elements that plays an important role in every sector of the economy. The ICT sector is a key pillar of the knowledge economy, whose development has become a priority challenge for many countries (Parys, 2024). The ICT sector is a key pillar of the knowledge economy, its development has become a priority challenge for many countries (Parys, 2024).

Polish ICT companies specialising in the production and sale of computer hardware make most of their profits thanks to exports - almost two-thirds of their revenues come from overseas sales, while companies specialising in ICT services made around a quarter of their revenues from exporting their services. Polish ICT companies specialising in the production and sale of computer hardware make most of their profits thanks to exports - almost two-thirds of their revenues come from overseas sales, while companies specialising in ICT services made around a quarter of their revenues from exporting their services. The value of exports and imports of ICT products grew by 15% and 18%, respectively (Polish Agency for Enterprise Development, 2023).

According to the Polish Economic Institute, in 2022 the gross value added generated by the ICT sector amounted to approximately 6% of global GDP. According to the Polish Economic Institute, in 2022 the gross value added generated by the ICT sector amounted to approximately 6% of global GDP. It should be noted that IT services represented the largest share of this value. Between 2000 and 2022, the IT services sector increased its value almost twice as fast as the rest of the global economy, showing how important an engine of growth the industry has become over the past two decades (Polski Instytut Ekonomiczny, 2024).

1.3. Creative industry

The creative economy is that part of the overall economy that uses creativity and intellectual capital as the primary factor of production. It includes three components: creative industries, the digital sector, and the cultural sector. The creative economy is the economy of the future - for the term reflects the change that is taking place in the economy with successive industrial revolutions, technological advances, and digitization. The creative economy is the economy of the future - for the term reflects the change that is taking place in the economy with successive industrial revolutions, technological advances, and digitization. Its function is both to directly

create GDP and to indirectly influence other sectors of the economy by stimulating innovation and knowledge transfer (Polski Instytut Ekonomiczny, 2020).

The development of creative industries is positively reflected in many aspects of the economy. Goods and services that are the result of the activities of entities belonging to the creative industries are characterized by an element of creativity and innovation, which significantly translates into building and strengthening the competitive position of the economy (Firlej, Leś, 2022.).

The cultural and creative sectors play an important role in the Polish economy. In 2021, these sectors generated about PLN 31.2 billion in added value, and if we include the indirect impact, it was about PLN 82.4 billion (3.58 percent of GDP). Advertising companies are responsible for the largest share. However, the economic importance of the creative sectors is not limited to the value added generated directly by these entities. Entities counted among the creative sectors procure products and services from other entrepreneurs, which translates into the development of the economy as a whole (Święcicki et al., 2023).

1.4. Medical industry

The demand for medical services in Poland is increasing year after year (PIU, 2019). The market for medical services is dynamic. Population growth or the trend of an ageing population means that the quality and availability of services should increase. Population growth or the trend of an ageing population means that the quality and availability of services should increase. Poles use medical services in both public and private form (Smarżewska, 2020).

Although the Polish healthcare market faces challenges, local and international investors recognize its high attractiveness and growth prospects. Although the Polish healthcare market faces challenges, local and international investors recognize its high attractiveness and growth prospects. This is evidenced by a more than 8% increase in healthcare spending between 2023 and 2028. This is evidenced by a more than 8% increase in healthcare spending between 2023 and 2028. Despite significantly higher public healthcare spending, projected growth is higher in the private sector (Strategy & Polska, 2024). Despite significantly higher public healthcare spending, projected growth is higher in the private sector (Strategy & Polska, 2024).

By 2027, the value of the telemedicine market in Poland is expected to reach PLN 4.5 billion, an increase of 300 percent compared to 2020. The introduction of innovative technologies such as the Internet of Things (IoT) in medicine could save PLN 2-3 billion annually by improving treatment efficiency and reducing medical errors. The future of Poland's healthcare sector will largely depend on its ability to adapt and implement these innovative solutions, which can significantly improve healthcare quality and reduce operating costs (Strategy & Polska, 2024). The future of Poland's healthcare sector will largely depend on its ability to adapt and implement these innovative solutions, which can significantly improve healthcare quality and reduce operating costs (Strategy & Polska, 2024).

1.5. Green Competencies

This new concept is still in the process of implementation from a business perspective. According to Łapiński et al. (2022), green competencies are related to all interactions between environment and human activity.

UNIDO defines the essence of green competencies as the knowledge, skills, values, and attitudes needed to live, develop, and support a sustainable and resource-efficient society (<https://www.unido.org/stories/what-are-green-skills>, 19 February 2023). According to Kozar (2017), green competencies of employees are the result of their knowledge and skills in applying pro-environmental solutions within the company.

According to Bugdol and Stańczyk (2021), green competencies include knowledge of the ecological use of resources and waste reduction; an ecological attitude characterised by responsibility for the state of the natural environment; and ecological behaviour, such as, for example, recycling waste, segregating rubbish (paper, glass, plastic, batteries), saving electricity and water, saving paper by using electronic media, commuting by public transport.

Cabral and Lochan (2019) indicate that green competencies consist of the following: (1) green knowledge - refers to general knowledge of the natural environment; (2) green skills - skills of a professional and general nature that are necessary for green occupations, but also for other occupations affected by the green transition; (3) green awareness - refers to awareness of the impact of human activities on the environment; (4) green attitudes - understood as individuals' perceptions of the value of protecting the environment; (5) green capabilities - important for self-development and increasing productivity in the green economy; (6) green behaviours that support environmental sustainability (Cabral, Lochan, 2019.).

Having discussed the issue of green competencies, Górnjak (2014) distinguishes between behavioural and functional competencies. Discussing the issue of green competencies, Górnjak (2014) distinguishes between behavioural and functional competences. The former defines the so-called 'soft' skills. The former defines the so-called 'soft' skills. Green behavioural competences indicate how employees must behave in order to do their job properly, i.e., in such a way that they do not contribute to any environmental risks. Among the soft competencies thus understood, the authors distinguish: creative environmental thinking, the ability to adapt to dynamic changes in the environmental field, openness to acquiring environmental knowledge, the ability to communicate one's environmental knowledge, experience, and beliefs in an appropriate manner, ethical environmental behaviour, the ability to manage people under environmental risk. On the other hand, green functional competences are the so-called 'hard' skills. They indicate what employees need to know in order to do their job well. They indicate what employees need to know in order to do their jobs well. Among green functional competencies, Górnjak (2014) distinguishes: expertise in the economical use of raw materials and in waste segregation, the ability to drive in an energy-efficient manner, knowledge of and compliance with laws, occupational health and safety.

Knowledge of the nature and structure of green competencies determines the right choice of methods for their development and can thus support corporate sustainability efforts directed towards, among other things, the fourth goal belonging to the group of seventeen Sustainable Development Goals (SDGs). This goal aims to provide inclusive and equitable quality education and promote lifelong learning opportunities for all, and its key indicators include “ensuring that by 2030 all learners have the knowledge and skills needed to promote sustainable development, including, *inter alia*, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and recognition of cultural diversity and the contribution of culture to sustainable development”. This goal aims to provide inclusive and equitable quality education and promote lifelong learning opportunities for all, and its key indicators include “ensuring that by 2030 all learners have the knowledge and skills needed to promote sustainable development, including, *inter alia*, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and recognition of cultural diversity and the contribution of culture to sustainable development”.

2. Methods

The goal of this study is to determine whether green competencies are a part of labour market demand and what are the differences between four selected industries. As Green competencies are understood according to Górniak (2014), the main research goal is supported by 4 objectives:

1. Identification of job offers and initial assessment of the research sample.
2. Creating the list of competencies required in the analysed industries by using key words such as green, environment, waste, raw, energy.
3. Analysing the Green Competencies.
4. Comparing the industries.

It is important to state that the research objectives are at the same time the research procedure itself. The exploratory and confirmatory research approach was introduced in the research. Exploratory part related to analysing theories and listing the words and roots indicating green competencies and pre-green competences. The confirmation approach was executed while the selected industries were compared with the Górniak theory.

All research analyses were performed with the use of MS Excel and SPSS30.

3. Results

The research procedure reflects the specific objectives of this study. The first step of the research procedure was the identification of job offers. This was done using the web-scraping method, obtaining data available on websites, including the Pracuj.pl portal as the most popular website with job offers in Poland. Offers were identified within selected areas on the Pracuj.pl portal (number of jobs offers):

1. Doctors/Medical Support for Medical Industry (733).
2. Commercials/Graphics/Creation/Photography for Creative industry (404).
3. IT Administration for Information and Communication technology (2915, excluding software development).
4. Advisory/Consulting for the Modern Business Services industry (482).

The second and third steps were related to the search for key words. The Górnjak theory was selected as the basis for this investigation, but the competencies mentioned there are strictly related to the environment. That is why researchers decided to introduce general roots indicating green competencies, as well as the term pre-green competence understood as a generated version of the green competence, out of which the green one may emerge.

The roots of the words and the words indicating green competences in general were established as follows:

- Gree*.
- Ecolo*.
- Environm*.
- Natura*.
- ESG.
- Sustainab*.
- Segregation*.

Identifying the green competencies in the database based on the key words (number of offers containing the selected version of a key word):

- Grea* - 10 indications all connected with green competences.
- Ecolo* - 4 indications connected with green competences.
- Environm* - 11 indications referred to the natural environment, others were related to the technology or medical terms.
- ESG - 15 indications.
- Sustainabl* - 47 indications.
- Segregation* - 0 indications.

The above-mentioned analysis states that green competences are embedded in labour advertisements in only about 1%. It makes green competences impossible to analyse in a more detailed way. That is why the concept of pre-green competences is introduced.

The next step of the analysis was to determine the importance of pre-green competences in job offers between the industries. The analysis is presented in Table 1.

Table 1.

Pre-green competences in job offers

			Industry				Total
			Medical	Creative	Business	IT	
Creativity	Mentioned	N	13	175	22	47	257
		%	1,8%	43,3%	4,6%	1,6%	5,7%
Adaptability	Mentioned	N	3	4	15	17	39
		%	0,4%	1,0%	3,1%	0,6%	0,9%
Openess	Mentioned	N	78	57	41	96	272
		%	10,6%	14,1%	8,5%	3,3%	6,0%
Ethics	Mentioned	N	25	23	18	49	115
		%	3,4%	5,7%	3,7%	1,7%	2,5%
Teamwork	Mentioned	N	77	84	160	1436	1757
		%	10,5%	20,8%	33,2%	49,3%	38,8%
Communication	Mentioned	N	207	183	253	332	975
		%	28,2%	45,3%	52,5%	11,4%	21,5%
Effectiveness	Mentioned	N	19	33	85	223	360
		%	2,6%	8,2%	17,6%	7,7%	7,9%
Law	Mentioned	N	34	13	53	36	136
		%	4,6%	3,2%	11,0%	1,2%	3,0%

Source: Own study.

Based on the table mentioned above it is possible to state that pre-green competences are much more popular in job advertisements in comparison with green competences.

Analysing soft/ behavioural pre-green competencies it is important to state that Teamwork is the most popular in job offers with 38.8% in total and almost 50% for IT industry. Communication is second with 21.5% in total and close to 50% in creative and moderating business industries. Other competencies are rarely mentioned. Creativity in 5.7% of job offers, with the most mentions in the creative industry (43.3%). Adaptability in 0.9% in total with the majority in the modern business industry (3.1%). Openness is demanded in 6% of job positions with the majority in the creative industry (14.1%). Ethics goes with 2.5% in total and similar distribution among the industries, maximal in creative industry (5.7%).

Considering hard/ functional competences, the most demanded, effectiveness scores 7.9% in total, with the majority in business (17.6%). Knowledge of law is needed in 3% of the total and mostly in business (11%). Segregation (considering waste) and health and safety competence were not mentioned at all, most probably because segregation is considered rather home/private life competence and health and safety is a mandatory training in Poland.

4. Discussion

The discussion will be structured by the research objectives. The above-mentioned research results are showing very interesting situation of both green competences and the way to analyse them. The first task of the research procedure was to identify job offers and create a vast research sample. The scraping procedure was very effective, but it is important to note that there are no filters or categories that might be supportive while searching for green competencies or sustainable job positions. It may be explained by the low availability of the sustainable positions/ green competence demand of a labour market which was presented in the research part.

Creating the list of competencies required in the analysed industries by using key words such as: green, environment, waste, raw, and energy. In order to make the analysis possible, introductory words were prepared. There were seven general forms introduced in order to generally assess the importance of sustainable topic within those industries. The maximum number of mentions was 47 out of 4534 job offers, making that 1.04% of the total job offers. It is important to state that although sustainable development is an important topic in science, the labour market does not pay much attention to this case. Within the business industry, it is popular to provide extended information and declarations about undertaken actions, but even those actions do not have a significant place in the labour market offers. Most of the connected offers were about the concept and job positions dedicated to ESG reporting. Green compounds are not yet visible within the non-esg related positions. Analysing of Green itself brought interesting results. The analysis based on the list created by Górnjak was not possible due to the lack of demand strictly connected with ecology, sustainability, and environment. There is still a huge gap between the still growing theoretical approach and is utilisation in the labour market practice. There is a time needed to implement green practices into every job position in the companies. Some organisations are still thinking of the ESG concept as a greenwashing possibility. Another reason might be related to the job advertising itself. Many of the offers are being created as a generalised template without some important information in them.

The comparison of green products across the selected industries was impossible due to the lack of mentions. That is why the authors decided to propose the pre-green competences as a tool for analysing the labour market. That is the concept based on generalising (as the job offers are very general) the competences into its basic forms. That is why instead of communicating environmental knowledge, communication was assessed and in a similar way openness instead of openness to acquiring environmental knowledge. Having a base competence, it would be easier to acquire the green version of it. This approach allowed authors to prepare a comparison of four industries. The summed score of all industries (by summing %) is equal to 86.3/800. Medical industry was not on top of any pre-green competence need and

scored 52.1 which is 34 lower than the average sum score. Within those job offers, a very detailed description of medical skills and knowledge as well as soft skills was presented. This industry is focused on saving lives, rather than whole environmental issues. The second-place industry is IT, with 76.8 points. This industry scored a lot in teamwork (49.3 points), but other competences were scored very low. This industry is also focused not on the environment but on technology, which causes low interest in the topic of green competence. This industry is also focused not on the environment but on technology, which causes low interest in the topic of green competence. The business sector scored 134.2 points with high scores in communication, teamwork, and effectiveness. As the modern business companies are aware of regulations and are mostly the ones which support other industries in all the ESG reporting needs, this shows that modern business services are an industry with a potential to be the leader in implementing the green competences due to the utilitarian approach. The industry that scored the most is a creative industry with a score of 141.9 points. The main factor is a score from the communication, creativity, and teamwork competence. It is also crucial to maintain an open mind for the changes that will become more and more popular.

4.1. Limitations and future research

The research is due to some limitations. First of all, it allowed for comparison only 4 industries. The industries were chosen based on their attractiveness in national intelligent specialisations, but do not show the whole picture of a labour market. All the data was scrapped from the *pracuj.pl* portal, which is mostly the source of job offers for specialist and middle management from business related industries. The last limitation worth mentioning is that the research is based on a quantitative approach. Some of the data might be missed without a deeper understanding of the contemporary situation on both the labour market and the perspective of employers/ hr specialists. While the presented study offers insight into the demand for both green and pre-green competences in selected industries, future research might be conducted in order to enhance the scope of data collection as well as to prepare an in-depth analysis of the framework.

The first step suggested is connected with future research, to develop a standardised green competence framework with unified names and understanding of competences. That will allow future research to be based on similar, up-to-date theories and will enable the replication of presented results.

The second important focus is on the methodological approach, especially the type of data collection methods. The presented method was focused on quantitative data, while the qualitative approach such as in-depth interviews might uncover a new way of understanding the terminology and demand. It is also a good idea to incorporate various sources, not just focus on one job portal.

The last path to follow relates to time. Conducting longitudinal studies will allow tracking the demand for green competences and will make it easily visible to all interest groups.

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SPORT MANAGEMENT IN THE CONTEXT OF THE SMART CITY CONCEPT

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Purpose: The purpose of this paper is to explore the integration of sport management within the smart city framework, focusing on how modern technologies—such as the Internet of Things (IoT), mobile applications, and data analytics—transform sports infrastructure, public engagement in physical activity, and urban planning strategies for sustainable development.

Design/methodology/approach: This is a theoretical and conceptual study grounded in a comprehensive literature review. The article synthesizes interdisciplinary research in sport management, urban studies, and information and communication technologies (ICT), supported by case studies from Tokyo, Amsterdam, and Singapore. The approach highlights the convergence between digital innovation and sport governance in the context of smart urban ecosystems.

Findings: The study finds that the implementation of smart technologies in sport management enhances infrastructure efficiency, increases community participation in physical activity, and supports sustainable urban development. It also reveals that data analytics, when integrated with sports systems, provide valuable insights for policy-making and operational optimization. However, challenges remain regarding data privacy, funding, and social acceptance.

Practical implications: The paper provides guidance for urban planners, sport facility managers, and policymakers on how to implement smart technologies in sport settings to improve operational efficiency and community health. It also informs investment strategies and public-private partnership models for infrastructure innovation.

Social implications: By promoting physical activity and digital inclusion, smart sport solutions contribute to improved public health outcomes, environmental sustainability, and greater social cohesion. These technologies can also shape more equitable access to urban sport facilities, aligning with broader social responsibility and quality-of-life goals.

Originality/value: This article offers an original synthesis of sport management within the emerging field of smart city development. It bridges gaps between technology, public administration, and community health, providing a structured framework for understanding the multifaceted role of sport in intelligent urban systems. The paper is relevant to scholars, urban planners, sport professionals, and civic leaders.

Keywords: smart city, sport management, sustainable development, digital infrastructure, urban innovation.

Category of the paper: literature review.

1. Introduction

Sport management in the context of the smart city concept is gaining increasing importance due to growing urbanization and the demand for efficient use of urban resources. The smart city model emphasizes the utilization of information and communication technologies (ICT), which not only enhance public sector operations and the economy but also contribute to improving residents' quality of life. Within this framework, sport emerges as a vital component of daily activity, shaping public health and supporting community development. Integrating smart technologies into sport management enables sustainable administration of sports infrastructure, precise monitoring of community needs, and the creation of innovative solutions for promoting physical activity.

The aim of this paper is to analyze sport management in the context of smart city development, with particular emphasis on modern technologies that support sports infrastructure, data analytics, and the integration of sport with other areas of the smart city. Key aspects of sport management will be addressed, including the role of digital systems, data analysis, and mobile tools in promoting physical activity. The paper will also discuss the challenges and limitations associated with implementing smart technologies in the sports domain.

2. The smart city concept and its components

The idea of a smart city is one of the key issues of contemporary urban planning and urban management. A smart city is defined as an urbanized space where information and communication technologies (ICT) are used to optimize city processes, enhance residents' quality of life, and support sustainable development (Kominos, 2015). Smart cities encompass various sectors, including transportation, economy, administration, education, and sports and recreation (Harrison, Donnelly, 2011). The implementation of smart city initiatives responds to the dynamic growth of urban populations and the resulting necessity to manage urban resources efficiently. Real-time data analytics and smart technologies play a key role in automating and optimizing city operations (Albino et al., 2015).

Information and communication technologies (ICT) serve as the backbone of the smart city concept. The Internet of Things (IoT) enables infrastructure monitoring, artificial intelligence (AI) supports data management, and 5G networks ensure rapid data transmission (Gubbi et al., 2013). In the context of sport, these technologies facilitate dynamic management of sports facilities, resource optimization, and personalized user experiences.

Smart cities are commonly structured into six key areas (Chen et al., 2021; European Commission, 2024; Gotlibowska, 2018; Kinelski, 2022; Nam, Pardo, 2011; Ulfik, 2024):

- Smart governance: the use of digital tools for transparent municipal governance.
- Smart environment: integration of eco-friendly solutions into urban infrastructure.
- Smart mobility: development of sustainable transport and optimization of urban traffic.
- Smart people: education and development of citizens' digital competencies.
- Smart economy: implementation of innovative business models and digitalization of services.
- Smart living: improving living conditions through modern technological solutions.

3. Sport Management

Sport management includes the strategic planning, organizing, leading, and controlling of sport-related activities to ensure their effective functioning (Hoye et al., 2018). This process includes managing sports facilities, events, and the promotion of physical activity among residents. Contemporary sport management also incorporates innovative technologies that improve event organization and increase accessibility to sports infrastructure (Ratten, 2019).

In the literature on the subject, several key aspects of sports management are distinguished. In most studies, smart city solutions in sports focus on three issues (Poynter, Viehoff, 2016; Ratten, 2019):

- modernizing sports infrastructure through the implementation of smart energy management systems and resource monitoring,
- utilizing ICT in organizing sports events, such as participant registration systems, smart ticketing, and digital crowd management,
- personalizing user experiences through Big Data analytics, enabling customized sport offerings based on individual needs.

Modern sport management is increasingly aligned with sustainable development strategies, which consider the ecological impact of sports events and their interaction with the urban environment (Gratton, Henry, 2002; Masdeu Yelamos et al., 2019; Triantafyllidis, Mallen, 2022).

4. Integration of sport management in the smart city

Smart sports infrastructure forms the foundation for effective sport management in the smart city context. An illustrative example includes smart stadiums that utilize IoT technologies for crowd monitoring, energy management, and safety assurance (Mahdi et al., 2021). IoT systems installed in sports facilities deliver benefits for athletes, fans, event organizers, and emergency services. These benefits include (Fernández-Villarino, 2021; Hu et al., 2016; João et al., 2019; Mohammed Sadeeq et al., 2021; Whaiduzzaman et al., 2022):

- continuous monitoring of environmental conditions (e.g., temperature, humidity, air pressure, wind speed),
- automated lighting and climate control to optimize energy usage,
- real-time detection of infrastructure overloads,
- analysis of crowd flows to enhance emergency evacuation protocols.

There can be many more applications for intelligent sports infrastructure. Other applications encompass intelligent water management systems for field irrigation, automated snowmaking technologies for winter sports venues, and predictive maintenance platforms designed to optimize operational efficiency and reduce long-term infrastructure costs.

Mobile applications and digital platforms play a pivotal role in promoting physical activity and managing sports infrastructure (Chioma Anthonia Okolo et al., 2024; Romeo et al., 2019). These tools enable:

- recording users' physical activity and delivering individually tailored training recommendations,
- real-time booking of sports facilities, enhancing access and efficiency,
- monitoring progress and enabling local community comparisons to foster motivation and engagement,
- utilizing loyalty programs that reward consistent use of public sports infrastructure.

From an urban management perspective, such applications may be integrated with healthcare systems, educational programs, or healthy lifestyle promotion campaigns.

Big Data is essential to decision-making processes in both facility management and athlete training. Data from IoT sensors, mobile apps, and CRM systems allow analysis of physical activity trends across age groups, forecasting infrastructure demand, optimizing training plans based on performance and injury risk, and customizing fan experiences (e.g., personalized match-day offers). Data analytics also support the development of urban dashboards, which provide policymakers with insights into infrastructure utilization, event effectiveness, and investment needs (Karaboga et al., 2023; Watanabe et al., 2021).

5. Global Examples of Smart Sport System Implementations

A wide range of major international sports venues have implemented various elements of smart management practices, primarily aimed at optimizing event logistics, enhancing safety measures, and advancing environmentally sustainable operations. These facilities often resemble self-contained micro-cities during events, hosting tens of thousands of people. Notable examples include venues in Tokyo, Amsterdam, and Singapore.

Tokio Smart Stadion – The Tokyo Dome is widely regarded as a pioneering model of smart stadium infrastructure (Coakley, Souza, 2013; Maguire, Nakayama, 2004; Manzenreiter, 2020). The facility integrates advanced safety systems featuring real-time video surveillance and analytics, energy management systems that adjust power and climate control based on demand, and mobile applications for fans providing real-time information on facility navigation, restroom availability, and food services. These solutions improve visitor comfort while minimizing environmental impact.

Amsterdam's CitySports Platform is an exemplary initiative in promoting physical activity by connecting municipal sports facilities into an integrated network (Hoekman et al., 2016; Van Mechelen et al., 2000). It enables streamlined booking and scheduling, integrates data from public transportation and energy systems, and fosters community collaboration through shared training sessions and events. The initiative has significantly increased physical activity among residents and improved infrastructure utilization.

Singapore, known for its innovative healthcare and urban space management, has implemented Smart Health & Fitness systems that integrate health apps with urban planning (Foong et al., 2024; Tan, 2022). These solutions track vital signs such as heart rate, steps, and calorie expenditure, relay the data to municipal databases, and analyze it for chronic disease prevention. Notifications and recommendations are personalized, encouraging healthy lifestyles and linking physical activity with broader health policies.

6. Challenges and limitations

The deployment of smart technologies entails processing vast volumes of personal data, raising concerns about data privacy and security (Cui et al., 2018; Eckhoff, Wagner, 2018). Within the context of sport management, this raises concerns regarding the protection of app users' privacy, protecting sensitive data such as health information, and preventing the misuse of data for profiling or commercial exploitation. Thus, legal frameworks, data protection standards, and user education are critical.

Moreover, advanced technologies such as IoT, AI, and Big Data require substantial financial investments (Karvonen et al., 2019; Vinod Kumar, Dahiya, 2017). For cities with limited resources, this represents a major barrier. External funding, including from EU programs, cost-benefit analysis, and public-private partnerships (PPPs) are essential mechanisms to support smart technology adoption in sports infrastructure.

Smart technologies may also encounter public skepticism regarding their necessity, security, and costs (Dirsehan, Van Zoonen, 2022; Manogaran, Teoh, 2023; Rijshouwer et al., 2022). In sport, it is vital to involve citizens in decision-making through consultations, provide educational campaigns highlighting the benefits of innovation, and maintain transparency in data collection and use. Social trust and acceptance are prerequisites for the full realization of smart city potential in sport.

7. Benefits of integrating sports management and smart cities

Implementing modern technologies can significantly increase residents' physical activity levels (Andrews, Silk, 2012). Mobile apps, social platforms, and other tools motivate participation in sports events both as athletes and spectators, leading to improved health, enhanced social integration, and promotion of healthy habits.

Process automation and data analytics (e.g., in booking, financial settlement, and infrastructure monitoring) allow for more efficient resource utilization. Smart systems reduce operating costs, ensure faster responses to system failures or overloads, and improve service quality.

Technology-driven sporting events can stimulate local economic growth, attract sponsors and tourists, and generate new jobs related to infrastructure operation and event organization (Müller et al., 2016; Thabi, 2024). This supports regional development and enhances urban competitiveness.

In summary, sports management in the smart city concept is closely linked to the use of modern technologies that allow for effective coordination of sports infrastructure, activation of residents and development of the local economy. Examples of implementations from global metropolises show the diversity of innovative solutions - from smart stadiums, through digital platforms integrating data from city systems, to mobile applications engaging users in physical activity and health prevention.

Implementing these solutions has the potential for significant benefits, such as improving the quality of life, strengthening social capital, and creating cities that are conducive to health and recreation. However, one cannot ignore the challenges related to personal data protection, investment costs, or the need to ensure social acceptance. The ultimate success of smart implementations in the field of sports depends on a properly designed city policy, coherent financing, and openness to further technological innovations.

8. Summary

Integration of sports management in the context of smart cities brings numerous benefits, such as improving the efficiency of infrastructure management, increasing the involvement of residents in physical activity, increasing the attractiveness of cities as places friendly to a healthy lifestyle, and the economic development of local communities. At the same time, implementing technology requires solving challenges related to data protection, investment costs and social acceptance.

To sum up, effective sports management in smart cities is not limited to the implementation of modern technologies, but is a holistic process covering planning, promotion and development of various sports initiatives supported by ICT solutions. Integration of these elements promotes building a community involved in an active lifestyle, generates new economic opportunities and strengthens the global position of cities.

In the future, we will certainly observe further development of sports in smart cities, including better integration with health care systems, education and public transport. Developing a coherent policy and consciously involving residents in the process of change will allow for lasting and sustainable benefits for the entire community. Thanks to this, cities will become places where sports play a key role in shaping a healthy, friendly and innovative living environment.

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EUROPEAN UNION REQUIREMENTS FOR CARBON FOOTPRINT REPORTING AS A CHALLENGE – THE CASE OF POLAND

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Purpose: This article aims to demonstrate threats to the correct reporting of carbon footprint according to the requirements of the European Union, using the example of Poland.

Design/methodology/approach: The research methods used include analysis of secondary data from Eurostat, analysis of legal acts, and literature studies on the measurement and reporting of carbon footprint.

Findings: The introduction of uniform reporting standards (European Sustainability Reporting Standards - ESRS) and key indicators for assessing the performance of units means the need to collect numerous data. The obligation to prepare sustainable development reports will significantly impact the scope of work and the accounting tools used in both financial and management accounting. Current European Union requirements for determining and reporting carbon footprint information will challenge accountants. The very complexity of the construction of the carbon footprint and the methods of its calculation, which require the use of dedicated software, may open up room for errors and abuse.

Research limitations/implications: The EU's environmental policy and ESRS reporting requirements will evolve. The actual enforcement of the accuracy of carbon footprint reporting remains to be verified; therefore, such a study should be repeated.

Practical implications: Poland is a country that has a lot to do in the field of environmental protection among the European Union countries. This will lead to remarkably high pressure and costs imposed on companies, increasing the potential threat of violations of ethical standards when preparing non-financial reporting regarding the impact of companies' activities and products on the natural environment. The problem for accountants is also the fear of the consequences of disclosing information, which indicates the negative impact of the activities of these entities on the natural environment. This is undoubtedly an area susceptible to unethical activities.

Originality/value: The paper's originality lies in comparing carbon footprint reporting requirements with the ecological situation of Poland, among other European Union countries, as a source of potential irregularities in the reports of Polish companies.

Keywords: carbon footprint; Green Deal, non-financial reporting ESRS; accounting; ethics.

Category of the paper: research paper.

1. Introduction

Entry into force of uniform reporting standards known as the European Sustainability Reporting Standards – ESRS (Herzig, Schaltegger, 2011) and key indicators for assessing the performance of units means the need to collect numerous data. The obligation to prepare sustainable development reports will significantly impact the scope of work and the accounting tools used in both financial and management accounting.

However, sustainability reporting is not only an obligation fulfilled by companies due to government requirements. Sustainability information included in the non-financial reporting of listed companies directly affects the decisions of external stakeholders, especially stock exchange investors. Indirectly, such information has an impact on most stock exchange indices of corporate social responsibility (CSR) or environmental, social, and governance (ESG) performance of listed companies (Huterski, Kaz, 2020). Also, every company can use information about its pro-ecological and pro-social activities to strengthen its image for public relations purposes (Łapińska, Huterska, Łapiński, 2017).

The European Commission sees the introduction of uniform ESRS reporting standards as part of its set of policy initiatives, called the European Green Deal, to make the European continent climate-neutral. The key goal of the European Green Deal is to achieve net zero greenhouse gas emissions by 2050. A concept related to measuring greenhouse gas emissions is carbon footprint. The name of this indicator emphasizes the key importance of reducing CO₂ emissions, but its structure also includes the emission of other gases that may contribute to global warming.

The topic of carbon footprint (CFP) is becoming increasingly popular and essential, both from the point of view of global climate policy and business conditions (Sneddon, Howarth, Norgaard, 2006). Therefore, some entities should prepare for the introduction of the provisions of the Corporate Sustainability Reporting Directive (CSRD 2022/2464), adopted by the European Parliament in November 2022. Selected entities must disclose non-financial information about the carbon footprint, one of the most critical factors in environmental issues assessed by the company's key stakeholders. However, in addition to the dominant non-financial data, financial data are also used in this process.

Companies in EU countries complain about excessive legal regulations (Amelang, 2023). At the same time, they are not exceptionally committed to reducing their carbon footprint, and they focus on financial results and short-term activities. This creates incentives for eco-scams and green PR, mainly known as greenwashing (Amatucci, Mollo, 2024; Zhao, 2023).

This article aims to demonstrate threats to the correct reporting of carbon footprint according to the requirements of the European Union, using the example of Poland.

To support the achievement of the above objective, the research question was posed:

What factors threaten the correct carbon footprint reporting by Polish enterprises and institutions?

The research methods used include analysis of secondary data from Eurostat, analysis of legal acts, and literature studies on the measurement and reporting of carbon footprint.

2. Poland as a greenhouse gas emitter compared to European Union countries

Based on Eurostat’s standard statistics for air emissions accounts for greenhouse gases, it is clear that Poland ranks among the top GHG emitters. The authors aggregated available quarterly data for the last full calendar year to account for the annual climate cycle. Regarding millions of tonnes of CO₂, Poland ranked fourth in 2023, behind much larger economies like Germany, France, and Italy, but ahead of Spain. Poland’s nominal GDP for the same period is equivalent to only 18% of Germany’s GDP and 51% of Spain’s GDP (Figure 1).

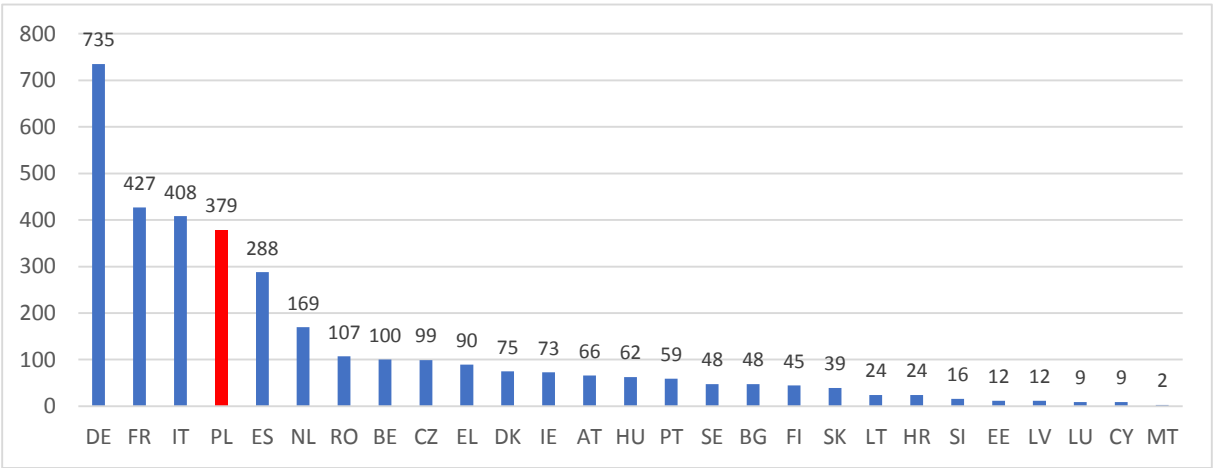


Figure 1. Air emissions accounts for greenhouse gases in the EU countries (2023, million tonnes).
Source: Authors’ calculation based on Eurostat data (env_ac_aigg_q).

Regarding per capita, Poland’s GHG emissions in 2023 also rank fourth in the EU, after Ireland, Luxembourg, and Denmark, while Germany ranks 9th, France 20th, and Italy 18th. However, in terms of GDP per capita, Poland ranks only twentieth in the EU (Figure 2).

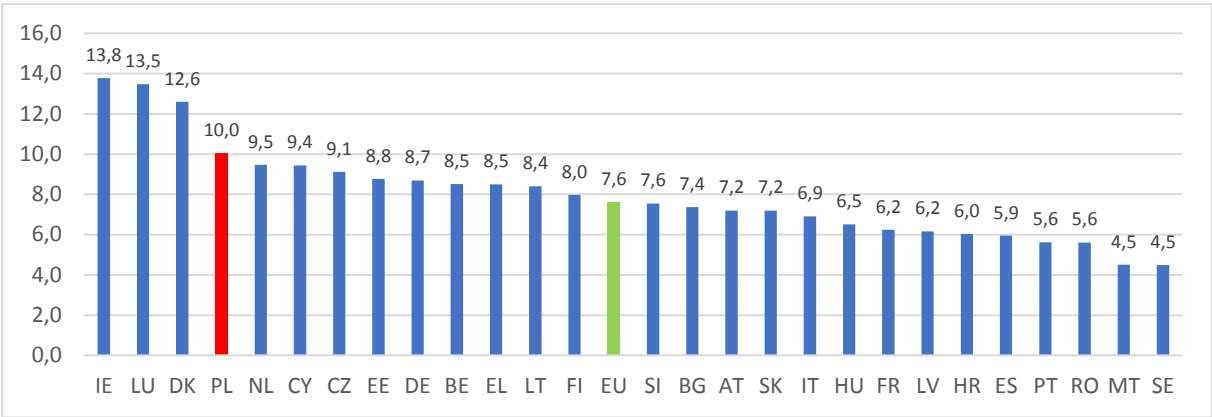


Figure 2. Air emissions accounts for greenhouse gases in the EU countries (2023, per capita).

Source: Authors’ calculation based on Eurostat data (env_ac_aigg_q).

According to the FIGARO tables for 2022, a statistical product of economic modeling, Poland ranked second in greenhouse gas emission footprints counted in a million tonnes of CO2 equivalent (Figure 3). The Eurostat-European Commission FIGARO project means ‘Full International and Global Accounts for Research in Input-Output analysis.’ It is also known as the EU inter-country Supply, Use, and Input-Output tables (IC-SUIOT).

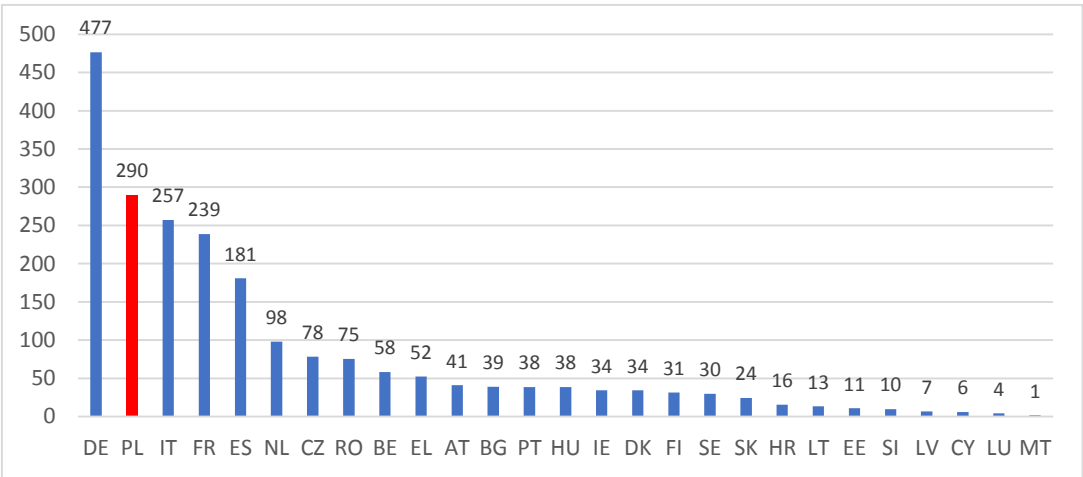


Figure 3. Greenhouse gas emission footprints in the EU countries (million tonnes of CO2 equivalent for 2022, FIGARO application).

Source: Authors’ calculation based on Eurostat data (env_ac_ghgfp).

Employers of the Republic of Poland, Instrat Foundation, and Qemetica Group jointly conducted the second reading of the Decarbonization Index of the Polish Economy (IDGP) on October 21, 2024 (Instrat, 2024). According to the study's authors, over half of the surveyed companies (53%) do not calculate their carbon footprint; 47% have this data, of which 18% increased their scope in the first half of this year, and 5% reduced it. In general, many Polish companies still do not calculate their carbon footprint at all, and of those that do, most do so in an incompetent manner. Some companies have reduced the scope of information collected and published.

Despite numerous studies, the level of knowledge in this area and understanding of the principles of calculation still requires improvement, both by companies, accountants, and groups of employees responsible for preparing annual reports. The reporting process will be difficult and expensive. Creating reports will accompany uncertainty and even chaos, including legal problems. These trends are exacerbated by the complexity of the legal framework for carbon footprint reporting and calculating, synthetically presented below. Poland is a country that has a lot to do in the field of environmental protection among the European Union countries. This will lead to remarkably high pressure and costs imposed on companies, increasing the potential threat of violations of ethical standards when preparing non-financial reporting regarding the impact of companies' activities and products on the natural environment.

3. Legal framework for carbon footprint reporting in the European Union

The Accounting Directive (2013/34/EU), as amended by the Corporate Sustainability Reporting Directive (CSRD 2022/2464), obliges large companies and small and medium-sized enterprises (SMEs) listed on a regulated market, as well as parent companies of large groups, to include in a separate section of their business report information necessary to understand the enterprise's impact on sustainability issues and, the other way around, information necessary to understand the implications of sustainability issues on the enterprise's development, performance and situation. Sustainability reporting requirements for large entities and listed SMEs are set out in Art. 19a and 29a of the Accounting Directive.

The Accounting Directive, as amended by the CSRD, also introduces an obligation to report certain sustainability information by branches or subsidiaries of certain non-EU companies (Art. 40a). The reporting obligation for these branches and subsidiaries will apply from the 2028 financial year. The reporting of this information must be following the European Sustainability Reporting Standards (ESRS), to be adopted by the Commission using delegated acts specifying the content and, where appropriate, the structure to be used to present this information (Accounting Directive 2013/34/EU, Art. 29b sec. 1). These publications shall include, where appropriate, information relating to the short, medium and long term (Accounting Directive 2013/34/EU, Art. 19a sec. 2, para. 2 and Art. 29a sec. 2). Where appropriate, it includes information about the entity's own operations and value chain, including its products and services, business relationships and supply chains.

The European Union legislation to be taken into account when reporting carbon footprint is the Regulation on disclosure of sustainability-related information in the financial services sector (2019/2088) and related delegated acts, the relevant delegated acts adopted under the Taxonomy Regulation (2020/852), the relevant delegated acts adopted under the Benchmarks

Regulation (2016/1011), certain implementing acts adopted under the Capital Requirements Regulation (CRR 575/2013), Commission Recommendation on the life-cycle environmental performance of products and organizations (2021/2279), the Greenhouse Gas Emissions Trading Scheme Directive (2003/87/EC), the Climate Neutrality Regulation (2021/1119), the EMAS Regulation (1221/2009) and the Whistleblower Protection Directive (on the protection of persons who report breaches of Union law, 2019/1937).

The largest public interest entities with more than 500 employees will be the first to be obliged to report their carbon footprint for the 2024 financial year following the CSDR 2022/2464 directive. Subsequently, other large entities, small and medium-sized companies listed on the regulated market (for the first time for the financial year 2025 and 2026), and selected companies based outside the EU (for the first time for the financial year 2027) will report, respectively. Small and medium-sized entities whose securities are not admitted to trading on a regulated market in the Union but are suppliers or customers in value chains will have the opportunity to use the standards voluntarily.

4. Carbon footprint in the light of ISO standards

A "carbon footprint" is the impact of an entity (e.g., a company, a person) on the climate based on a specific metric that takes into account all relevant sources of emissions, removals, and storage both during consumption and production within spatially and temporally defined system boundaries (Peters, 2010). A carbon footprint (Onat, Kucukvar, 2020) is often defined as the total greenhouse gas emissions caused directly or indirectly by a given person, organization, event, or product. It should be emphasized that the carbon footprint includes emissions of carbon dioxide, methane, nitrous oxide, and other greenhouse gases that are expressed in CO₂ equivalent. The carbon footprint measure is tCO₂e - a tonne of carbon dioxide equivalent. This measure determines a specific process or product's impact on climate change or indicates how much Earth's resources are used. Therefore, to determine the carbon footprint, it is necessary to calculate the total sum of greenhouse gases (West, Owen, Axelsson, 2016) produced directly or indirectly by an economic entity (person, product, or event).

The principles, requirements, and guidelines for quantifying and reporting the carbon footprint of a product (CFP) (Raza et al., 2012) for entities conducting business activity are set out in the ISO 14067 standard. It is consistent with the ISO 14040 and ISO 14044 standards on product life cycle assessment (LCA) (Cabeza et al., 2014; Earles, Halog, 2011). One can calculate the carbon footprint based on the ISO 14067 standard. In addition, commercial programs (applications and calculators) have appeared on the market (Mulrow et al., 2019), which will allow for the correct calculation of the carbon footprint (Ahmad et al., 2016). Free openLCA software is already on the market (Ciroth et al., 2020), but its functionality does

not satisfy everyone. However, it is worth remembering that when making such calculations, access to databases about products and their production processes plays a vital role because the carbon footprint calculation is based on direct and indirect emissions – calculated over a specific period (Wiedmann, Barrett, 2010). Most often, the amount of greenhouse gas emissions is recorded annually.

Three scopes are analyzed to determine the carbon footprint of a business entity. The first scope covers all direct emissions generated by equipment used by an economic entity and concerns, among others, emissions from the car fleet and heating fuels. The second scope concerns indirect emissions related to the consumption of electricity and heat purchased by the entity. However, the third scope is considered the most problematic to calculate because it includes all indirect emissions not included in the first and second scope and occurred in the value chain. This is related to determining the amount of GHG (Greenhouse Gases) emissions, which include carbon dioxide, water vapor, freons, halons, methane, ozone, and industrial gases generated during the production process of purchased raw materials, materials, manufactured and managed waste or use of the offered products (Gillingham, Stock, 2018; Abrell, Kosch, Rausch, 2017; Hughes, Podolefsky, 2015). Within the third scope, emissions can be distinguished at the production (upstream) and consumption (downstream) levels, divided into 15 categories.

5. Calculating the carbon footprint

Calculating and managing the carbon footprint following the ISO-14064-1 standard and the GHG Protocol requires the correct counting of materials and raw materials used, but above all, the development of a material and energy balance along with the source and type of raw material origin (primary, secondary) and transport. The results of calculating the carbon footprint will form the basis for developing environmental declarations and reporting. It is also worth noting that the carbon footprint and information about it are already included on selected products containing information on CO₂e.

Calculating carbon footprint emissions will be difficult and require additional paid applications. However, this may allow the entity to review its processes to optimize them, which helps in taking action to reduce gas emissions and build a competitive advantage in the market. CO₂e emission values must be aggregated, and limit values should be introduced. There is a high probability that standardization will gradually occur in individual industries, as nowadays observed in the automobile and construction industries (Andreasi Bassi et al., 2023). The agricultural sector will face the most difficulty measuring and reporting GHG (Miao, Zhao, Chen, 2023).

6. Conclusions

The assumptions of the European Green Deal, by their very nature, also include regulating and monitoring procedures for creating and presenting information on the impact of the activities of all enterprises and institutions on polluting the natural environment, especially the one that strongly impacts global warming. Appropriate accounting services in these enterprises and institutions must expand the scope of collected and shared information regarding environmental impact.

In a negative sense, Poland's high position compared to other EU countries in terms of greenhouse gas emissions, presented in Eurostat data, is essential for assessing the risks of correct carbon footprint reporting. Firstly, accidental or intentional errors in calculation and reporting leading to underestimation of the carbon footprint will have a high cumulative value due to the high reference point. Secondly, with high greenhouse gas emissions, the benefits for reporting entities, even marketing and PR, from underestimating or omitting the carbon footprint are high, which provides a stronger motivation for dishonesty. Thirdly, high greenhouse gas emissions from a wide variety of sources translate into the need for a more precise understanding of the details of the relevant legal regulations for reporting.

As presented above, the legal framework for carbon footprint reporting is complicated. This creates more substantial incentives for Polish accountants to provide dishonest reporting. They result from the increased costs of correct reporting (for example, expenditure on staff qualifications and software purchases and potential adverse effects of honestly demonstrating a large carbon footprint of an enterprise or institution). At the same time, the conclusions presented in the article from the results of the Decarbonization Index of the Polish Economy 2024 (IDGP) confirm major weaknesses in incorporating the principles of calculating and reporting the carbon footprint by the relevant services of Polish enterprises and institutions.

Additional indirect factors that may make it difficult for Polish accounting services to report the carbon footprint properly include the overload of public finances with military expenditure resulting from Russia's aggression against Ukraine and the necessary huge expenditures on restructuring the outdated and inefficient Polish energy sector. This may tempt the Polish authorities to prioritize short-term economic effects over environmental benefits. This may manifest in weakening state services' supervision over the correctness of carbon footprint reporting. This problem is aggravated by the increasingly clear anti-environmental rhetoric of the new US authorities from 2025, intensifying the already existing anti-ecological trends in the societies and authorities of some European Union countries.

Most specialists assume that companies will make mistakes at the beginning of the ESG carbon footprint reporting process due to the issue's complexity. As mentioned above, preparing economic entities to calculate the carbon footprint is multi-element (Scopes 1, 2, and 3). Inevitably, we will learn from our mistakes. However, an essential aspect of this process

will be employing people with appropriate qualifications and training selected employees responsible for preparing carbon footprint reports.

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EMPLOYEE WELL-BEING AS AN ANTECEDENT AND EFFECT OF THEIR EXPERIENCES IN THE WORK

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Purpose: Literature on human resource management does not contain many studies on the relationship between employee well-being and their experiences in the work environment. The existing research gap justifies the need for analysis and reflection on the relationship between the two. The aim of this article is to draw attention to the key importance of this relationship for human resource management practice.

Design/methodology/approach: In this theoretical article, which does not exhaust the entire topic, a literature review in the fields of economics, human resource management and psychology was used as a research method.

Findings: The close relationship and two-way connection between employee well-being and their experiences in the work environment has been confirmed. This shows that well-being generates positive experiences, but it is also the result of strategic management within HRM.

Originality/value: The originality relates to the research context and interrelationships (experience economy, employee experience and well-being in the workplace).

Research limitations/implications: Limitations arise from the fact that this is an inherently theoretical article, as well as on the need to confirm the relationship between employees' well-being and their experiences in empirical studies.

Keywords: experience economy, experiential marketing, employee experience, well-being in the workplace.

Category of the paper: Literature review.

1. Introduction

The evolution of the economy and the structural changes taking place in it have led, after the phases of the agrarian economy, the industrial commodity economy and the service economy, to the emergence of the next stage in its development - the experience economy. The concept of the *experience economy* developed by J.B. Pine II and J.H. Gilmore (1998, 1999) refers to a new way of thinking and creating value by companies through positive, unique, memorable experiences that are important for consumers and employees alike.

Experiences as a specific product become a new, separate offer for which customers are willing to pay. People no longer just buy products, but the entire experience associated with them. While previous offers (goods and services) are something external to the buyer, experiences (impressions, feelings and the emotions that accompany them) involve individuals in a personal way on a physical, emotional, intellectual and even spiritual level. Companies try to actively involve the customer in the experience creation process. They adapt them to individual needs and preferences, strive to evoke positive emotions, engage all the customer's senses to enhance the experience and create lasting memories, thus creating a long-term relationship conducive to building loyalty. Examples include tourist trips, survival expeditions, culinary events, promotional events, fascinating exhibitions, virtual reality experiences, etc.

The experience economy, so influential in economics and inspiring for management science, is part of the broader trend of behavioral economics, which, going beyond the *homo economicus* paradigm, has begun to offer alternative explanations for economic behavior. As one of its pioneers aptly put it, rational decision-making does not boil down to constant and strict calculation: "people behave as they like, or as they feel they have to, or finally they can make compromises between these two elements" (Leibenstein, 1985, p. 128). Behavioral economics, which draws on psychological knowledge, has started to consider explanations of human economic behavior other than the general equilibrium or efficiency theory, and its leading researchers and supporters, C.F. Camerer and G. Loewenstein - recognized that behavioral economics, which combines economic and psychological knowledge, "increases the explanatory power of economics, giving it a more realistic psychological basis" (Camerer, Loewenstein, 2004, p. 3).

Undoubtedly, the cultural changes in the second half of the 20th century, which manifested themselves, among other things, in post-materialism as part of the post-modernization process, had a significant impact on experimental economics. The decline of materialistic values associated with the satisfaction of basic needs resulted in an increase in post-materialistic values such as quality of life, mental well-being, personal development and self-realization or various forms of self-expression (Inglehart, 1990; Bauman, 2008). These changes are reflected in the sphere of values that emphasize the importance of free time, hobbies, entertainment and a lifestyle open to all forms of individual self-expression (*homo ludens*).

The aim of the considerations undertaken in the article is to find an answer to the question of whether the experience economy and its assumptions have an impact and are applicable in human resources management, with particular focus on employee well-being.

2. From experience marketing to employee experience management

A practical application of the principles of experience economy is *experiential marketing*, which aims to engage the customer by creating interactive and memorable brand experiences (Schmitt, 1999ab). In traditional marketing, the consumer is seen as a rational decision-maker who considers the functional characteristics of the product and the potential benefits. In contrast to traditional marketing, experiential marketing sees the consumer as someone who can make rational choices, but who is also often guided by emotions and the search for positive experiences and sensations.

For the purpose of consumer experience management (CEMs), B. Schmitt (1999a, pp. 60-65) has identified five modules that can be used to create different types of customer experiences. These modules include:

- sensory experiences, referring to the senses of sight, hearing, touch, taste, smell (sense),
- affective experiences related to emotions, feelings, mood (feel),
- cognitive experiences referring to intellect, creativity, learning (think),
- behavioral experiences related to behavior, lifestyles (act) and
- experiences resulting from relating to a broader system, society, culture (relate).

It should be emphasized that, according to B. Schmitt, experience is not the sum of individual sensations, but a holistic whole, composed of interrelated sensory, emotional, cognitive and behavioral interactions. These interactions, as a coherent system, form experience modules.

The modern market places increasingly high demands on companies, and building strong customer relationships is becoming the key to success. *Customer experience* is therefore becoming a priority for many organizations. It is important to bear in mind that a good customer experience is the result of a positive employee experience. Employees are brand ambassadors, and their satisfaction and commitment directly translate into the quality of customer service and the customer's perception of the company.

Work is one of the main values and one of the most important experiences in a person's life. It is no coincidence, therefore, that an approach based on *employee experiences*, inspired by experience marketing, is gaining more and more importance in human resources management. The experiences of employees, which arise from their interaction with various entities and factors, are formed throughout their entire life cycle in the organization. They are characterized by, among other things, different degrees of awareness and intensity, contextuality, subjectivity, as well as positive or negative character (Lipka, Waszczak, 2024, p. 11).

The human resource management model of an organization that focuses on analyzing and shaping the *employee experience management* uses B. Schmitt's modular approach (Lipka, 2022). Although the model was originally developed for marketing, it can also be applied to human resources management and employee experience design. As mentioned above,

the researcher identified five modules that, when applied to the work environment and organization, influence various aspects of employee experience and well-being (see Table 1).

Table 1.

Experience modules and examples of their practical application in the work environment to shape positive experiences and sensations of employees

Experience modules	Examples of application
Sensory: – visual stimuli, – auditory stimuli, – olfactory stimuli, – taste stimuli, – tactile stimuli.	• aesthetic and employee-friendly office design (design, furnishings, quality of equipment), • pleasant experiences (color, aromas, adequate lighting, quiet and stimulating background music, the smell of coffee in the office, adequate temperature, access to healthy meals and water, especially on hot days, comfortable seating), • access to nature (plants, fish in an aquarium, or a nice view from the window),
Emotional	• positive atmosphere at work, • organizational culture based on respect and trust, • emotions conducive to creative work and the experience of <i>flow</i>, • higher level of motivation, • the ability to reduce stress in relaxation zones, • providing support in crisis situations (stress, burnout),
Intellectual	• stimulating learning processes, creativity and innovative thinking, • sharing knowledge, • encouraging challenging tasks, • offering training, mentoring and coaching,
Behavioral	• promoting physical activity and a healthy lifestyle, • work organization that allows you to choose flexible forms of work (including remote/hybrid work), • a concern for work-life balance,
Relational (social)	• fostering the creation of a sense of belonging; • efficient and free communication, • taking care of an inclusive organizational culture, • strengthening organizational values (trust, loyalty), • fair treatment, • support and appreciation through regular feedback.

Source: own elaboration based on the literature on the subject.

The examples given in the table are those that are conducive to shaping positive employee experiences and therefore have a positive impact on employee well-being.

3. Employee well-being and experience in the work environment

Researchers belonging to the positive psychology trend define well-being as a general, subjective sense of happiness and satisfaction with life. Its structure includes a cognitive component (assessments of one's own life relating to the past, present and future, manifested in a general positive assessment of life and satisfaction with its individual areas) and an emotional component (positive balance of emotions, more frequent experiencing of positive emotions than negative ones, high level of life satisfaction) (Diener, Lucas, Oishi, 2004, p. 35; Ryff, Singer, 2004, p. 156). People who are satisfied with life are characterized by high self-esteem, a sense

of control, optimism, self-efficacy, stable extroversion and a low level of neuroticism (Sobol-Kwapińska, 2009, pp. 93-94).

An interesting attempt to formulate a definition of well-being was made by Keyes (2009, quoted in: Trzebińska, 2012, pp. 21-22), who identified it as a nosological entity, similar to the definitions of psychopathological entities contained in the DSM. As in the case of mental disorders, the definition of well-being combines qualitative and quantitative criteria. It includes both a list of symptoms of well-being and the number of symptoms that must be present in order to assign this mental health category to a person being diagnosed. The symptoms of well-being, according to Keyes's definition, are as follows:

- positive affect for the last 30 days,
- the belief that one has a generally successful life,
- a positive attitude towards oneself without excluding aspects of oneself or periods of life history,
- a positive attitude towards other people while being aware of the differences between people and the ambiguity of their behavior,
- focus on personal development,
- belief in the progress of human civilization,
- a sense of meaning and purpose in one's own life,
- sense of the social meaning of one's own life,
- the ability to influence events that are important to them,
- interest in and understanding of social life,
- maintaining autonomy in relationships with other people in a socially acceptable form,
- having cordial relationships, the ability to empathize and intimacy,
- a sense of social belonging and support.

The components of general well-being and the characteristics of people who are satisfied with life can also be related (to a certain extent) to employee *well-being*, as well as to the conditions of the working environment and the quality of working life. Despite the fact that professional work is a partial satisfaction, well-being at work can be considered one of the most important determinants of general well-being. The way in which the work environment and work properties affect the well-being of employees is explained by various theories and models, e.g. the model of work properties by J.R. Hackman and G.R. Oldham – 1980, the model of requirements – control – support by R.A. Karasek, T. Theorrell and J.V. Johnson, E.M. Hall – 1988, 1990, the vitamin model by P.B. Warr – 1987 (De Jonge, Schaufeli, 1998, p. 397).

Among the many factors in the literature on the subject that determine the well-being of employees and correspond to B. Schmitt's experiment modules, the following can be mentioned:

- work that matters (as long as it does not come down to routine activities, gives employees a sense of purpose, satisfaction from its performance, a feeling of pride in achievements, a sense of dignity, self-acceptance, and sets status),
- affective reaction to the work environment (sense of satisfaction related to various aspects of the work environment, among others: autonomy, the possibility of using one's talents and skills, remuneration, working time, transfer of information, relations with co-workers, as well as professional stress),
- balance of emotional experiences at work (proportions of positive and negative emotions experienced in the workplace; well-being increases when the employee experiences more positive emotions than negative ones),
- the level of satisfaction of employees' needs by the organization (existential, social, self-fulfillment),
- satisfaction in the work-life relationship (satisfaction has a hierarchical structure, it is conditioned by satisfaction with the main spheres of life: professional, personal, family, social, spiritual, related to spending free time, etc.; satisfaction with work results from its specificity, conditions in which it is performed, compliance with expectations, etc.),
- work-specific well-being (taking into account attitudes and emotional states experienced in connection with the work tasks performed) (cf. M.J. Sirgy, 2012, pp. 35-38).

According to N. Delobbe and her colleagues, well-being at work is determined by organizational factors that generate stress and organizational factors that influence psychological well-being and job satisfaction (Delobbe, Van Tolhuysen, Berck, Wattiaux, 2009, pp. 14-20). Well-being can therefore be seen through the prism of the quality of employees' experiences, which means that the two categories are interrelated and the boundaries between them are not clearly defined (Molek-Winiarska, Bereś, Drzewiecki, 2024).

In this article, it is assumed that the relationship between employee well-being and their experiences in the workplace is two-way. On the one hand, positive experiences can help improve well-being (e.g. when employees feel that they are respected and appreciated, and have opportunities for development). On the other hand, employees with a high level of well-being are more likely to perceive their daily work experiences positively, which in turn has a positive impact on their innovation and productivity. Therefore, the experiences of employees, covering such a wide range as relationships with superiors and team members, participation in decision-making, autonomy in performing tasks, remuneration and working conditions, significantly affect their well-being. Positive experiences, such as a sense of purpose in one's work, recognition for one's work, support from the team and clearly defined goals, lead to a higher sense of satisfaction and commitment (Czerw, 2017). Negative experiences, on the other hand, e.g. a lack of clearly defined goals, insufficient support, discrimination, mobbing or excessive workload, have a negative impact on well-being, leading to stress and burnout as well as problems in relationships with others.

4. Conclusion

Understanding the relationship between employee well-being and employee experience is crucial for the human resources management practice of organizations. Organizations and managers should focus more on creating a work environment that fosters positive experiences, which in turn will improve employee well-being. This may include implementing programs that support mental health, promoting a healthy work-life balance, investing in employee development, or creating an inclusive culture based on respect and mutual support.

Regular monitoring of well-being and gathering feedback from employees are essential to identify areas for improvement and develop effective intervention strategies. Organizations that invest in improving both employee well-being and employee experience often see an improvement in workplace atmosphere, greater loyalty, and lower turnover rates. The implementation of mental health support programs and opportunities for feedback and professional development are examples of measures that can strengthen these interdependencies. In conclusion, well-being is both a result of positive work experiences and an important factor shaping them. Therefore, organizations that prioritize the well-being of their employees create the basis for positive employee experiences and achieve better results.

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SUSTAINABLE LEADERSHIP IN SPORT ORGANIZATIONS: EXAMINING THE ROLE OF RELATIONAL REFLEXIVITY

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Purpose: This study explores the role of relational reflexivity in sustainable leadership within sports management, focusing on the predominant reflexivity traits among sports management students.

Design/Methodology/approach: The research examines four key dimensions of relational reflexivity: self-awareness, perspective-taking, communication, and conflict resolution. A sample of 146 sport management students completed a questionnaire assessing these dimensions, with the results analyzed using Friedman ANOVA and post hoc Wilcoxon signed-rank tests.

Findings: The acquired results revealed that conflict resolution ($M = 5.86$, $SD = 1.20$) and communication ($M = 5.19$, $SD = 1.33$) were the most prominent aspects, while self-awareness ($M = 4.72$, $SD = 1.49$) and perspective-taking ($M = 4.73$, $SD = 1.46$) received lower ratings. Post hoc analyses confirmed significant differences among dimensions, with conflict resolution rated significantly higher than self-awareness ($p < .001$) and perspective-taking ($p = .002$). These results suggest that students prioritize practical, outward-facing skills over introspective abilities, highlighting a potential gap in leadership education.

Originality/value: The study underscores the importance of integrating self-awareness and perspective-taking into leadership training programs to develop well-rounded, ethically responsive leaders. By addressing these gaps, sports management education can better prepare students to navigate the complexities of team dynamics, stakeholder relationships, and sustainable decision-making in sports organizations.

Keywords: relational reflexivity, sustainable leadership, sport management, self-awareness, perspective-taking, conflict resolution, communication.

Category of the paper: Research paper.

1. Introduction

Effective leadership in sports organizations entails harmonizing social and economic obligations. Leaders must consistently reflect on this. They should assess their relationships with stakeholders to make informed decisions that align with sustainable principles.

In sports management research, this practice of thinking, known as reflexivity, can enhance the research process and yield positive results for various interested parties. In leadership within sports organizations, understanding the repercussions of actions on stakeholders and integrating ecological and social factors into decision-making processes is crucial. Relational reflexivity involves assessing the connections between sports organizations and their stakeholders while emphasizing best practices.

In discussions about leadership, relational reflexivity is deemed essential, particularly emotional reflexivity. This trait allows leaders to adapt according to their followers' expectations (Gbaraka, Obipi, 2017). Expanding on this discourse, Warwick (2011) underscores the importance of understanding interactions in leadership studies by shifting from abstract concepts to concentrating on the intricate details of human engagements from an individuals perspective. This approach is inspired by complexity sciences and the responsive processes involved in relating to others, deepening our understanding of the continuous nature of human interactions. Cunliffe & Eriksen (2011) built upon this framework by proposing that leadership is a practice rooted in responsibility and an awareness of the dialogic and multifaceted nature of life. This viewpoint not only enhances our understanding of leadership but also emphasizes the practical significance of making leaders more cognizant of the importance of relationship dynamics and the role of everyday conversations in promoting morally accountable leadership.

Painter-Morland (2008) and Willis (2019) delve into the systemic and contextual aspects of relational leadership, shedding light on the challenges in manifesting desired leadership behaviors within complex organizational systems. Willis stresses the responsibility of members to nurture an ethically attuned environment that acknowledges how leadership is socially constructed through intricate interactions within organizations. The discussion examines how different leadership styles influence decision-making processes, as evidenced by Kayode (2014) and Cunliffe (2009), who advocate for an approach to leadership education. Binns (2008) focuses on considerations within leadership, particularly concerning gender dynamics. By exploring the dilemmas leaders face attempting to navigate relational practices amidst societal expectations favoring instrumental and masculine attributes, Binns's study offers valuable insights into the ethical challenges in contemporary leadership contexts. Leaders are encouraged to reflect on their actions and consider self-improvement, challenging traditional leadership norms for a more inclusive and morally grounded approach.

Cronen et al. (1982) distinguish reflexivity and paradox by critiquing the foundations of Russells theory of types and its practical implications. He proposes a framework that acknowledges reflexivity as a component of systems of meaning. Farrugia (2013) discusses the concept of reflexivity, drawing on Bourdieus theory of practice to link reflexivity with practice. Doucet (2007) employs the metaphor of "threads" to illustrate how knowledge evolves among researchers, participants, and the academic community. Tsekeris and Katrivesis (2008) offer a perspective on the development of reflexivity in sociology, emphasizing its role in addressing

issues related to awareness and significance while transcending binaries. Hibbert et al. (2014) and Hosking and Pluut (2010) advocate for approaches to reflexivity that stress theorizing and constructed processes, respectively. Archer (2013) defines reflexivity as the ability to introspect within social contexts, highlighting its interactive aspect. These works highlight the dynamic nature of reflexivity in inquiry, cultivating a more nuanced and comprehensive understanding of its implications for knowledge and practical application.

Numerous studies have explored practices in sports management, advocating for a hands-on approach that promotes innovation in sports leadership through learning and research. This research highlights the importance of customizing advancements in the sports industry to specific contexts by examining leadership and followership. It also stresses the value of integrating real-world experiences into sports management education, research, and community engagement efforts (Damon et al., 2022). In soccer management, there is a critical need to investigate the psychological aspects of leadership. Discussions cover leadership models used in soccer management, underscoring the importance of research in sports, improved training programs, and support for soccer managers. Future studies should focus on understanding the demands and challenges faced by soccer administrators (Crust, Lawrence, 2006). The field of sports leadership is dynamic and evolving, emphasizing adaptability and responsiveness to change.

Examining how different models interact in sports management and marketing shows that the ongoing evolution in sports, driven by technology, should focus on efficient and practical strategies. These efforts aim to enhance the importance of sports and commercial roles, highlighting the nature of the industry (Malacko et al., 2019). Stakeholders influence leadership perceptions and encourage a collaborative leadership style to promote growth. Sports management research often neglects stakeholder aspects while emphasizing quantitative approaches. Stakeholders views on leadership are shaped by their experiences and connections within the field, suggesting that these interactions impact leadership. Embracing a collaborative leadership approach can foster change (Kihl et al., 2010).

The social construction of leadership significantly impacts sports management education and practical application. This research underscores traits of sports managers such as interpersonal skills and emotional intelligence. It also emphasizes the need to explore evaluating sports managers effectiveness in peer relationships. This study critiques the focus on process management over people management in sports administration and advocates for a constructionist approach to leadership within this field. This viewpoint addresses limitations in existing leadership studies within sports management while reinvigorating understanding by spotlighting construction (Billsberry et al., 2018).

Today, in sports organizations, leadership skills such as intelligence and data-driven decision-making are essential for overcoming challenges. A study explores leadership practices within the sports industry, emphasizing the importance of intelligent, informed decision-making and effective problem-solving in shaping an organizations values and culture (Scott,

2014). Improving leadership and management in sports demands strategic development, clear role definitions, and personal growth. The research identifies five elements for leaders, managers, and sports entities to enhance their performance in elite sports management: establishing a structured method to clearly understand roles, improving contextual awareness, refining personal skills, and fostering relationships to create a supportive environment with adequate resources (Arnold et al., 2012).

This study explores the role of relational reflexivity in leadership development, particularly within the context of sports management. Relational reflexivity enables leaders to critically evaluate their stakeholder interactions critically, fostering effective decision-making and sustainable leadership practices. The research builds on established frameworks, including Edwards (1999) work on sustainable leadership and Schneiders (2014) theories on reflexivity, to investigate the dominant reflexivity traits among sport management students. Specifically, the study examines four key dimensions of relational reflexivity: self-awareness, perspective-taking, communication, and conflict resolution. Understanding which aspects of reflexivity are most prominent can provide valuable insights for designing leadership education and training programs. Relational reflexivity is particularly critical in sport management, where leaders must navigate complex interpersonal dynamics and team-based environments. This study addresses the following research questions:

1. Which type of reflexivity is most dominant among sport management students: self-awareness, perspective-taking, communication, or conflict resolution?
2. Which specific element within these categories is rated the highest?

2. Methods

2.1. Participants

The study included 146 sports management students from various academic institutions. The sample consisted of 87 males (59.6%) and 59 females (40.4%), with an average age of 24.3 years ($SD = 3.1$). Participants ranged in age from 19 to 30 and were enrolled in sports management programs. All participants had prior experience in team-based settings, either in amateur or organized sports.

2.2. Procedure

The study employed a questionnaire (see appendix) grounded in established theories of relational reflexivity. The four core dimensions of reflexivity were operationalized as follows:

1. Self-Awareness: Based on Golemans (1995) Emotional Intelligence Theory, which emphasizes the role of self-awareness in leadership effectiveness.

2. Perspective-Taking: Rooted in the Theory of Mind (Premack, Woodruff, 1978) and Social Exchange Theory (Blau, 1964), highlighting the importance of understanding others viewpoints.
3. Communication: Barnlunds (1970) Transactional Model of Communication describes communication as a dynamic and reciprocal process.
4. Conflict Resolution: Derived from the Thomas-Kilmann Conflict Mode Instrument (1974), which identifies various approaches to managing interpersonal conflicts.

Each dimension was assessed using five items, rated on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree). The total relational reflexivity score ranged from 20 to 100, with higher scores indicating stronger reflexivity skills. Participants completed the questionnaire online, providing data on their self-perceived reflexivity abilities.

2.3. Statistical Methods

A Friedman ANOVA test examined differences among the four reflexivity dimensions. The test yielded a statistically significant variation in participant ratings across the categories. Post hoc Wilcoxon signed-rank tests with Bonferroni corrections were used to analyze pairwise differences. Mean scores and standard deviations were computed for each dimension to provide further insights

3. Results

The analysis revealed significant differences among the four dimensions of relational reflexivity: self-awareness, perspective-taking, communication, and conflict resolution. Conflict resolution emerged as the most dominant aspect ($M = 5.86$, $SD = 1.20$), closely followed by communication ($M = 5.19$, $SD = 1.33$). In contrast, perspective-taking ($M = 4.73$, $SD = 1.46$) and self-awareness ($M = 4.72$, $SD = 1.49$) received notably lower ratings. These findings, illustrated in Figure 1, suggest that sport management students prioritize practical, outward-facing skills such as conflict resolution and communication over introspective abilities like self-reflection and perspective-taking.

Post hoc analyses using Wilcoxon signed-rank tests with Bonferroni corrections confirmed these differences. Self-awareness was rated significantly lower than both communication ($p = .038$) and conflict resolution ($p < .001$), while perspective-taking was rated significantly lower than conflict resolution ($p = .002$). The difference between communication and conflict resolution was also highly significant ($p < .001$), underscoring a strong preference for effectively resolving disputes. The contrast between self-awareness and perspective-taking approached significance ($p = .055$), suggesting a relatively balanced perception of these two dimensions.

A closer look at individual items within each dimension provided further insights. For self-awareness, students rated "taking responsibility for mistakes" ($M = 5.19$, $SD = 1.33$) higher than "actively seeking feedback to improve management style" ($M = 4.72$, $SD = 1.49$), as shown in Figure 2. This suggests that while students value accountability, they may be less proactive in seeking feedback for self-improvement.

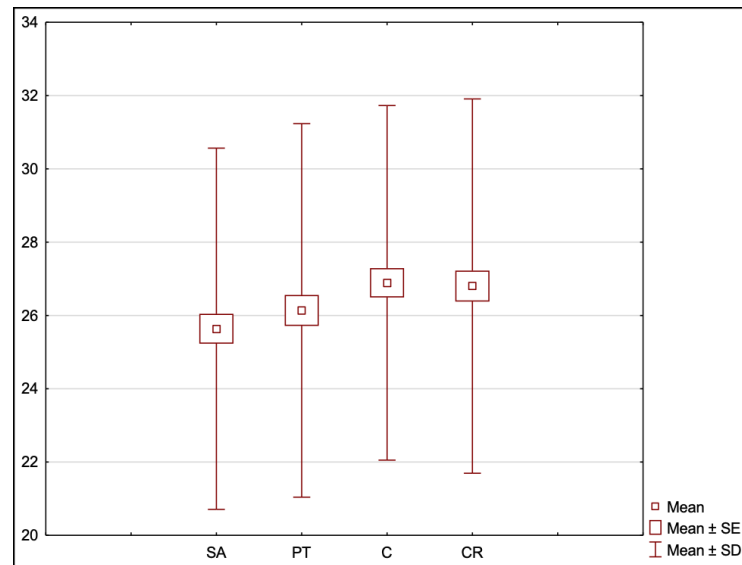


Figure 1. Mean values of Self-Awareness (SA), Perspective-Taking (PT), Communication and Conflict-Resolving (CR) in sport management students.

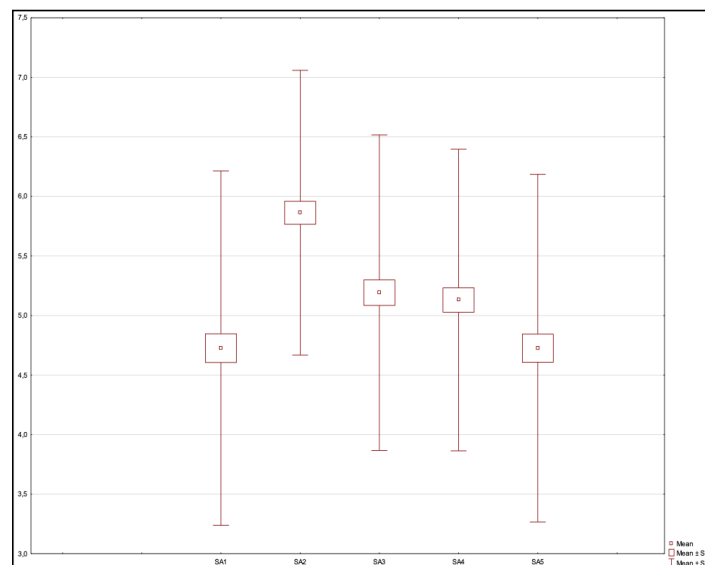


Figure 2. Mean values of Self-Awareness questions in sport management students.

In the conflict resolution dimension, skills such as "mediating disputes" ($M = 5.86$, $SD = 1.20$) and "ensuring all parties feel respected" ($M = 5.56$, $SD = 1.16$) were rated highly, as depicted in Figure 3. This reinforces the prominence of conflict resolution as a key leadership trait.

Within the communication dimension, "facilitating open and honest communication" ($M = 5.51$, $SD = 1.25$) was rated higher than "active listening during discussions" ($M = 5.25$, $SD = 1.34$), as shown in Figure 4. This indicates potential gaps in empathetic communication skills. For perspective-taking, "encouraging team members to share their views" ($M = 5.39$, $SD = 1.22$) was rated higher than "being open to changing opinions based on team insights" ($M = 4.91$, $SD = 1.46$), as illustrated in Figure 5. This suggests challenges in adapting viewpoints based on others input.

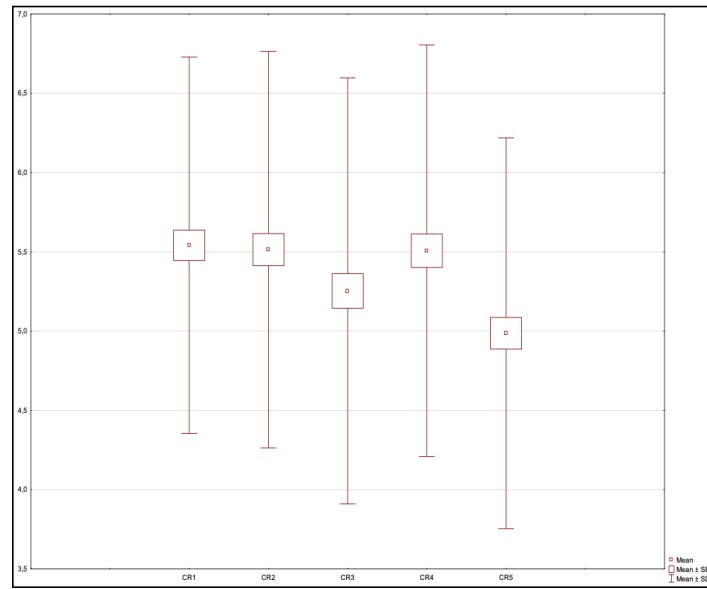


Figure 3. Mean values of Conflict-Resolution questions in sport management students.

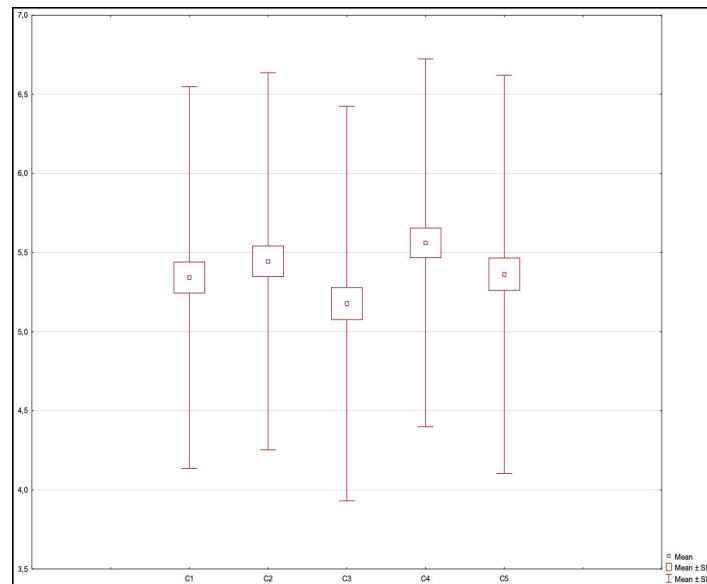


Figure 4. Mean values of communication questions in sport management students.

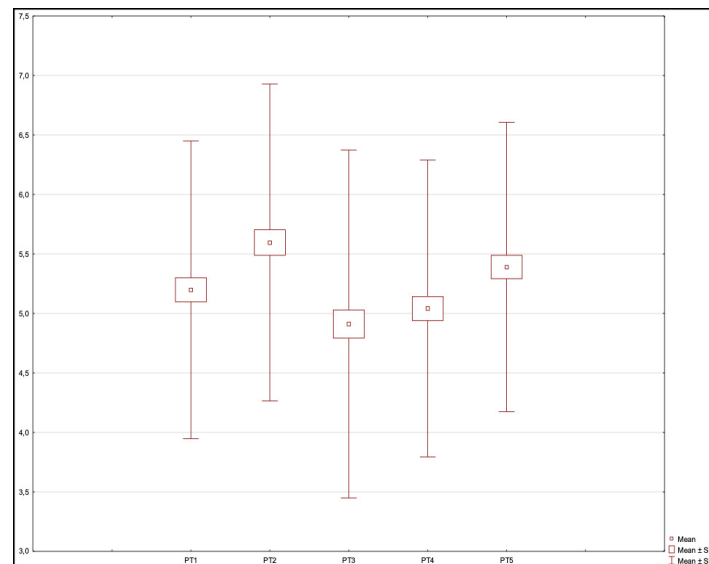


Figure 5. Mean values of Perspective-Taking questions in sport management students.

Post-hoc analyses revealed significant differences between specific items. For example, within communication, "resolving misunderstandings quickly and constructively" ($M = 5.56$, $SD = 1.16$) was rated significantly higher than "actively listening during discussions" ($M = 5.25$, $SD = 1.34$, $p = .029$). Similarly, within conflict resolution, "mediating conflicts in a way that strengthens team cohesion" ($M = 5.86$, $SD = 1.20$) was rated significantly higher than "encouraging a culture of respect to prevent conflicts" ($M = 5.51$, $SD = 1.25$, $p = .012$).

These results collectively highlight a preference for practical, action-oriented skills over introspective and empathetic abilities. While conflict resolution and communication are well-developed, self-awareness and perspective-taking require further attention in leadership training programs. The figures' visual representations underscore the need for a more balanced approach to leadership development in sports management education.

4. Discussion

The findings highlight the critical role of relational reflexivity in fostering sustainable leadership within sport management. By examining reflexivity traits among sport management students, the study underscores a crucial insight: practical, relational skills—particularly communication and conflict resolution—are strongly emphasized, while introspective capacities such as self-awareness and perspective-taking remain underdeveloped. This imbalance points to a significant gap in current leadership education, where immediate problem-solving overshadows deeper, reflective capabilities essential for sustainable and ethically informed decision-making.

The strong preference among students for conflict resolution resonates with previous research emphasizing effective leadership in high-pressure, team-oriented contexts. Sports organizations frequently demand swift conflict management and clear communication, making these outward-oriented relational competencies particularly valued. However, sustainable leadership also demands deeper introspection, a dimension highlighted by Archer (2013), who argues that relational reflexivity empowers leaders to critically evaluate their biases and understand the broader ethical implications of their actions.

Recent advancements in the relational reflexivity literature strengthen the case for a balanced integration of practical and introspective relational skills. For instance, Groulx et al. (2025) demonstrated that relational reflexivity is particularly beneficial for teams composed of members with diverse tenure levels and experience. Leaders frequently manage teams comprising experienced practitioners and newcomers in sports management contexts, mirroring this tenure diversity. Encouraging students to cultivate stronger self-awareness and perspective-taking could significantly enhance their ability to integrate diverse viewpoints, thus improving team cohesion and organizational adaptability.

Moreover, Leblanc, Harvey, and Rousseaus (2024) meta-analysis identifies psychological safety as a critical mediator enabling effective relational reflexivity. Their findings emphasize that leadership styles promoting openness, active participation, and reduced power distance enormously facilitate reflective dialogues among team members. Given the comparatively low scores observed for introspective relational skills in the current study, incorporating psychological safety training into leadership education could encourage students to reflect more deeply and openly on their interactions and decisions.

In parallel, Hadi and Chaudhary (2021) found that relational reflexivity effectively mediates the relationship between shared leadership structures and team performance, particularly under complex task conditions. Since sports management leaders often face complex and dynamic decision-making scenarios, training programs would benefit from actively fostering shared leadership practices that encourage mutual reflection, dialogue, and perspective-sharing. This could bridge the identified gap between practical skills (such as conflict resolution) and introspective capabilities (like self-awareness and perspective-taking), fostering adaptive, resilient leadership.

Yang et al. (2020) further underline that relational reflexivity significantly improves decision-making quality in diverse teams by enhancing collective information processing. Thus, a deeper engagement with relational reflexivity skills—especially perspective-taking and empathetic listening—could constructively equip sports management students to leverage diversity. The current findings reinforce the necessity for leadership education to explicitly incorporate relational reflexivity as a foundation for navigating diversity and ethical complexity in stakeholder relationships.

Additionally, relational reflexivity contributes profoundly to organizations' broader identity formation and learning process. Beech et al. (2021) highlight that identity construction and collective learning through relational reflexivity help individuals manage differences and organizational contradictions. Such identity-related competencies are critical in sports management, where leaders must continually adapt their identities and practices in response to shifting stakeholder demands and ethical challenges. Gordons (2021) insights complement this view, suggesting that continuous relational dialogue between leaders and team members—achieved through longitudinal, experiential learning methods—can significantly enrich leaders reflective capacities, facilitating more empathetic and ethically-informed decision-making.

Further supporting the integration of relational reflexivity into leadership education, Meier and Carroll (2023) conceptualize relational reflexivity as inherently communicative and interactional. They propose that leadership programs emphasize real-time, interactive reflection practices rather than solely cognitive introspection. Cunliffe (2009) aligns with this relational view, advocating reflexivity deeply embedded in lived organizational experiences. She suggests practical, experiential methods that directly link leadership theory with the complex realities encountered by leaders daily.

These theoretical insights reinforce Edwards (2005) foundational arguments for sustainable leadership, emphasizing a holistic approach balancing economic, social, and environmental responsibilities. Relational reflexivity serves as the bridge connecting practical leadership capabilities to deeper introspective awareness and ethical reflection. To address the identified educational gaps, leadership development programs in sports management must embed structured opportunities for self-reflection, empathy training, psychological safety, and interactive experiential learning. Employing pedagogical strategies such as journaling, scenario-based role-play, longitudinal reflective dialogues, and collaborative problem-solving can strengthen relational reflexivity, ultimately cultivating well-rounded leaders capable of ethically and sustainably navigating complex organizational dynamics and stakeholder expectations.

5. Conclusion

This study underscores the importance of relational reflexivity in leadership development, particularly in sports management. While students prioritize conflict resolution and communication, self-awareness, and perspective-taking must be enhanced to cultivate well-rounded leaders. Future research should explore the long-term evolution of these reflexivity skills and assess the impact of targeted training interventions. By integrating external and internal reflexivity competencies, leadership education programs can better prepare students to navigate the complexities of team management and ethical decision-making in sports organizations.

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Appendix

The Relational Reflexivity Questionnaire

Self-Awareness

1. I regularly reflect on my own behaviors and their impact on my team.
2. I actively seek feedback from my team to improve my leadership style.
3. I am aware of my personal biases and work to address them in decision-making.
4. I consider how my actions are perceived by others in my team.
5. I take responsibility for my mistakes and work to correct them.

Perspective-Taking

6. I make an effort to understand my team members' points of view before making decisions.
7. I value the input and opinions of all team members equally.
8. I regularly ask for team members' perspectives on issues affecting them.
9. I am open to changing my mind based on my team's insights.
10. I encourage team members to share their views even when they differ from mine.

Communication

11. I ensure that my team feels comfortable sharing their thoughts and opinions.
12. I communicate clearly and effectively with my team.
13. I address misunderstandings within the team promptly and constructively.
14. I actively listen to my team members during discussions.
15. I facilitate open and honest communication within the team.

Conflict Resolution

16. I approach conflicts within the team with a focus on finding solutions.
17. I ensure that all parties feel respected and valued during conflict resolution.
18. I handle conflicts or disagreements among team members promptly.
19. I encourage a culture of respect and understanding to prevent conflicts.
20. I mediate conflicts in a way that strengthens team cohesion.

IMPACT OF ECONOMIC CRISES ON THE SCALE OF BANKRUPTCY AND RESTRUCTURING OF ENTERPRISES IN POLAND

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Purpose: The purpose of this article is to analyze the change in the number of bankruptcies of Polish companies by industry in 2016-2024, as a consequence of the emergence of crisis factors (Covid-19 pandemic and the war in Ukraine) and the introduction of the restructuring law.

Design/methodology/approach: The paper uses descriptive methods with a table and graphs showing the number of business bankruptcies in the period 1997-2024 and a comparison of bankruptcies and restructuring and dynamics by PKD section in the period 2016-2024.

Findings: the analysis of the number of bankruptcies and restructuring proceedings conducted allows us to conclude the dependence of their number on the occurrence of economic crises.

Originality/value: It is noted that crises and crisis situations have had a significant impact on the scale of bankruptcies and restructuring proceedings, which, after the introduction of the restructuring law, have contributed significantly to reducing the number of

Keywords: economic crisis, bankruptcy, business cycle.

Category of the paper: research paper.

1. Introduction

Economic crises are inherent in the modern economy. Inevitable economic fluctuations are the result of changes in basic macro- and microeconomic quantities. A review of historical economic crises and their impact on the economy shows that as a result of economic fluctuations, the economy is exposed to, among other things, a decrease in demand, an increase in inflation, an increase in interest rates manifested in problems in the functioning of economic entities, but also become a kind of catalyst for the processes of elimination of entities - enterprises, weak with low economic efficiency contributing to improving the efficiency of the national economy. Enterprises are the basic element that drives the economy and creates the GDP of countries. Operating in an unstable economy makes them vulnerable to the effects of economic fluctuations, which in the worst-case scenario can lead to collapse or bankruptcy. The causes of corporate bankruptcy lie in both external and internal conditions. The research

shows that economic crises have a definite impact on the financial problems of companies, however, the state with the introduction of the Restructuring Law has slowed the dynamics of bankruptcy, allowing companies to fight for survival and avoid foreclosure proceedings through restructuring. However, this does not represent an escape from financial problems and continues to show the magnitude of the impact of crises on companies' problems with maintaining liquidity and ensuring business continuity. The purpose of the article is to analyze the change in the number of bankruptcies of Polish companies by industry in 2016-2024, as a consequence of the emergence of crisis factors (the Covid-19 pandemic and the war in Ukraine) and the introduction of the restructuring law.

2. The impact of the global crises of the 20th and 21st centuries on the scale of bankruptcy and restructuring proceedings in Poland

Over the years, economies and businesses have struggled with crises, which have often brought with them devastating consequences for both the economy itself and the businesses operating within it. A crisis is a phenomenon identified with danger and is characterized by features such as suddenness or trauma (Dudzik-Lewicka, 2013, p. 114). A crisis occurs unexpectedly and causes a breakdown of a stable situation, and consequently marks a breakthrough between two different phases of the process. The word "crisis" itself comes from the Greek "krino" and means precisely a turning point, a turning point (Otwinowski, 2010, p. 83). Crisis is associated with uncertainty and functioning under risk. The most common symptoms of a crisis include unfavorable changes in macroeconomic indicators such as inflation, unemployment, GDP, public debt, economic growth or stock market indexes (Naruć, 2012, p. 15). An economic crisis is equated with a decrease in economic activity, with recession and the collapse of the economic situation. Crisis can take many forms, economic crisis, banking crisis, currency crisis or financial crisis (Wague, 2009). Nowadays, therefore, crisis is seen as an immanent part of the economic process. Economic crises can be characterized by different territorial scope. Indeed, in economic reality, we have both local and global crises. By far the most significant for the economy are global crises, as they affect the world economy, which translates into the economies of individual countries (Marek, Wiczorek-Szymańska, 2011, p. 227). Economic crises are inherent in business cycle fluctuations. This is because the business cycle is a response to the changing pace of a country's economic development and activity. As a result of business fluctuations, basic market quantities such as national income, consumption, employment and investment levels change. According to one of the earliest theories of business cycles, cycles are made up of periods of expansion and subsequent crises or increases, which are the cause of the expansion of subsequent cycles (Palaszewski, 2009, p. 160). In classical economic theory, a business cycle is four consecutive phases - recession,

depression, recovery and boom. The current approach distinguishes two phases of the business cycle the upswing phase and the downswing phase, with limit points referred to as the upper and lower turning points (Pangsy-Kania, 2004). Business cycles and the economic crises that are part of them undoubtedly affect the functioning of economic entities. In economic theory, there are different views describing the impact of business cycles on the functioning of businesses.

Crises in the economy have been occurring periodically for many years. In the history of the world economy of the 20th and 21st centuries, several major economic crises can be distinguished, the effects of which the world economy has felt for a long time and continues to feel. Due to their diverse nature, not all crises can be characterized as global economic crises, but the economy at the turn of the century struggled with various situations that affected, to a greater or lesser extent, if not the entire economy, then its selected sectors. An overview of the major crises at the turn of the 20th and 21st centuries and their impact on the economy is presented in the table.

Table 1.
Economic crises at the turn of the 20th and 21st centuries

Crisis	Years	Impact on the economy
Great crisis	1929-1933	Collapse of the banking sector, massive corporate bankruptcies, collapse of trade, rising unemployment
Oil crisis	1973-1974	Rising oil prices, hyperinflation, economic slowdown, debt of Eastern European countries
Crisis of transformation	1984-1990	Technological inefficiency, decline in demand for uncompetitive products, lack of investment capital, high inflation, rising unemployment, collapse of state-owned enterprises
Asian crisis	1997-1998	Decline in prices of raw materials exported by Eastern European countries, weakening of local currencies, reduced access to international capital, banking sector failures in the region
Russia's financial crisis	1998	Debt crisis, collapse of many banks, loss of savings by citizens, increase in inflation, economic recession, increase in unemployment
Global financial crisis	2008-2009	Corporate bankruptcies, especially in the real estate and finance sectors, rising unemployment, reduced access to credit
Crisisogenic "black swans"	2000	Bursting the Internet bubble
	2001	The attack on the World Trade Center
	2020-2023	Pandemic Covid-19
	2022	Outbreak of war in Ukraine

Source: own elaboration based on literature review.

Crises at the turn of the last century appeared for different reasons and took different forms. The first economic crisis of the 20th century, the Great Economic Crisis, affected primarily the social sphere, but also the economic and political spheres on a global scale. It became the source, poverty, economic stagnation of the interwar period and, for various reasons, the cause of the outbreak of World War II (Jedruszczak, 1975, p. 6). The oil crisis caused by the outbreak of war in Israel, was the result of OPEC's restriction of oil supply. This restriction caused oil prices to increase by 400%, with far-reaching consequences for the entire world economy (Pangsy-Kania, 2017, p. 442). The oil crisis, in the long term, resulted in the emergence of a tendency to look for alternative sources of energy, such as coal or nuclear energy, as well as

changes in economic strategies that reduce countries' dependence on oil imports (Jedlinska, 2023, p. 37). The transition crisis, on the other hand, was a response to the collapse of communism and involved the introduction of reforms aimed at liberalizing the economy, reducing state interventionism and increasing the role of private enterprise. Another Asian crisis, sometimes referred to as the "Asian flu", of a typically financial nature, affected the countries of East and Southeast Asia. Excessive investment and speculation in financial markets led to the crisis. The Asian crisis, through reduced capital inflows, a decline in export earnings and low levels of foreign exchange reserves, also contributed to the collapse of the Russian economy (Zhukovskaya, 2001, p. 47). The Russian Crisis, is also a crisis of a financial nature, resulting from the Asian crisis, which caused a sharp outflow of capital from the Russian market. The Russian crisis caused a recession in the economy and significantly reduced the standard of living of citizens (Abassy, Kosovskaya, 2023, p. 153). The global financial crisis initiated in the mortgage sector in the United States is among the biggest crises in the history of the world economy. U.S. banks granted high-risk loans to customers without assessing their creditworthiness. The inability to repay the loans initiated financial problems for the banks, resulting in a market collapse and eventually a recession (Radomska, 2013, pp. 1-21). The global financial crisis is a typical debt crisis, which caused a deterioration in financial stability, a decline in industrial production and global demand. Lack of access to capital caused a liquidity crisis around the world (Matusiewicz, 2012, p. 15). What the indicated economic crises have in common is that they affected the condition of the global economy and national economies. An increase in inflation, a rise in unemployment, a decline in demand, or an inability to finance activities are just some of the effects they have caused.

In addition to the aforementioned crises, the economy also felt the effects of events such as the bursting of the so-called Internet bubble after 2000 and the attack on the WTC on September 11, 2001. The Internet bubble phenomenon consisted of euphoria in the US stock market regarding Internet-based technology companies. The value of the companies grew at an unimaginable rate, making it extremely easy for them to raise foreign capital. The collapse of the stock market caused the value of "Internet" companies to fall by up to 99%, as a result of which many companies collapsed drowning in debt and funding gigantic losses for investors (Goral, 2015, pp. 178-179).

Another black swan in the history of the economy - the terrorist attack on the World Trade Center in the United States caused an immediate depreciation of the dollar and halts in transactions in the international foreign exchange market. Commodity prices rose significantly, and liquidity problems also emerged (Rękas, 2016, p. 39). The attack triggered a decline in the rate of economic growth in the US, which also reduced global GDP and caused massive bankruptcies and increased unemployment (Szymanik, 2019, p. 60).

Another crisis caused by an infectious disease, the Covid-19 pandemic also decisively changed the conditions of the world economy. The Covid-19 pandemic is among the so-called black swans¹. Global bans, restrictions on mobility, closure of workplaces, caused a drastic reduction in economic activity and led to a disruption of financial stability and a decline in stock market indices (Czech, Karpio, Wielechowski, Wozniakowski, Zebrowska-Suchodolska, 2020, p. 15).

With the economy yet to fully recover from the global financial crisis and pandemic, the world has had to deal with another black swan - armed conflict and specifically Russian aggression against Ukraine. Among the primary effects of the war, already can be counted the rise in inflation and unemployment, the increase in fuel and energy prices, economic sanctions, reduced international trade, galloping migration, a decline in investment and disruption in the energy industry (Prokopovich, 2023, pp. 286-288). The ultimate impact of the crisis is unknown as the conflict continues, however, the economy has begun to stabilize and the effects of the war are now becoming less severe.

The economic crises of the twentieth and twenty-first centuries also significantly contributed to changes in global economic indicators describing the Polish economy, which did not go unnoticed by economic entities, since interest rates, exchange rates, unemployment, inflation rates, are important factors on which the functioning of economic entities depends, as they determine the capabilities of enterprises and define the reality of the economy. The global crises of the 20th and 21st centuries clearly affected the condition of Polish enterprises, causing an intensification of the phenomena of elimination from economic life of the economically weakest entities - bankruptcies. Due to the lack of availability of reliable figures on the effects of the Great Depression of 1929, the Oil Crisis and the Transformation Crisis of 1984-1990, a detailed analysis was not possible, but the data for 1998-2023 are presented in the figure.

¹ A black swan in economics is an irregular, unpredictable event of great economic significance. Black swans besides the Covid-19 pandemic include the Internet bubble of 2000, the September 11, 2001 attack on the World Trade Center and the global financial crisis, among others.

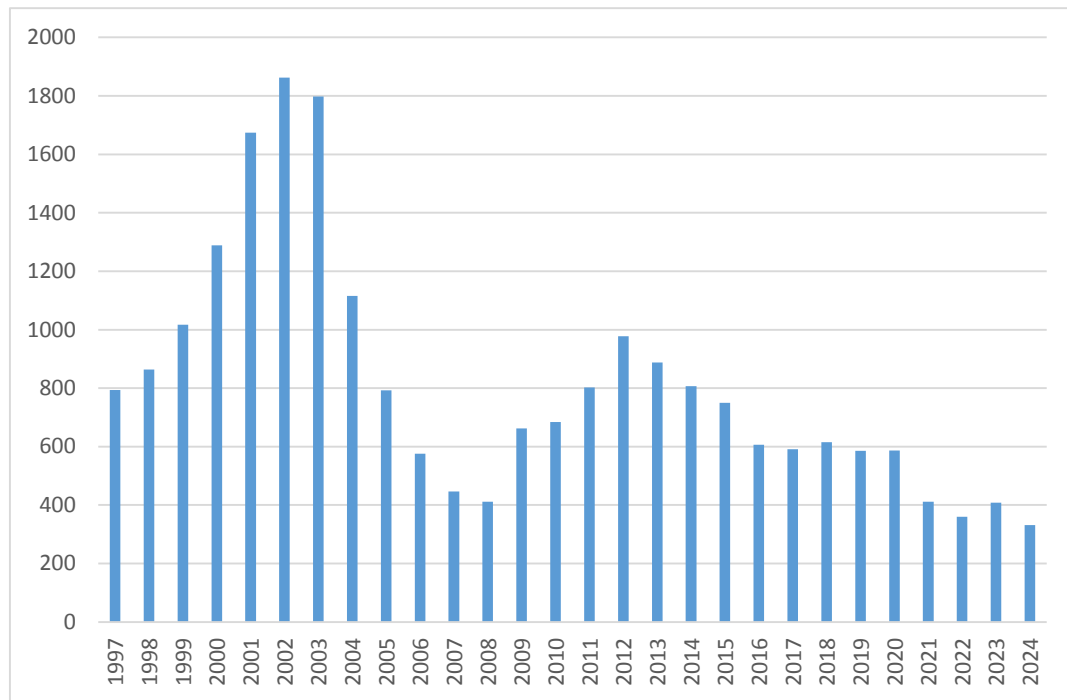


Figure 1. Bankruptcies of companies in Poland between 1997 and 2024.

Source: own compilation based on: www.stat.gov.pl

During the analyzed period, 22,709 bankruptcies were declared. The largest wave of bankruptcies occurred in 1997-2003. In this 7-year period, just under 9300 companies went bankrupt, accounting for 40% of bankruptcies in the entire analyzed period - 28 years. Year after year, the number of bankruptcies increased by about 19%. After 2003, we observe a reversal of the trend and a decrease in the number of bankruptcies for the next 5 years. During this period, 3343 entities declared bankruptcy, and the annual decline averaged 24%. The year 2009 saw a 61% increase in the number of bankruptcies. The upward trend continued, legally at a lower rate, until 2012, with 3126 business entities going bankrupt in 4 years. The years 2013-2017 were characterized by a downward trend. A year-on-year dynamics of less than 10% can be observed. Subsequent years without a clear trend with the largest decrease in the number of bankruptcies in 2021 by less than 30% and an increase in 2023 by 13%. The year 2024 contains data for three quarters and in this period the number of bankruptcies increased compared to the previous year by less than 19%. The data shows that the Asian crisis combined with the Russian crisis and the global financial crisis had the greatest impact on the scale of business bankruptcies in the period under review.

3. Formal-legal conditions of restructuring and bankruptcy proceedings in Poland

Enterprise crisis and economic crisis are two separate but related phenomena. An enterprise crisis refers to a single company with financial, operational or strategic problems. An economic crisis, on the other hand, is a widespread disruption of the economy, involving many sectors and economic entities. For a company, a crisis often means financial problems and the need to put the company into bankruptcy, according to the Bankruptcy Law (Law of February 28, 2003 Bankruptcy Law) . However, companies in crisis or suffering the effects of economic crises have the opportunity to implement recovery strategies to survive and protect themselves from bankruptcy. The Law of May 15, 2015. Restructuring Law, introduces formal conditions for rescuing a company from bankruptcy in the form of the possibility to conclude agreements with creditors and carry out sanitation measures (Law of May 15, 2015 Restructuring Law) . Restructuring, globally speaking, focuses on radical changes, so it is often the only solution a company can use to fight the crisis and defend itself from bankruptcy (Kaczmarek, 2018, p. 107).

Restructuring proceedings include four modes: proceedings for approval of an arrangement, accelerated arrangement proceedings, composition proceedings and sanitation proceedings. Their common feature is the possibility of concluding an arrangement with creditors, which allows the debtor to regain liquidity. A key role in this process is played by a court supervisor or administrator, and its purpose is to avoid bankruptcy (Law of May 15, 2015 Restructuring Law) .

Bankruptcy proceedings, on the other hand, are initiated when a debtor becomes insolvent. It involves the liquidation of the debtor's assets and the satisfaction of creditors' claims according to a certain hierarchy. A bankruptcy petition can be filed by both the debtor himself and his creditors. It is also possible to conduct bankruptcy proceedings with the possibility of an arrangement, which allows the partial preservation of the debtor's enterprise (Law of February 28, 2003. Bankruptcy Law) .

Both procedures are important for economic stability, providing protection mechanisms for both indebted entrepreneurs and their creditors. The introduction of simplified restructuring proceedings, as well as subsequent amendments to the bankruptcy law, indicate the legislature's desire to increase the efficiency and flexibility of these processes.

4. Analysis of the impact of the economic situation on Polish companies in 2016-2024

After shaking off the global financial crisis, the economy remains stagnant, with no clear impact of the economic situation on the scale of business bankruptcies. The following table contains data on selected economic indicators for the Polish economy in 2016-2023.

Table 2.
Selected macroeconomic indicators of Poland 2016-2023

	2016	2017	2018	2019	2020	2021	2022	2023
Inflation (%)	-1,60	2,00	1,60	2,30	3,40	5,10	14,40	11,40
Unemployment (%)	8,20	6,60	5,80	5,20	6,80	5,80	5,20	5,10
Debt of the public finance sector (PLN billion)	965,2	961,8	984,3	990,9	1111,8	1148,60	1209,50	1328,10

Source: own compilation based on: <https://bdm.stat.gov.pl/>

Perturbations related to the pandemic, initially caused a slight increase in unemployment and a significant increase in prices in 2022. As a result of increased state spending on subsidies and grants, among other things, the debt of the public finance sector also increased. Thus, the pandemic has not been without an impact on the economy. Analyzing the data on the number of bankruptcies and restructurings, it can be seen that while the pandemic did not contribute to an increase in the number of corporate bankruptcies, it definitely had symptoms of crisis for the various industries in which companies filed restructuring applications. The scale of companies' financial problems is illustrated by the number of restructuring proceedings and dismissed bankruptcy petitions shown in Figure 2. Undergoing restructuring indicates the likelihood of liquidity problems and the threat of bankruptcy.

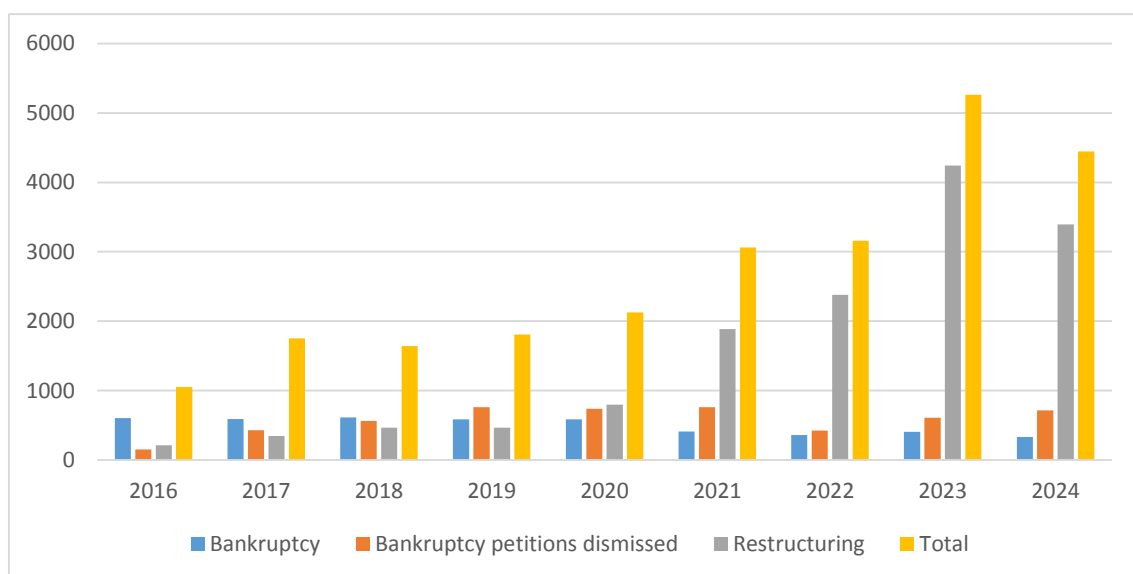


Figure 2. Bankruptcies and restructuring of companies in Poland between 2016 and 2024.

Source: own compilation based on: www.stat.gov.pl

The entry into force of the Law of May 15, 2015. Restructuring Law, had a decisive impact on the number of bankruptcies of companies in Poland. However, the downward trend in the number of bankruptcies is not evidence of the absence of financial problems for companies. In the first year of the Restructuring Law, 212 entities underwent restructuring. In 2017, there were 64% more. The largest increase in restructured companies took place in 2021, when there was a 136% increase on the previous year. Subsequent years also showed an upward trend of 26% in 2022 and 78% in 2023. The year 2024 for the third quarter shows a downward trend of less than 20%. The scale of companies facing financial problems is raised by the number of entities whose bankruptcy petitions have been rejected by the court. Data on rejected bankruptcy petitions is available from 2016, a number that increased after restructuring opportunities became available. In 2016, the court rejected 151 applications, and in 2017 there were already 430, or 184% more. The next two years continued to show an upward trend. In 2023, a decrease of 45% in rejected applications can be seen, the next two years are again an upward trend, with an average of 30%. The total number of bankruptcies, rejections and restructurings shows the real scale of companies' existential problems.

The magnitude of the companies' problems in the period under review was decisively influenced by the events caused by the Covid-19 pandemic and the outbreak of war in Ukraine. Global bans, restriction of mobility, closure of workplaces, as a result of Covid-19, caused a drastic reduction in economic activity and led to a disruption of financial stability and a decline in stock market indices (Czech, Karpio, Wielechowski, Wozniak, Zebrowska-Suchodolska, 2020, p. 15). As a result of lockdowns, many companies had to close down, which caused an increase in unemployment. Lockdowns caused problems with supply chains, resulting in long-term consequences for many industries. The pandemic created fear in the public, which reduced investment levels and drastically reduced demand for many goods and services (Kacperska, Gomółka, Kasprzak, Lukasiewicz, Wroblewski, 2023, pp. 53-56). The pandemic caused fear of a global economic crisis and an increase in the economic uncertainty index (Czech, Karpio, Wielechowski, Wozniak, Zebrowska-Suchodolska, 2020, p. 20). Among the primary effects of the war, already can be counted an increase in inflation and unemployment, an increase in fuel and energy prices, economic sanctions, a reduction in international trade, galloping migration, a decline in investment and disruption in the energy industry (Prokopovich, 2023, pp. 286-288). The ultimate impact of the war is unknown as the conflict continues, however, the economy has begun to stabilize and the effects of the war are now becoming less severe.

The number of restructuring proceedings by PKD class is shown in Table 3.

Table 3.
Number of enterprise restructurings by PKD class

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Construction	51	56	66	45	77	160	213	595	503
Manufacturing	46	85	112	102	120	274	302	904	469
Wholesale and retail trade	42	82	103	107	150	316	481	329	700
Professional and technical activities	10	18	21	22	48	127	173	329	227
Agriculture, forestry, hunting, and fishing	4	18	53	73	138	486	423	386	293
Transport and warehousing	6	13	20	28	76	115	241	513	503
Information and communication	9	15	12	10	13	28	58	96	78
Accommodation and food service activities	5	8	13	11	38	71	91	191	134
Real estate services	3	6	8	10	23	64	47	60	56
Financial and insurance activities	6	8	9	8	28	40	54	84	46
Activities related to administrative services and support activities	4	8	10	10	22	75	84	156	159
Activities related to culture, entertainment, and recreation	1	1	5	1	8	6	16	29	23
Healthcare and social assistance	2	5	9	12	28	66	109	170	87
Other	25	30	33	38	59	126	196	572	205
Total	212	348	465	465	800	1888	2379	4244	3396

Source: own compilation based on <https://www.coig.com.pl/>

Analyzing the data in the table, it can be seen that the largest number of enterprises restructured during the Covid-19 pandemic were industrial, commercial, agricultural, construction and transportation enterprises. Not such a high number of restructurings, but a high increase in the number of restructurings was recorded in the hotel and catering industry, real estate, and health care and cultural activities. The dynamics of restructuring proceedings by PKD class is shown in Table 4.

Table 4.
Dynamics of restructuring proceedings by PKD class in the period 2016-2024 (previous year 100%)

	2017	2018	2019	2020	2021	2022	2023	2024
Construction	10%	18%	-32%	71%	108%	33%	179%	-15%
Industrial processing	85%	32%	-9%	18%	128%	10%	199%	-48%
Wholesale and retail trade	95%	26%	4%	40%	111%	52%	-32%	113%
Professional and technical activities	80%	17%	5%	118%	165%	36%	90%	-31%
Agriculture, forestry, hunting and fishing	350%	194%	38%	89%	252%	-13%	-9%	-24%
Transport and storage management	117%	54%	40%	171%	51%	110%	113%	-2%
Information and communication	67%	-20%	-17%	30%	115%	107%	66%	-19%
Accommodation and food service activities	60%	63%	-15%	245%	87%	28%	110%	-30%
Real estate activities	100%	33%	25%	130%	178%	-27%	28%	-7%
Financial and insurance activities	33%	13%	-11%	250%	43%	35%	56%	-45%
Administrative and support service activities	100%	25%	0%	120%	241%	12%	86%	2%

Cont. table 4.

Culture, entertainment and recreation activities	0%	400%	-80%	700%	-25%	167%	81%	-21%
Health care and social assistance	150%	80%	33%	133%	136%	65%	56%	-49%
Other	20%	10%	15%	55%	114%	56%	192%	-64%
Total	64%	34%	0%	72%	136%	26%	78%	-20%

Source: own compilation based on <https://www.coig.com.pl/>

The table shows the cyclical nature of the economy and the impact of crisis events, such as the pandemic, on individual sectors. From 2017-2021, a noticeable increase in the number of restructuring proceedings in all sectors with a total increase of 136%, which may indicate the impact of the pandemic and its economic impact. The years 2022-2023, continue to see increases in many industries, although the dynamics are much lower than the previous period. The year 2020 with the largest increase in proceedings in cultural and entertainment activities (700%), and in financial and insurance activities (250%) and accommodation and food service activities (245%). In 2021, a large increase in restructuring proceedings in agriculture, administrative activities and real estate. The year 2022 with the largest increase in proceedings in cultural and entertainment activities, a big jump in dynamics in transportation. Improvement, however, in real estate and agriculture, here decreases of 27 and 13 percent, respectively. 2023 on the dal with an upward trend in most industries, especially in industry and construction and transportation. In 2024, the total decrease in the number of restructuring proceedings by 20 percent, which may indicate an improvement in financial health and stabilization of the market.

5. Applications

Analyzing the scale of corporate bankruptcies and their dependence on economic crises shows a clear correlation. The wave of bankruptcies had already been rising since the Asian crisis and met the effects of the bursting of the Internet bubble and the terrorist attack in the US. It should be noted that the economy in 1997 had not yet recovered from the transition crisis (no figures on business bankruptcies here). The sharp increase in bankruptcies until 2022 shows the strong correlation of bankruptcies with the economic situation. Another wave of growth can be seen after the financial crisis as early as 2009, and the effects persist for another 3 years. The dependence of the number of bankruptcies on crises changes somewhat when Restructuring Law came into force. In 2017, admittedly, there were no global crises, but there were problems in the economy and local crises that caused financial problems for companies, which can be seen in the scale of restructuring.

Both the Covid-19 pandemic and the consequences of the outbreak of war in Ukraine, do not bear the typical hallmarks of an economic crisis, as they did not cause radical changes in macroeconomic indicators (the level of real GDP decreased in the initial phase of the pandemic), but they definitely changed economic conditions. The pandemic, through unprecedented prohibitions, worsened the quality of life of the population, caused a reduction in mobility and a decrease in demand for certain goods through financial uncertainty and reduced consumption. The years of the pandemic were characterized by a significant increase in just restructuring proceedings, as was the case immediately after the outbreak of the conflict in Ukraine.

Therefore, one can conclude that the financial condition of entities, and thus the number of bankruptcies and corporate restructuring, is strongly dependent on economic crises and crisis phenomena, but the state's actions of enabling companies to implement restructuring proceedings, result in more entities having a chance to survive. There is no certainty as to how many restructured companies would have collapsed if not for the possibility of restructuring, the number of proceedings, however, certainly illustrates the scale of companies' problems in the face of emerging crises.

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MECHANISMS SUPPORTING HUB FUNCTIONS IN AIRPORT CHARGES SYSTEMS OF EUROPEAN AIRPORTS

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Purpose: The paper investigates whether the structure of airport charges and incentive schemes at European hub airports supports the development of hub operations. The motivation arises from post-pandemic challenges, increased competition from non-European hubs, and the need to understand if pricing strategies align with hub-specific traffic profiles.

Design/methodology/approach: The study employs a mixed-methods approach combining cost simulation modelling and qualitative document analysis. It examines passenger charges and landing fees across 15 major European hub airports. Quantitative modelling involved calculating passenger costs and per-ton MTOW costs for three aircraft types (regional, narrow-body, wide-body), while qualitative analysis identified the types and purposes of discounts applied. Airports were selected using purposive sampling based on their hub status.

Findings: All analysed airports offer reduced charges or discounts for transfer passengers, and most provide lower unit costs for wide-body aircraft. However, there is no uniform strategy supporting hub development. Price differentiation by route length or aircraft type is inconsistent. Discount schemes vary widely in scope and focus.

Research limitations/implications: The study is limited to a single date (January 2025) and to officially published tariffs, which may not reflect all commercial arrangements. It focuses solely on European hub airports and does not incorporate airline perspectives. Future research should include dynamics of pricing strategies, non-European hubs, and interviews with stakeholders.

Practical implications: The results can inform airport managers seeking to enhance hub competitiveness through targeted pricing mechanisms. Regulators may use the findings to refine policy on airport charges and better align economic incentives with strategic goals.

Originality/value: This paper fills a research gap by evaluating the pricing structures of European hub airports in the post-pandemic context. It offers valuable insights for airport operators, regulators, and transport policymakers.

Keywords: airport charges, hub airports, mechanisms supporting network development.

Category of the paper: research paper.

1. Introduction

The COVID-19 pandemic has had a drastic impact on the global and European aviation market. Passenger traffic in the European Union declined by 73%, 64% and 21% from 2019 to 2020-2022, respectively (Statistica, 2024) [accessed 13.12.202]. Currently, European traffic is in a recovery phase, no less unevenly between airports. Point-to-point traffic, with a tourist profile and visiting friends and relatives, is rebuilding stronger (ACI, 2024, p. 1). This means slower traffic recovery of network carriers, which are the main operators of European hub airports. Additionally, hubs in Europe face very strong competition, both from their continental counterparts and non-European airports (OAG, 2023, p. 1). In view of the above, the question arises as to how much, in the post-pandemic era, European hubs are trying to maintain the profile of a connecting airport, and how much they are changing their business models toward operating direct flights.

One of the tools for supporting a certain type of traffic profile is the appropriate design of airport tariffs, which are one of the primary sources of airport revenue. They are charged to air carriers for the use of airport infrastructure. In practice, airlines include the cost of fees in the price of an airline ticket. Although ACI (2021, p. 2) shows that airport fees account for only 5.1% of the price of an airline ticket, taking into account the price elasticity of air carriers' customer demand, it should be borne in mind that both the amount and structure of airport fees affect the profitability of airline connections, and thus stimulate certain traffic profiles at the airport.

The purpose of the article is to investigate whether the structure of airport charges and incentive schemes at European hub airports supports the development of hub operations.

2. Airport charges

As mentioned earlier, one of the basic elements of airport revenues is airport fees. According to the definition proposed by the ICAO Council (2012), these are measures aimed at recovering the costs of providing infrastructure and services for civil aviation.

The setting, consultation, approval and implementation of airport charges are regulated by both international and domestic lawⁱ

At a general level, we can distinguish the following basic airport fees:

- Aircraft takeoff and landing charge.
- Noise fee or gas emission charge.
- Parking charge.
- Passenger charge.

- Security screening charge.
- Additional and other charges (e.g., commodity fee), etc.

However, it is difficult to clearly determine, the share of the individual fees indicated above in the overall airport revenue. Based on ICAO's analysis (2014, p. 7), it can be deduced that as much as at least 80% of airport fee revenue is accounted for by take-off and landing charge, passenger charge and security control charge. With this in mind, further analysis will be conducted based on takeoff and landing fees, passenger fee and security screening fee.

3. Hub airport

Chakuu, Kozłowski, Misery (2012, p. 84) distinguish between two approaches to airport types - the market approach and the technical approach. According to the market approach, airports are divided into two types - hub airports and regional airports. One of the main factors differentiating the market approach is the predominant type of traffic handled at the airport and, consequently, the predominant type of air carriers performing flight operations at the airport.

A hub port is characterized by complex airport infrastructure and a networked type of *hub-and-spoke* passenger traffic (Ministry of Transport, Construction and Maritime Affairs, 2020) [Accessed: 18.11.2024]. A network carrier's route network consists of feeder routes (generally short- and medium-haul routes) that feed passenger flows to long-haul routes (Pels, 2021, p. 2). From the passenger's perspective, this makes it possible to reach a destination, even in the absence of direct connections from the port from which the journey begins or when a connecting offer is more competitive in terms of, for example, days of operation or price.

One of the basic elements that define a hub, therefore, is the design of the route network, enabling passenger transfers at the airport. What also distinguishes a hub from other airports is a significant share of long-haul connections, fed by a network of short-haul connections, and consequently a higher share of connections operated by regional and wide-body aircraft than at other airports. An airport manager who wants to support the development of hub functions should therefore seek solutions that will reduce the costs of operating a hub/network carrier. The airport manager, due to the basic principle of non-discrimination between carriers, cannot directly address solutions that will support a specific carrier. However, it can apply tools within airport charges that will support carriers with a specific business profile. In the case of hub carriers, these are primarily the handling of transfer traffic, operations with a diversified fleet, including regional aircraft and wide-body aircraft, significant traffic volumes, a large number of aircraft based at the hub airport, a high frequency of flights or an offer of special-profile routes.

4. Literature review

Over the years, a number of scientific papers have been published analyzing airport tariffs at airports. The analyses have dealt with general patterns, similarities and differences, or types of discounts or incentives to stimulate air traffic at airports. All of the available studies were done at least a few years ago, and especially before the Covid-19 pandemic, which affected aviation in an unprecedented way.

Analyzing the available literature on the structure and amount of airport charges and their impact on traffic profiles at a given airport, one should first point to the publication by Malina, Albers, Krola (2011), who analyzed 200 of Europe's largest ports in terms of commercial policies, focusing on the analysis of airport fee tariffs at hub and regional airports. At the ports studied, the authors identified many forms of discounts and incentives in a general way (e.g., volume discount), however they did not isolate discounts that directly stimulate hub airport traffic. In a similar way, a study was conducted by Cai, Jones, Budd and Pitfield (2013). For their analysis, they selected 46 European airports of different types and scales of passenger traffic. Some of the analyzed ports included hubs (Amsterdam, Brussels, Frankfurt, Munich), however, in this case, too, the authors focused on the general pattern of discounts granted to carriers, and therefore did not directly study the stimulation and development of hub functions.

Markiewicz (2019), on the other hand, analyzed the legislative environment of the European Union and its impact on airport fees and more broadly on the financial health of airports themselves. The paper, like the previous one, did not analyze the tools that support the hub function.

The work of other researchers focused on other regions of the world, mainly Asia, e.g. (Lin, Zhang, 2017) and was conducted before the Covid-19 pandemic, or their conclusions were general and did not focus on the role of airport fees in hub development and transfer traffic. On this basis, a research gap has been identified in terms of the tools used by airports in Europe to stimulate the development of air hub functions in the post-pandemic period as part of the airport fee tariffs offered.

5. Description of the research method and indication of the research objectives

The research method used combines elements of quantitative analysis (modeling of costs based on algorithms included in airport tariffs) and qualitative analysis (in-depth analysis of the tariff strategy and discount system used by airports).

The selection of cases was purposeful and based on the criterion of "hubness", i.e. a significant share of transfer traffic. The study looked at 15 European airportsⁱⁱ that the authors identified as hubs. The authors deliberately excluded Heathrow Airport from the study because of the significantly above-average cost of airport fees offered by the airport's management.

The first two parts of the study were quantitative in nature. First, the authors realized an analysis of the mechanisms used by airports in relation to passenger fees. They analyzed the existence and, if any, the number of differences in charges between short-haul and long-haul flights, as well as the application of different fees for a direct flight passenger and a transfer passenger. The two analyzed pricing strategies of the ports were identified as the most effective in supporting the development of hub functions within the framework of passenger fees. The purpose of this section was to determine the pricing strategies applied to passengers traveling on long-haul flights and to identify the application and analyze the size of discounts, if any, for transfer passengers.

The second part of the study was based on simulation modeling of operating costs, based on current airport tariffs. The modeling included three representative aircraft types - regional (E190), narrow-body (A321) and wide-body (B773) - with fees for takeoff, landing, emissions and noise. The analysis allowed an analysis of the unit cost of operations in relation to take-off weight (MTOW). The purpose of this section was to determine to what extent the fare algorithms preimmunize the fleet typical of hub carriers, i.e. regional and wide-body aircraft.

Finally, a qualitative content analysis of fee schedules and regulations and supporting documents was applied. Using thematic categorization, typologies of discounts and concessions that can support hub functions were identified - including discounts for transfer traffic, high frequency, aircraft basing or opening strategic routes. Based on the identified typology, an analysis of the discounts and concessions used by airports was conducted. The goal of this section was to identify additional mechanisms to support hub functions.

The authors formulated the following research objectives:

1. Whether the passenger charge structure at hub airports supports operations with a diversified fleet serving routes of different lengths, and whether it supports transfer traffic.
2. Whether the charges structure for take-offs and landings supports diversified fleet operations.
3. Does the discount system support operations with a diverse fleet, transfer traffic, traffic volume, based aircraft, high frequency of traffic or opening of routes with a specific profile.

6. Research results

In pursuing the research objectives outlined above, it is first necessary to look at passenger fees. Due to the fact that the security screening fee is also charged to the passenger, and in value can match or even exceed the passenger fee, the sum of both fees was used in further analysis.

As a first step, it can be assumed that one potential way to support hub operations is to differentiate fees according to the length of the route, with the assumption that the fee is higher on long-haul flights. Such a solution makes it possible to link charges to revenue per passenger, which is also higher on long-haul flights. It is worth bearing in mind, however, that without additional mechanisms to reduce rates in other areas, such a solution may increase the average rate of fees that a hub airline incurs.

An analysis of airport charges schedules showed that some of the analyzed airports differentiate passenger fees depending on the length of the flight. Such solutions are used by FRA, MUC, CDG, MAD, LIS and FCO airports. VIE airport does not differentiate basic fees depending on the distance, while such a difference exists for transfer passenger fees. Among the airports analyzed, however, fiveⁱⁱⁱ do not differentiate fees for security screening. LIS, on the other hand, charges higher fees for passengers on long-haul flights.

It should be noted that the airports in the studied range approach the differentiation of flight length in different ways. As a common denominator for comparing rate differentiation, one can assume a division into short- and long-haul routes. In the case of short-haul routes, it can be assumed that they are defined by the Schengen zone, the EEA or the EU area, depending on the airport. The results of the analysis are illustrated in the figure below, which shows the difference between the rate per passenger on short-haul and long-haul flights.

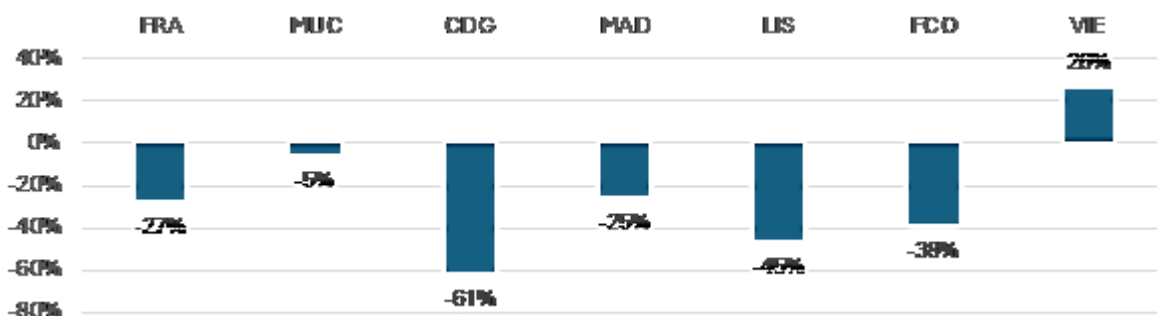


Figure 1. Ratio of short-haul passenger fare to long-haul passenger fare.

Source: own compilation based on airport tariffs.

The analysis showed that the biggest difference between fees for long-haul flights and short-haul flights is at Paris, where the passenger fee for short-haul flights is more than 60% lower than for long-haul passengers. The smallest difference is at Munich, at just 5%. In the case of Vienna, there is an inverse relationship and the charge for a passenger on a short-haul flight is 26% higher than for a passenger on a long-haul flight. Thus, the analysis showed

that a relatively low percentage of the analyzed ports apply a mechanism for differentiating prices according to the distance of travel.

Another element requiring analysis is the potential differentiation of rates for transfer and point-to-point passengers. Such a mechanism potentially reduces the costs of operating a hub carrier, while correlating with lower revenue yields from transfer passengers compared to point-to-point passengers.

An analysis of price lists showed that all analyzed airports apply lower charges or discounts for transfer passengers. In contrast, the airports use a different strategy regarding screening fees. Four^{iv} apply a lower rate, five^v do not vary it, three^{vi} do not charge it at all, and two^{vii} do not separate it out. As the figure below shows, the largest difference between the rates, by 83%, is at the Warsaw. The smallest difference is offered in Lisbon^{viii}.

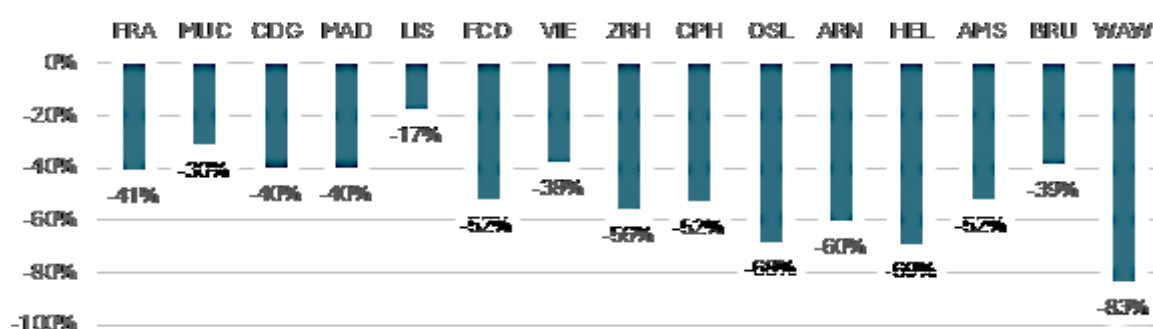


Figure 2. Difference in transfer passenger fee vs. passenger charge on a direct flight.

Source: own compilation based on airport tariffs.

A separate analysis was devoted to the question of whether airports differentiate transfer passenger discounts by travel distance. For four of the analyzed airports differentiating fees by travel distance, the difference in the transfer passenger fee was virtually the same depending on travel distance. In Rome, the difference between the per-passenger fee on short-haul flights and long-haul routes was greater in favor of shorter connections. In Vienna and Frankfurt, the relationship is reversed. In conclusion, no conclusion can be drawn that airports follow a consistent practice in this area.

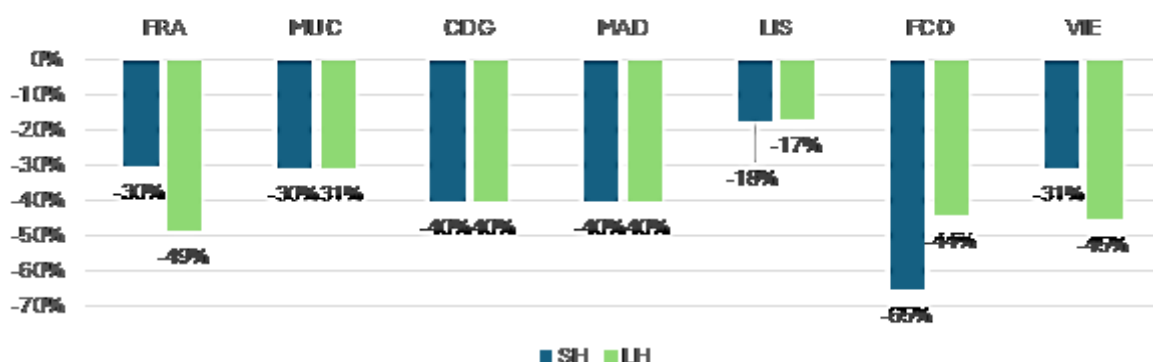


Figure 3. Difference in transfer passenger fare vs. on a direct flight depending on the length of the travel distance.

Source: own compilation based on airport tariffs.

The second part of the analysis focused on algorithms for calculating landing charges. Based on the price lists^{ix} of airport fees provided by airport managers, the value of fees charged for operations (for landing, noise and emissions) was calculated for three types of aircraft: E190, A321 and B773. The first type represents a group of regional aircraft. The second of large, narrow-body aircraft, used by low-cost carriers^x. The third type of aircraft belongs to wide-body aircraft. This selection of aircraft was intended to analyze the cost of operations of aircraft used by hub carriers. Given that the hub's business model involves the use of regional and wide-body aircraft, the purpose of the analysis was to examine to what extent airports use algorithms that result in lower calculated costs per ton MTOW^{xi} for these types than for narrow-body aircraft.

Analysis of the per-ton MTOW for regional aircraft did not provide a clear picture regarding the strategies used by airports. For five airports, the price per ton MTOW for regional aircraft is higher than for narrow-body aircraft. In contrast, 6 airports show a noticeably lower price, which may indicate a practice of supporting network carriers. The remaining airports basically do not differentiate prices.

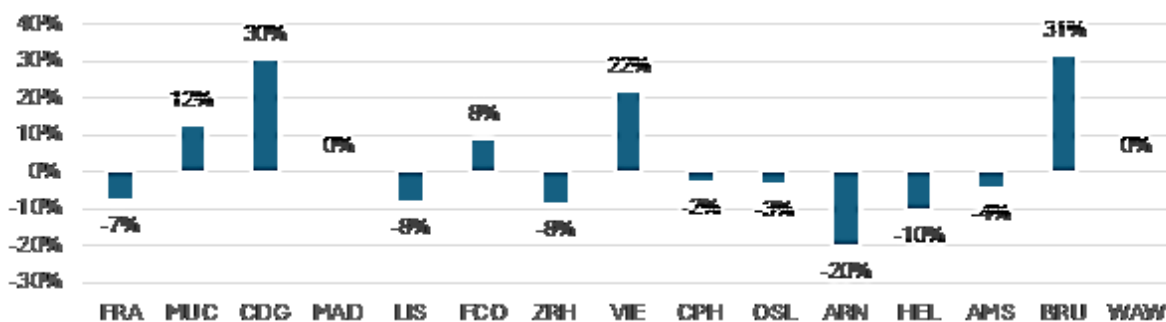


Figure 4. Difference in fee per ton MTOW for a regional aircraft compared to a large narrow-body aircraft.

Source: own compilation based on airport tariffs.

The picture is different for the difference per 1 ton MTOW for wide-body aircraft. As many as 9 airports show significantly lower rates for this type of aircraft compared to narrow body aircraft.

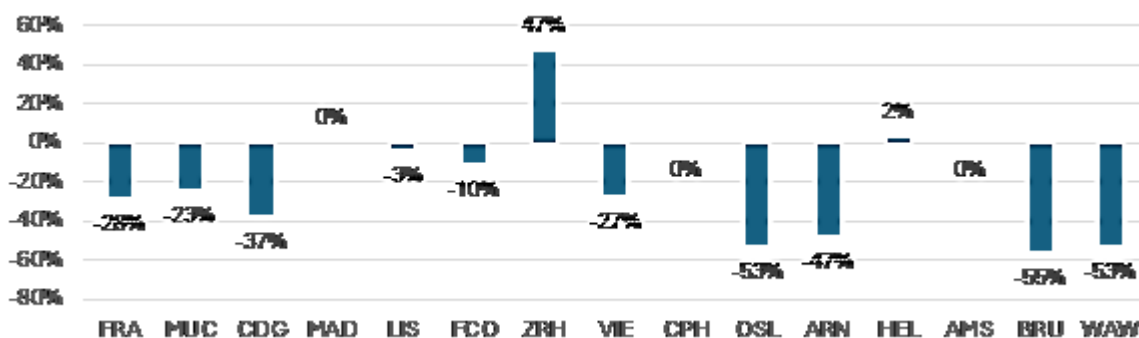


Figure 5. Difference in fee per ton MTOW for a wide-body aircraft compared to a large narrow-body aircraft.

Source: own compilation based on airport tariffs.

In conclusion, it can be noted that it is not possible to see directly the efforts of airports to reduce the unit cost of operations by regional aircraft. On the other hand, such action is already evident in the case of wide-body aircraft.

7. Analysis of the discount system

The analysis showed that hub airports take different approaches to the airport fee discount system. Some of them offer discounts directly related to stimulating transfer traffic, and some do so indirectly using a mechanism that can be applied, for example, to all passengers of a particular carrier checked in at the port, or applies to a new route that will be traveled by local and transfer passengers.

The following table is the result of researching airport fare tariffs and additional related documents. Discounts have been categorized based on destination. Such discounts were selected that are directly or indirectly related to transfer traffic, traffic volume, aircraft basing and the profile of routes served.

Table 1.
Analysis of types of discounts at transfer ports

Type of discount and its impact on transfer traffic (B - direct, P - indirect)	FRA	MUC	CDG	MAD	ZRH	VIE	CPH	OSL	ARN	HEL	AMS	BRU	WAW
Discount for high filling of airplane seats, (P)	X	X											
Discount for intercontinental or transfer passengers, (B)	X												
Discount on new regular route, (P)			X	X			X	X	X	X		X	X
Discount on new regular strategic route, (P)													X
Discount for passenger traffic growth, (P)									X			X	X
Discount for route served with high frequency, (P)							X						X
Volume discount, (B)					X				X				
Discount for increase in number of based aircraft, (B)												X	

Source: own compilation based on airport tariffs.

Based on the table above, it can be seen that the vast majority of hub airports apply various types of discounts, which can be directly or indirectly linked to the support of air hub functions. The most popular discount is the new route discount, which, while it can support the development of traffic in general, not necessarily only hub connections, but all new scheduled routes. The strategic route discount works in an analogous way. In terms of discounts that can be linked directly to the hub development function, the research has shown that they are applied by individual ports, and it is not possible to hypothesize on this basis that the ports apply a consistent strategy and mechanisms in this regard.

8. Summary

The study found that hub airports are diversifying their passenger and landing fee structures, as well as employing discount systems that support the operations of network carriers, and thus the development of hub functions. However, the mechanisms and tools used, as well as their scope, vary between airports. The survey results showed that all hub airports apply discounts or lower fees for transfer passengers. Most airports also support operations by wide-body aircraft, through a lower charge per ton MTOW for take-off and landing. In the case of the other tools identified, such patterns can no longer be found, and it can be concluded that in this regard, airports no longer use a consistent approach and similar mechanisms. However, the results of the study in this regard should be considered valuable, as they identify possible mechanisms used by different airports.

Summarizing the results of the study, it should be emphasized that they are of an applied nature. Based on them, airport managers can adjust the structure of airport fees to more effectively support the hub function. Regulators, on the other hand, can use the results of the study to further develop policies and regulations on airport fees and airport regulation.

The main limitations of the study stem from its scope and the nature of the source data. First, the analysis is based on officially published tariffs and documents, which do not always reflect the actual all commercial and operational conditions for operating at a given airport. Second, the study focuses on a single moment in time, January 1st 2025, which limits the ability to observe dynamic changes. Third, the selection of airports is limited to European ports considered to be hubs, which precludes comparisons with airports on other continents. In addition, the study does not analyze the effectiveness of support mechanisms in practice, but only their existence and structure. Finally, the methodology does not include the carriers' perspective, which could enrich the interpretation of the results.

The results suggest several directions for future analysis. First of all, it is recommended to evaluate the effectiveness of individual support mechanisms in the development and competitive position of hub airports. Comparative studies are also needed with airports outside of Europe, especially with rapidly growing ports in Asia and the Middle East. Longitudinal studies to capture changes in fare strategies over time are also worth considering. A further step might be to include the carriers' perspectives, their experiences regarding the effectiveness and preferences of their fare systems. An analysis of the impact of fares on decisions to open new routes would also be an interesting extension.

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Footnotes

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- ⁱ Article 15 of the Chicago Convention (OJ 1959 No. 35, 1944) refers to airport charges. In addition, in the area of airport charges, the ICAO has issued recommendations (ICAO, 2012), which form the basis for much of the world's regulation in the area of airport charges. ICAO regulations and recommendations point to a number of basic principles that should apply to the airport fee regime, in particular non-discrimination, transparency, cost dependence and an independent mechanism for economic regulation of airports in the process of setting and implementing airport fees. At the European level, the basic act regulating this area is Directive 2009/12/EC of the European Parliament and of the Council on airport charges, which applies to airports handling more than 5 million passengers a year. The directive emphasizes the basic principles and conditions for setting airport charges, which are based on ICAO recommendations. From the point of view of the amount and structure of fees, special attention should be paid to:
- the principle of non-discrimination, which, however, does not preclude differential fees,
 - ability to modulate fees,
 - the possibility of offering infrastructure and services that vary in quality and scope, while access to this infrastructure should be open to all users. As far as the Polish legal order is concerned, the issues of airport fees are regulated in particular by the Aviation Law, particularly Article 67 paragraphs 1-3 and Articles 75-77. However, the implementing regulations in this regard are contained in the Regulation of the Minister of Infrastructure and Development of August 8, 2014.
- ⁱⁱ London Heathrow Airport and Istanbul Airport were excluded from the study, due to the fact that they are not subject to the European EU regulatory regime. This approach was intended to assess the behavior of the ports in a uniform regulatory environment.
- ⁱⁱⁱ FRA, MUC, MAD, VIE and CDG, with Paris airport not singling out this fee at all.
- ^{iv} MAD, ZRH, CPH, AMS.
- ^v FRA, MUC, LIS, VIE, BRU.
- ^{vi} OSL, ARN and HEL.
- ^{vii} WAW and CDG.
- ^{viii} Among the airports differentiating fees.
- ^{ix} For 5 ports, calculators available on airport websites were used.
- ^x This aircraft is also used by network carriers.
- ^{xi} Charges for takeoffs, landings, but also often noise and emissions, are calculated according to algorithms based on an aircraft's maximum takeoff weight (MTOW), expressed in tons.

EXPERIENCING INCLUSION BY THE GENERATION Z – OPPORTUNITIES AND THREATS

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Purpose: The article was written within the framework of the research task of the project “Quality and risk of employee experience management under conditions of sustainable development”.

Methodology: A self-survey was conducted among working people of Generation Z regarding their experience of inclusion in the workplace. Using the Climate for Inclusion Scale, their perception of inclusion in the area of employment and integration of differences was diagnosed. Their dominant positive modules of experiences were established.

Findings: Inclusive workplaces determine employee experience. The majority of respondents perceived their workplaces as inclusive, viewing the climate of inclusion in the areas of employment and integration of differences positively. They rated highest the companies' commitment to hiring a diverse workforce and meeting individual employee needs through flexible benefit programs. Intergroup relations in companies characterized by respect and trust scored the highest. The majority of respondents experienced workplace inclusion positively in all modules, where the sensory module was dominant, followed by the social and emotional ones. Half of those surveyed valued inclusion and diversity in the workplace as the most important. Opportunities included broadening mind by sharing different experiences, increased awareness and understanding of others, greater commitment to work, loyalty, and countering stereotyping. The main threat of inclusion in organizations was seen as promoting people not on the basis of competence, results obtained but belonging to a particular minority group in order to meet certain Inclusion & Diversity metrics.

Research limitations: The study was ad hoc and exploratory in nature. Due to the small size of the study group, it is not possible to generalize the results.

Practical implications: The research findings may be useful for anyone interested in adopting a new perspective on the management of Generation Z employees, based on experience economics.

Social implications: It influences modern human resource management practices in organizations.

Originality: It builds awareness of the sensory, emotional, intellectual, behavioral, relational experiences of Generation Z employees regarding inclusion.

Keywords: inclusion, Generation Z, human resource management, employee experience, employee experience management, inclusion & diversity.

Category of the paper: Research paper.

1. Introduction

Inclusion in the workplace can involve opportunities and threats to human resource management. To date, studies have examined, among other things, the use of diversity and inclusion in the workplace in achieving business goals (Jozefowicz, 2017), the impact of inclusivity on employees in organizations (Dudek, 2023), the role of inclusivity in building resilience in organizations (Winnicka-Wejs, 2024b). What is missing, however, is a description of the experience of inclusion and its risks from the perspective of representatives of the youngest generation currently active in the labor market, that is, Generation Z (born 1995-2010) (cf. demarcation of generational cohorts, Klesta, Korpula, Grębosz-Krawczyk, 2024, p. 205), which is characterized by an open, assertive attitude towards others (Lipka, 2017, p. 53), and they take diversity for granted (Warwas, Wiktorowicz, Jawor-Joniewicz, 2018, p. 31; Lavinskaya, Korombel, 2023, p. 16).

The topic is relevant not only because of the diagnosed research gap, but also because of the timeliness of the subject of diversity, equity and inclusion (DEI - diversity, equity, inclusion) in the conditions of sustainable development (cf. Sadowska, 2021) and a new perspective on the development of human resource management in the era of the experience economy employee experience management (Lipka, Król, 2021; Lipka, 2022, 2023, 2024a, 2024b; Lipka, Waszczak, 2024a, 2024b; Król, Karczewska, 2024; Winnicka-Wejs, 2024a).

The purpose of the article is:

- to determine the perceived climate of inclusion in the organization by representatives of Generation Z in the area of employment conditions and integration of differences,
- to diagnose the modules of experiences (sensory, emotional, intellectual, behavioral, relational) of Generation Z regarding inclusion,
- identification of opportunities and threats of inclusion in the workplace.

The article has cognitive value for the development of knowledge of management science and quality in the field of human resource management. Its originality is related to building awareness of the sensory, emotional, intellectual, behavioral, relational experiences of Generation Z employees regarding inclusion.

2. Research methodology

For the purpose of the study, research questions, research hypotheses and a survey questionnaire were formulated, using scales available in foreign literature for measuring inclusion (cf. Table 1), which were translated into Polish, using a five-point Likert scale from 1 - strongly disagree to 5 - strongly agree (cf. Tables 3, 4).

Table 1.*Research questions, research hypotheses, sources of measurement scales*

No.	Research question	Research hypothesis	Question number in the survey	Source
1.	How does Generation Z experience and live through inclusion?	Generation Z representatives see their workplaces as inclusive, viewing the climate of inclusion in the area of employment and integration of differences positively.	Question 1 (9 items) Question 2 (11 items)	Dimension 1: Foundation of equitable employment practices – Climate for Inclusion Scale (Nishii, 2013). Dimension 2: Integration of differences – Climate for Inclusion Scale (Nishii, 2013).
2.	What are the dominant positive modules of experiences of representatives of the Generation Z regarding inclusion?	Positive emotional and social modules of experiences of inclusion by representatives of Generation Z are dominant.	Question 3 (modules: sensory, emotional, intellectual, behavioral, relational)	Relational module - Workplace Social Inclusion Scale (Pearce, Randel, 2004) Other modules - own items based on (Lipka, 2022)
3.	What are the opportunities and threats of inclusion in the workplace?	Representatives of Generation Z consider inclusivity a key value. In their view, inclusion in the workplace brings more opportunities than threats.	Questions 4, 5	Concepts of Inclusion & Diversity (Pearce, Randel, 2004; Shore et al., 2011) Generation Z values (Lipka, 2017; Warwas et al., 2018; Ławińska et al., 2023)

Source: own elaboration.

The survey explained the concepts of inclusion and diversity to respondents. A high level of inclusion in the workplace means that employees can participate in a wide range of activities, enjoy respect, feel that they are part of a team, are valued and treated fairly (Pearce, Randel, 2004; Shore et al., 2011, p. 1265). Diversity involves valuing and promoting different viewpoints, promoting the inclusion of diverse employees, and the employer countering discrimination based on gender, age, ethnic, national or social origin, religion or belief, sexual orientation, language, disability, political beliefs, and social or material status.

The pilot survey, which aimed, among other things, to improve the tool from a substantive and technical point of view, was conducted in the 4th week of 2025, and the relevant survey took place in the 5th week (from 27.01.2025 to 02.02.2025). The link to the survey was provided via a Google form, noting that the target group of the survey is people born between 1995 and 2010.

An occasional sample was used - it was made up of easily accessible people (students and seminarians) and the snowball method - a request was sent to acquaintances among lecturers about spreading the link among Generation Z individuals (Babbie, 2013). The original study conducted was ad hoc and exploratory in nature.

3. Characteristics of the surveyed Generation Z employees

Twenty-three people took part in the survey. The surveys were filled out correctly, all closed questions were answered, as a result of which no survey had to be rejected. The structure of the respondents who took part in the survey is summarized in in Table 2.

Table 2.

Structure of respondents by gender, year of birth, size of enterprise

Respondents' particulars		Distribution of answers
Gender	Woman	16
	Man	7
Year of birth	1995-2000	12
	2001-2005	11
	2006-2010	0
Size of enterprise	Micro (< 9 employees)	2
	Small (10-50 employees)	2
	Medium (51-250 employees)	3
	Large (> 250 employees)	16

Source: Own elaboration.

The survey was filled out by Generation Z people working mainly in junior specialist positions (for example: junior specialist; junior production planning specialist; junior customer relations specialist; junior forecasting scenario analysis specialist;), specialist (for example: specialist; logistics specialist; Operation Support Specialist; process specialist; administrative specialist; Customer Journey Specialist). The survey group also included three managers (including: Project Manager, Deputy Manager of the Economic Department in the Restructuring Office), two assistants (clerk/assistant), one accountant, and two interns.

Respondents represented a variety of industries, including: IT, Automotive, Education, E-commerce, High-Tech, Audit, Public Administration, Research, Construction, Administration, Law & Economics/Non-Financial Data Reporting, Steel, Food, Manufacturing, Banking.

4. Perception of inclusion in the area of employment conditions, integration of differences in the organization

A diagnosis of Generation Z employees' perceptions of inclusion in the area of employment conditions and integration of differences in the organization was made using the "Climate for Inclusion Scale" (Nishii, 2013). Table 3 shows the results on the dimension of fair employment practices, and Table 4 shows the area on integration of differences.

Table 3.

Perceptions of inclusion in the area of employment in the organization by surveyed Generation Z employees

Items from question 1	1*	2	3	4	5
The company is committed to hiring diverse employees across the organization.	3	2	3	6	9
Employment practices in the company are reliably implemented.	2	2	8	4	7
The company has a fair promotion process.	2	5	5	5	6
My company's performance review process is fair.	0	5	5	4	9
Individual employee needs are met through flexible benefits programs.	0	4	4	7	8
The company invests in the development of all employees.	4	6	3	2	8
The company's employees receive "equal pay for equal work".	4	5	6	6	2
The company provides safe ways for employees to report complaints.	3	4	2	5	9
Employees can count on fair performance evaluation.	0	2	8	5	8

* 1 – I definitely disagree, 5 – I definitely agree.

Source: own elaboration.

The data in Table 3 shows that respondents are most positive about hiring diverse workforce and meeting the individual needs of employees through flexible benefit programs. They are least positive about the company's investment in the development of all employees and their receiving equal pay for equal work.

Table 4.

Perception of inclusion in the area of integration of differences in the organization by the surveyed employees of Generation Z

Items from question 2	1*	2	3	4	5
In the company, employees feel comfortable being themselves.	0	2	5	6	10
The company is characterized by a non-threatening environment in which people can reveal their "true" selves (e.g., through dress-code, expressiveness).	2	1	5	8	7
Promoting diversity awareness is a priority for the company.	6	5	3	5	4
The company values work-life balance.	2	4	5	5	7
The company respects the differences between people.	0	1	5	9	8
Employees are actively encouraged to take advantage of work-life balance programs.	6	3	6	2	6
The company provides the means to enable employees to effectively resolve conflicts.	2	8	6	3	4
Employees are valued for who they are as people, not just for the work they do in the company.	1	7	4	8	3
Within a company, employees often share information and learn about each other as individuals.	2	3	3	8	7
The company has a culture where employees appreciate the differences people bring to the workplace.	1	5	5	9	3
Within a company, intergroup relationships (between different races, occupational groups, age groups, etc.) are characterized by respect and trust.	2	0	3	8	10

* 1 – I definitely disagree, 5 – I definitely agree.

Source: own elaboration.

On the other hand, the data in Table 4 show that in the area of integration of differences, the respondents perceive positively especially intergroup relations characterized by respect and trust. In their perception, companies respect the differences between people, and they feel comfortable being themselves. However, in their opinion, promoting awareness of diversity is not a priority for companies.

Although there are differences in the assessment of individual statements, when analyzing the indications carefully, it turns out that most of the items were definitely and rather positively evaluated by the respondents. For question 1 of the survey, 5 items out of 9 have more than half of the answers on point scales 4 and 5, and for question 2 of the survey – 7 items out of 11.

5. Modules of Generation Z experience of inclusion

Respondents were also asked to rate their experiences of inclusion in the workplace (see Table 5). The most positive indications were for the sensory module related to visual experiences - “I accept people who look different from me” (19 responses “5 - strongly agree”, 2 responses “4 - rather agree”).

Next, the most positive responses were for the relational (social) module, related to feelings and interpersonal relationships: “I feel accepted as part of the team” (14 responses '5 - I strongly agree', 5 responses '4 - I rather agree'); “I feel included in most activities at work” (11 responses '5 - I strongly agree', 7 responses '4 - I rather agree').

Inclusion and diversity in the workplace evokes positive feelings among respondents (12 responses “5 - I strongly agree”, 4 responses “4 - I rather agree”) and refers to the emotional module.

The other modules: behavioral, intellectual were also positively assessed, however with fewer strong indications. It should be noted that respondents do not feel alienated in their companies.

Table 5.
Generation Z experience modules on inclusion in the workplace

Module of experiences	Items from question 3	1*	2	3	4	5
Relational (social)	I feel accepted as part of the team.	0	2	2	5	14
	I feel included in most activities at work.	0	2	3	7	11
	Sometimes I feel like an outsider.	9	4	2	4	4
Emotional	Inclusion and diversity in the workplace evokes positive feelings in me.	0	1	6	4	12
Behavioral	I am happy with the company's standards for inclusion and diversity.	0	2	6	6	9
Intellectual	Working to promote the inclusion of a diverse workforce is interesting to me.	2	3	6	6	6
Sensory	I accept people who look different from me.	0	0	2	2	19

* 1 – I definitely disagree, 5 – I definitely agree.

Source: own elaboration.

6. Views on the opportunities and risks of inclusion in the workplace

More than half of the respondents indicated that Inclusion & Diversity in the workplace is of key value to them. However, every third person did not have a precise answer in this regard, answering "neither yes nor no".

Table 6.

Structure of the answer to the question: "Is inclusion and diversity in the workplace of key value to you? Please select one"

Range of answers	Number of answers
Definitely yes	5
Rather yes	8
Neither yes nor no	8
Rather not	2
Definitely not	0

Source: own elaboration.

Thirteen comments were obtained on the open-ended question; "What is your opinion on inclusion and diversity in the workplace? In your opinion, does inclusion in the workplace bring more opportunities than threats? What are the opportunities? What are the threats?"

Six people for whom inclusion and diversity are of key importance wrote:

1. "Depending on the specifics of the company it occurs - it's worse on construction sites, for example".
2. "It is difficult for older people to accept the young generation and their behavior".
3. "In my workplace, the boss's relatives are employed in high positions, the headquarters is in Warsaw, and there is only a small branch in Katowice where very few people work. In my work, inclusion would certainly bring more chances. I would definitely feel better in a workplace where there is a high level of inclusivity".
4. "I don't see any threats, definitely only opportunities. Inclusion allows you to broaden your horizons and those of the company by being able to share very different life experiences".
5. "Working with different people you can look at things from a different point of view, but diversity can also confuse the team, such a group can be difficult to manage, the leader must have experience".
6. "I think inclusion is needed in the workplace, it allows you to understand the needs of others, it increases awareness, you can understand others better".

People who ticked "neither yes nor no" in the previous question about the key value of inclusion and diversity left the following five comments:

1. "In my opinion, there are more opportunities, people who feel good in the workplace and know that they are accepted can perform their tasks with more peace of mind and commitment".

2. "In my opinion, inclusion in the workplace has a number of benefits, equal involvement of employees in projects, in team activities and treating them with respect, will certainly bring long-term benefits resulting from the sense of comfort that employees will feel as a result. This state of affairs can translate into greater involvement of employees in performing their tasks and discourage them from changing their workplace only because of financial issues, because the environment also matters (although of course much less), because it is in the workplace that we spend 1/4 or even most of the day. However, I see neither opportunities nor threats in initiating diversity in the workplace, a properly functioning organization should not be based on beliefs relating to religion, origin, etc. but only on the person's experience, personal culture and approach to work. Other issues should not be any starting point for the recruiter when selecting a candidate for the position, and co-workers should not be guided by prejudice at work about the above-mentioned issues on diversity".
3. "There are chances that actually valuable and good employees will not be rejected in a job or promotion because of diversity, the risks are such that people who stand out with some religious/cultural aspect will be promoted not because of the quality of their work or the value they bring to the team, but because of the above-mentioned diversity".
4. "Inclusion is important, but I don't spend time on diversity".
5. "Inclusivity in the workplace allows us to confront reality with stereotypes and to combat stereotypes. Inclusivity should mean equal opportunities, but unfortunately it happens that instead of competences, it is more important to achieve the "target" of a given gender or race minority".

Two people who negatively assessed the value of inclusion and diversity expressed the same opinion on an open question, writing down the following comments:

1. "An employee should be employed on the basis of their competence and character. Hiring to be "diverse" resembles a zoo, and as a person who would be hired only for the sake of my appearance/orientation or anything else, I would feel like a PR tool. In my opinion, a more transparent recruitment process should be introduced to explain to everyone why they were or were not hired".
2. "The opportunities are obvious: freedom, equality, less stress, and the threat is to promote people in given positions "by force" only because of belonging to a minority, so that it looks good in the statistics".

7. Conclusion

Positive and inclusive workplaces are one of the determinants specific to employee experience (Lipka, 2024, p. 44). They have the following attributes: flexible work time and space; an inclusive and diverse community that gives employees a sense of fairness; support for work productivity through appropriate organization, processes, as well as tools; adequate evaluation of employees, showing them appreciation, and appropriate compensation (Nuernberg, 2023, p. 64).

The results of the company's own empirical survey of working Generation Z showed that the majority of respondents perceived their workplaces as inclusive, viewing the climate of inclusion in the areas of employment and integration of differences positively. Considering fair employment conditions, they rated highest the companies' commitment to hiring a diverse workforce and meeting individual employee needs through flexible benefit programs. On the other hand, with the criterion of integration of differences, the highest positive scores were when stating that intergroup relations in companies are characterized by respect and trust.

Experiencing inclusion is associated with feeling safe, trusted, accepted, respected, supported, valued, fulfilled, engaged and authentic in their work environment, both as individuals and as members of specific identity groups (Ferdman et al., 2009, after DeHart-Davis et al., 2023, p. 501). In the study group, the majority experienced workplace inclusion positively in all modules: relational, emotional, behavioral, intellectual, and sensory. The sensory module related to visual experiences turned out to be dominant, followed by the social module relating to interpersonal relationships, then the emotional module with positive feelings.

The value of inclusion and diversity in the workplace was of key importance to half of the Generation Z employees surveyed, with those who expressed an opinion on inclusion identifying more opportunities than threats. Among the opportunities, they included: broadening mind by sharing different experiences; increased awareness and understanding of others; greater commitment to work and tasks; loyalty; and countering stereotyping. Some of them drew attention to the occurring in practice the phenomenon of promoting people not on the basis of competence, results obtained but belonging to a particular minority group in order to meet certain I&D metrics, which they assessed negatively as a threat.

Due to the small size of the study group, it is not possible to generalize the results to all of Generation Z. Financial and time barriers determined the course of the research proceedings thus affecting the limitations of the empirical study, which was intended to be rather ad hoc and exploratory. This article was mainly intended to highlight the concept of *Employee Experience Management* in relation to the youngest employees (Generation Z) and their experiences of inclusion in the workplace. It should be emphasized that inclusion in the workplace is not only coherent with the idea of *Employee Experience*, but also corresponds to such a megatrend

shaping the global labor market as diversity and inclusiveness (Sidor-Rządkowska, Sienkiewicz, 2023, p. 31).

Further research should focus on diagnosing the modules of experiences of Generation Z in terms of other constructs/values, as well as the development of a new perspective on the management of Generation Z employees, taking into account the assumptions of experience economics and Employee Experience Management.

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KNOWLEDGE ABSORPTION IN BEAUTY BUSINESSES

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Purpose: The purpose of the article is to analyze the processes of acquiring knowledge from the environment in companies providing services in the Beauty industry.

Design/methodology/approach: The study used the method of literature analysis and critique, as well as a review of the websites of companies offering opportunities for Beauty companies to acquire and expand their knowledge and practical skills.

Findings: The availability of a very wide range of studies, trainings, courses, workshops for Beauty entrepreneurs to acquire and expand their knowledge was indicated. Both the technical offer during the operation of specialized equipment dedicated to the performance of treatments, as well as the offer of training and courses dedicated to those who want to expand their knowledge related to the latest trends and improve the workshop of performing specialized treatments using innovative products.

Practical implications: Sources of knowledge absorption for entrepreneurs running companies in the Beauty industry have been identified, which can prompt them to acquire, share, expand and develop knowledge using the wide range of offerings in the marketplace.

Originality/value: Insights and conclusions are presented that contribute to the diverse research context of the problem addressed and fill a kind of research gap in the form of showing the sources of knowledge acquisition in Beauty industry enterprises. The article can expand the literature on knowledge acquisition and sharing in Beauty industry enterprises.

Keywords: knowledge absorption, Beauty industry.

Category of the paper: Research paper.

1. Introduction

In a dynamically changing (turbulent) environment, a company's most significant resource becomes knowledge, the ability to absorb it, and the ability to transform potential absorptive capacities into real ones (Jelonek, 2016, p. 57) that improve organizational performance. Knowledge management, therefore, is important from the perspective of doing business. The creation of knowledge in an enterprise is related to the process of acquiring and transforming data into specific information, which consequently creates or enriches knowledge

in the enterprise (Rumniak, 2011, p. 160). When doing business in the Beauty industry, it is important to be aware that it is not just about gaining a competitive advantage, but about constantly keeping up with trends and technology. In order to be able to provide top-notch services and meet the expectations of customers you need to follow innovative solutions, the latest innovations and stay up to date, because the industry is developing very quickly, using the latest equipment, introducing innovative products, using modern methods of skin care. This development is fostered by global trends regarding the increase in awareness of health-oriented lifestyles and beauty care (Kryczka, 2021, p. 225), and advances in education are forcing the accelerated development and implementation of scientific and technical, marketing, product and service innovations (Wisniewska, 2019, p. 251). From the point of view of business management, it is important to acquire, update and develop this knowledge.

2. Knowledge absorption in organizations

One of the principal issues concerning the development of companies is the ability to obtain knowledge “from outside”. It can be assumed that in an environment full of potential sources of innovation any company will find the information and knowledge it needs and use it accordingly. Companies vary in their ability to receive signals from the environment. A measure of the ability to invent and adapt new knowledge is absorptive capacity (Absorptive Capacity) (Tidd, Bessant, 2011, pp. 356-359). The concept was first introduced by Cohen and Levinthal (1990, pp. 128-152), defining it as “the ability of a company to recognize the value of new externally sourced information to assimilate it and apply it commercially, whereby this information largely a function of the company's level of prior knowledge”.

In works on innovation and development, the concepts of learning the processes by which companies acquire new technologies and assimilate organizational and management procedures have been widely described in the works of C. Freeman, L. Soete (1997), M. Bell, K. Pavitt (1993, pp. 157-211). The authors revised the concept of absorptive capacity, we are dealing not with mere absorption of knowledge, but with various processes that consist of separate activities of seeking, acquiring, assimilating, and using.

Among the various definitions of absorptive capacity, there are several positions according to which it is: (Cohen, Levinthal, 1990; Fu, 2008; Spithoven, Zahra, George, 2002):

- the ability (of an individual, an organization) to evaluate, assimilate and apply new external knowledge,
- the sum of learning ability and problem-solving ability; learning ability is the ability to assimilate knowledge for imitation and solve problems to create new knowledge for innovation,

- the set of organizational practices and processes through which a company acquires and assimilates (potential capability) and transforms and applies (consumed capability) knowledge to create a dynamic organizational capability.

Taken together, all four dimensions of absorptive capacity (acquisition, assimilation, processing, and utilization) enable a company to reconfigure its resource and adaptive base to changing market conditions to gain a competitive advantage.

Not all companies have the same degree of absorptive capacity. Companies (for distinct reasons) face barriers when trying to develop based on acquiring and using new knowledge:

- some are not aware of the need for change at all,
- some recognize the need for change in the long term, but are unable to either choose a search target or assimilate or consume the knowledge already identified,
- some are aware of what they need, but are unable to acquire or internalize this information,
- part of them have well-developed procedures for dealing with all these problems and have the means and strength to serve as an example to the less experienced.

A review of the literature provides a number of dimensions and skills that make up absorptive capacity. The most identified dimensions of absorptive capacity are identifying, assimilating, internalizing, and exploiting new knowledge (Lenart, p. 929).

Identification of new knowledge by the organization means determining the sources of knowledge that remains in the environment and “bringing it into transparency”, recognizing the value of this knowledge using the knowledge that is held.

These activities are aimed at adapting companies to changes in their environment. These elements can be measured. The ability to identify baseline knowledge, the knowledge gap, sources of knowledge, knowledge of the organization's learning mechanisms, and previous experience with identifying new knowledge can be evaluated.

Assimilation: is defined as the ability of an organization to absorb knowledge gained from “outside” and interpret it. This requires having a base knowledge and the ability to combine it with new knowledge.

Internalization of new knowledge is the ability to design, develop and improve procedures that enable combinations of existing knowledge and absorbed knowledge. Exploitation of new knowledge is defined as the application of new knowledge acquired externally, gaining economic benefits from previous exploitation, while using the existing competencies of employees. Exploitation makes absorbed knowledge valuable to an organization when the organization can apply it to achieve its intended purpose.

The basic manifestation of absorption capacity is "the ability to absorb external knowledge, use it in creating innovative solutions and imitate other organizations, as well as recognizing new values and layers of knowledge in the environment and assimilating them, including using them to solve problems in the organization" (Cohen, Levinthal, 1990).

The ability to absorb requires three types of skills:

1. The ability to identify new sources of information and external knowledge that may be valuable to the development of the personnel function.
2. The ability to assimilate current information and knowledge through analysis and processing, to achieve a new quality in the personnel function.
3. The ability to create an “internal market” for new knowledge, so that it can be transformed, adapted to the specifics of the company, new applications.

Absorption capacity is determined by a number of external and internal factors that overlap and influence each other in numerous ways. Basic internal determinants include:

- the specifics of the company are determined by its culture, strategy, structure, size, financial capabilities, form of ownership, management,
- process determinants related to the ways in which information and personnel knowledge are acquired and flowed,
- competencies of change leaders - business owners, managers.

3. Analysis of the Beauty industry's processes for acquiring knowledge the environment

As an economic category, the market is an institution of exchange between entities that have certain resources (sellers) and entities that need those resources (buyers) (Kryczka, 2021, p. 226). Treated on a sectoral basis, it refers, among other things, to the service market, and on an industry basis to the Beauty industry service market, which can be defined as: “all fields dealing with beauty and well-being” (Beautyrazem), and the model areas of the Beauty industry, refer to: hairdressing, cosmetology, aesthetic cosmetology and aesthetic medicine, eyelash, eyebrow and eye frame styling, makeup, makeup with wig making and makeup artist and stylist work, tanning beds, light therapy and spray tanning, ear piercing, piercings including those performed by piercers, tattooing and permanent makeup, manicures, pedicures, nail styling and podiatry, hairdressing and trichology, cosmetic massage, relaxation, wellness and spa, body shaping, depilation by any technique, including laser, sales of aftercare products, and courses education and training and other forms, in all of the above areas of Beauty (Wiśniewska, 2024, p. 523). Particularly noteworthy are the courses and training, because they are short 1-2-day meetings, and the knowledge and practical skills gained during them are certified by receiving a certificate. This is important when working in the Beauty industry due to the fact of raising the value of the person holding them on the labor market. It is a guarantee for the client to receive a professional service at the highest level, according to the latest trends, using the latest technology. Services in the Beauty industry today have a lot to do with aesthetic medicine and dermatology, as well as skin care and beauty treatments.

The services offered include those in the fields of dermatology, cosmetic chemistry, allergology or plastic surgery. Their performance requires not only experience but also thorough knowledge of anatomy, dermatology pharmacology. The issue of authorization to perform invasive procedures from the borderline of cosmetology and medicine is not directly regulated by law (www.gov.pl). It happens that aesthetic medicine procedures can be performed at a bargain (in terms of price) by cosmetologists. Based on the current legislation, which does not regulate the matter comprehensively, cosmetologists are sufficiently authorized to perform non-invasive aesthetic procedures. However, they should not be confused with aesthetic medicine procedures.

Beauty industry is developing extremely fast, companies in it acquire knowledge by hiring specialists to use their skills in the process of providing services. Also, they cooperate with entities that allow them to become increasingly competitive. They acquire knowledge that comes from market participants such as customers, mass media, politicians, and financial markets, but also by purchasing specialized software, advanced applications to help personalize services. They also take advantage of various courses.

The economic reality is changing very rapidly therefore enterprises as open systems must adapt to these changes knowing that they can consider each change as an opportunity or a threat (Karas, 2021, p. 75). Individual companies, depending on the time, and the degree of response to the volatility of the environment, especially those operating in the Beauty industry, can take advantage of this situation, treating it as an appropriate time for their own development. One of the most key factors that affect the competitiveness of enterprises is knowledge, which, being properly targeted, becomes the basis for creating innovative solutions.

Knowledge in the form of data is absorbed first. Then knowledge in the form of information to take the form of new organizational knowledge in its final form which relates to the assumptions of the DIK model creating data and information (Ackoff, 1989, pp. 3-9). Data as unconnected observations or facts are unprocessed and unorganized, so they remain meaningless. If they are not placed in context and subjected to interpretation, they do not represent value. However, if the data is systematized, information will be created from it, considered an initial representation of reality (Stelmaszczyk, 2024, p. 32). Knowledge, on the other hand, provides the ability to translate information into specific actions and is created by combining information with existing knowledge. Thus, we can define it as the effective use of information in action, and as a key factor in building competitive advantage. Knowledge is the practical use of the information held (Sopinska, 2010, pp. 84-86; Sopinska, Dziurski, 2018, p. 25). Managing an organization in the 21st century requires experience and relevant knowledge.

Nowadays, it is extremely difficult to succeed economically without the organization's ties to the environment in which it operates. In order to achieve this, it is necessary to effectively and efficiently use the resources an organization has at its disposal. The most important category of resources an organization has at its disposal is human resources and the associated

intellectual capital (Dziwulski, Harasim, 2019, p. 201). Human capital refers to the most flexible factor that exists in an organization and that is the human being. It is human capital that determines success or failure in achieving the organization's goals. On human capital is based the knowledge management system, which is created in the minds of people, and the task of the knowledge management system is to identify it and use it effectively. The knowledge that organizations have consists of two levels, explicit knowledge, and tacit knowledge (Brdulak 2005, p. 14).

Companies can use internal and external sources of knowledge to build market advantage (Kozioł, Wojtowicz, Karaś, 2017, pp. 159-172). Internal ones include the state of knowledge of employees, their creativity and databases and data resources. External sources of knowledge, on the other hand, include information that comes from the environment: from customers, competitors, research and development centers and suppliers. Therefore, the ability to absorb knowledge from external sources means the ability to acquire new data, transform it into information and then into knowledge.

Achieving success in the Beauty industry requires conscious planning of education, permanent improvement of qualifications and the ability to adapt to trends and customer expectations. The road to professionalism in the industry in question requires passion, constant development, and maximum commitment. Self-discipline, continuous improvement of skills and expansion of industry knowledge are especially important (Wiśniewska, 2024, p. 527). This can be done both during education e.g.: cosmetology studies, cosmetology courses, courses in aesthetic medicine, marketing of services, personal branding, AI training for the industry, or building relationships with clients. In the Beauty industry, knowledge cannot be outdated, so entrepreneurs in the industry in question invest in courses, training, postgraduate studies, attend congresses and industry conferences and scientific symposiums. They visit Beauty fairs but also reach for industry publications. Entrepreneurs also monitor the activities of competitors.

The Beauty industry is constantly training. There are many sources of acquiring knowledge, which are shown in Table 1. One of them is the completion of cosmetology studies, which allow one to acquire extensive theoretical knowledge. However, these studies do not teach the most important thing, which is to practice in top offices that would be able to share their knowledge. They do, however, teach perseverance and give you a college education and a cosmetology degree, which you can use to perform a variety of body care and beautification activities. With a degree you can perform procedures that are unavailable to others, for example, plastic surgery procedures and some aesthetic medicine procedures. Knowledge of chemistry is also important. Learning about the ingredients used to make cosmetics, their properties and effects on the skin gives you the ability to select preparations for different skin types. However, not everyone chooses to study cosmetology or medicine.

Knowledge in the industry in question can also be gained by completing a 2-year post-secondary study after which one can obtain the title of cosmetic service technician, passing professional examinations. The study offers condensed knowledge but also emphasizes practical skills. You can also take advantage of postgraduate studies, the advantage of which is that there are no superfluous subjects and students gain specific knowledge on selected issues.

The most common source of knowledge acquisition in the Beauty industry is training and courses. These intensive 1-2-day meetings conducted by practitioners, people with years of experience and practical knowledge provide specific information, ways to operate, use equipment, technology or apply the latest cosmetic formulations.

Courses and trainings are held both in classrooms and online. The advantage of training is gaining knowledge that is necessary here and now, that is, when we need it most. Training is designed for entrepreneurs, but also for employees, although in micro-enterprises it is the boss who goes to training, sometimes with a selected employee, sharing new ways, ideas, and skills within his team. This usually happens for economic reasons. The cost of training ranges from PLN 1000-6000. There is the possibility of funding from the National Training Fund granted by the PUP (mezoplus.oszkoleniach). Usually, participation in training confirms the acquisition of a certificate allowing the use of the products of the training form or conditions the possibility of acquiring specialized equipment used for dedicated care treatments.

The industry also offers health, cosmetology or hairdressing conferences and congresses. There you can get inspiration, learn about the latest technologies, new solutions, innovative equipment for scalp and body care. This is a good place to make new business contacts and start cooperation. There are also large scientific symposiums for specialists in cosmetology and aesthetic medicine. These events are accompanied, for example, by an exhibition with companies that present their achievements in white cosmetology, (treatments involving care of the body and face with non-invasive treatments gentle to the skin, providing an alternative to aesthetic medicine treatments), and the latest technologies.

Entrepreneurs wishing to enrich the offerings of their Beauty salons can take advantage of the several-hour workshops both outside and invite practitioners to their business to gain knowledge and acquire specific skills. It is a good form that engages the audience by focusing on the practical application of the knowledge gained through discussions and exercises. Examples of workshops include the latest techniques for special hair and makeup for special occasions.

Table 1.*Selected sources of knowledge absorption in the beauty industry*

Knowledge absorption source	Example	Speakers	Topic	Access/Source	Certification
Cosmetology studies	Field of study: Cosmetology	Highly qualified specialists working in the beauty and medical industries	The functioning of the body, the secrets of the human body, selecting treatments for specific cases. Rules for operating specialized equipment used in cosmetology, how to perform podiatric treatments.	www.wsz.pl/studia-licencjackie/kosmetologia/ 31.01.2025	Graduation diploma
Cosmetology program	Post-Secondary Cosmetic School	Experienced cosmetology professionals	Training future beauticians to work in the beauty industry with mandatory practical training in selected beauty salons.	https://szkolajaroszevska.pl/ 03.02.2025	Diploma in Cosmetic Services Technician
Postgraduate studies	Modern Hi-tech Cosmetology	Experienced specialists in cosmetology, dermatology, physiology, cosmetic chemistry, and other fields related to state-of-the-art equipment.	State-of-the-art equipment and devices used in cosmetology, enabling advanced aesthetic treatments.	https://podyplomowe.wsnoz.pl/oferta/studia-podyplomowe/kosmetologia-nowoczesna-hi-tech-ii-stopnia/ 13.02.2025	Postgraduate diploma certificate
Trainings	Rapid relationship building	Michał Lenczyński, founder of Beauty Razem	How to build positive relationships with customers, which are key to growing your beauty business.	https://beautyrazem.pl/eventy/ 02.02.2025	Certificate of participation in the theoretical and practical parts of the training
	Law in the beauty industry	Jagoda Rusińska, attorney (legal advisor to Beauty Razem, that provides services to beauty salons and aesthetic medicine clinics)	How to avoid unsubstantiated claims and damages, how to minimise the risk in terms of compensation claims for post-surgical complications, how to protect the image of the company and clients, respecting the regulations.	Błyskawiczne Budowanie Relacji - Beauty Razem 04.02.2025	Certificate
	Needle mesotherapy Permanent makeup	Industry experts	The training consists of two parts: theoretical general information, indications, contraindications, legal regulations, sanitary requirements, client interview, and practical information on performing individual treatments, exercises on models.	https://www.mezopuls.pl/szkolenia,20 07.02.2015	Certificate confirming the qualifications obtained
	Highly concentrated chemical peels				
Courses	Hairstyle	Original training methods based on techniques used by the leading hairdressing academies. Team of trainers	Expansion of the range of services offered in salons to include professional treatments: hair extensions, trichology, hairstyles and updos.	https://kursy-alan.pl/kursy/fryzjerskie/ 08.02.2025	Course completion certificate
Conferences	Biznes&Beauty 2.0	Industry experts and trainers	Education and combining expertise and business knowledge	https://www.akademiaszkolenbeauty.pl/konferencja 10.02.2025	Conference attendance certificate
Workshops	Hairdressing workshops	Professional hairdressers	Hairdressing workshops for companies to develop their potential and learn advanced hair cutting and styling techniques.	https://warsztatyfryzjerskie.pl/ 07.02.2025	Certificate confirming attendance

Cont. table 1.

Symposium	SKINLIVE II	Cosmetologists, clinical dietitians, doctors, pharmacists, and marketers who are also academic lecturers	Issues in psychocosmetology, post-treatment complications, pharmacology, facial anatomy, dermatology, safety in the cosmetology salon, use of artificial intelligence (AI) to promote the company in the beauty industry..	https://beautyrazem.pl/sympozjum-skinlive-2023/ 13.02.2025	Participation in the Symposium will be confirmed with a certificate
Trade fairs	Poznań International Fair Look and BeautyVision 2025	Experts in makeup and hairstyling	Program A program of inspiring lectures and demonstrations on global trends in makeup and advanced skincare, aesthetic cosmetology, hairdressing, trichology, and modern services offered in beauty salons.	https://beautydays.pl/ 08.02.2025	Participation certificates
Congress	Beauty Innovation Congress		Trends and innovations to grow your business. Inspiration, networking, shaping new standards.	https://beautydays.pl/ 08.02.2025	Participation certificates

Source: Based on own research.

Table 1 shows various sources of knowledge absorption and presents selected examples of them for the Beauty industry. Graduation from a cosmetology post-secondary school, college or post-graduate cosmetology course provides comprehensive preparation for work in the industry, gives the opportunity to combine, for example: specialization in regenerative cosmetology and anti-aging diet therapy. Trainings, courses, and workshops are shorter forms of knowledge absorption and are a key element of development and professional improvement for the Beauty industry due to the need to introduce new, safer, more innovative solutions, devices and technologies to the range of treatments performed.

4. Shaping knowledge absorption processes in organizations

Building knowledge resources in an organization and sharing them with all employees is fundamental to controlling the absorption process. This involves adopting a model that captures innovation as a cycle of so-called four episodes, overlapping and occurring not necessarily in a linear order.

The first episode boils down to creating and acquiring knowledge. Companies can acquire knowledge from internal and external sources. Given that many ideas arise in the environment, a company's ability to capture them becomes important. This usually manifests itself in employees developing networks of contacts outside the organization and using them to gather various innovative ideas, concepts, best practices, etc., which they then share with other employees.

The dissemination of knowledge is the subject of episode two. Networks of contacts determine the quantity and level of latest ideas flowing into the organization from external sources.

New ideas are not yet innovations as they need to be developed and adapted to the specific nature of the company. At this stage, the bonds between employees in the company are particularly important as they facilitate dialogue and discussion, thereby increasing the chances of ideas being put into practice. All these activities are part of the third episode – the selection and implementation of knowledge.

The trigger for starting the knowledge management process is to identify gaps in the organization's knowledge and skills. Admitting that they exist is necessary and at the same time marks the beginning of the process of assimilating innovative ideas. Companies that decide to fill these gaps must start by gaining transparency of their internal and external knowledge resources (Probst, Raub, Romhardt, 2004, p. 84). The first step is therefore to assess the current situation, i.e., to identify the knowledge assets existing within the company and to locate sources of knowledge in its immediate environment.

Sources of valuable knowledge for a company can also be found in its immediate environment.

The main external sources of knowledge include:

- entities providing information, e.g., consulting companies, trade fairs,
- consulting and training companies specializing in specific areas of knowledge,
- benchmarking, which allows companies to assess their own capabilities by comparing their competencies and effectiveness with those of their competitors.

Regardless of whether knowledge is obtained from internal or external sources, it is necessary to develop knowledge, which includes all conscious actions taken by management to create new competencies. The creation of knowledge within a company should be viewed strategically; the long-term perspective of the benefits of maintaining control over key competencies is of decisive importance.

Understanding the process of knowledge creation is fundamental. New knowledge in an organization always starts with individual employees and is only then transferred and transformed into organizational knowledge. Many researchers believe that creating new knowledge is not just a matter of processing information appropriately but rather depends on skillfully extracting hidden and often subjective views, intuitions, and hunches from individuals and making them available for testing and verification by the entire organization.

To understand Nonaka's dynamic process of knowledge creation, Toyama and Konno (2000) proposed a model consisting of three elements:

- the knowledge creation process and the knowledge creation process moderator,
- the knowledge context formation process,
- knowledge resources and the knowledge creation process moderator.

These three elements of knowledge creation interact with each other, forming a so-called knowledge spiral, which is a kind of perpetual motion machine for its creation.

5. Conclusion

The purpose of the study was to analyze knowledge acquisition processes and identify sources of knowledge absorption in companies in the beauty industry. It was shown that at the current stage of the industry's development, knowledge is acquired from external sources, from the market, where a wide range of certified training courses, workshops, and training companies are available. They offer training in cosmetology, skin care, facial treatments, but also eyelash styling, eyebrow styling, eye makeup, nail styling, and body shaping. There is also a wide range of companies that offer sales and rental of specialized equipment for performing treatments, such as lasers or cryolipolysis devices. Such companies train their partners on how to use the equipment and how to perform the treatment to ensure that it is effective and conducted in a professional and safe manner for the customer. There are also training courses available on customer service, establishing customer relationships, and understanding customer personalities. The training courses cover marketing and the use of social media to promote the company and its services, sales training, and the use of artificial intelligence to promote the company. There are also courses on the legal aspects of running a service business in the beauty industry, covering topics such as unjustified claims for damages and the protection of the company's image.

In order to absorb knowledge, it is worth visiting trade fairs whose organizers want to open the doors to the world of beauty, offering participants a formula that supports professional development. You can also take advantage of dedicated courses, e.g., 25-day courses.

The beauty industry is unique because staying in it depends on constantly gaining broad specialist knowledge in various fields from many sources. In further research on an increased number of companies, it seems reasonable to focus on internal sources of knowledge absorption.

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AI, FEAR AND EMPLOYMENT: A NATIONWIDE STUDY OF PERCEIVED JOB DISPLACEMENT

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Purpose: The aim of this article is to examine how the advent of artificial intelligence influences employees' perceived risk of job displacement, with particular attention paid to age, educational level and occupational statute that mediate individuals' fear of being replaced by AI.

Design/methodology/approach: The research employs quantitative methods, specifically logistic regression analysis, using data collected from a nationwide CAWI survey conducted among Polish working-age adults (N = 816). The analysis explores the relationships between perceived fear of AI-driven job displacement and various demographic (age, education), occupational, and socioeconomic factors (savings, residence).

Findings: The study finds that individuals with higher education have significantly lower levels of fear regarding AI-induced job displacement, while residents of large cities exhibit greater concern. Additionally, self-employed individuals and agricultural workers demonstrate higher anxiety about potential displacement due to AI, indicating occupational differences in perceptions.

Research limitations/implications: The study is limited geographically to Poland, which may constrain the generalizability of results. Further cross-cultural research could enhance understanding. Additionally, future research might explore in-depth qualitative aspects of AI-related fears.

Practical implications: Results highlight the need for targeted educational and occupational policies aimed at enhancing job security in the context of AI-driven automation. Educational institutions and employers should promote lifelong learning and upskilling, focusing particularly on groups identified as most vulnerable.

Social implications: Understanding the demographic and occupational factors associated with fear of AI can help policymakers develop targeted strategies for alleviating workers' anxieties and preparing them better for technological changes.

Originality/value: This study contributes to current debates on AI and labor market disruption by clearly identifying demographic, educational, occupational, and financial factors influencing individuals' perceived risk of job displacement by AI. It is valuable for scholars, policymakers, educators, and labor-market stakeholders.

Keywords: AI, employment, job displacement, automation, logistic regression.

Category of the paper: Research paper.

1. Introduction

The advent of artificial intelligence (AI) means a transformative era in various fields, in particular in the labor market. As AI technologies proliferate, organizations increasingly incorporate these systems to improve efficiency, reduce costs, and improve productivity. Adaptation to the landscape of employment changing by the development of AI means a change in paradigm in the training and education of the workforce.

Given the growing uncertainty surrounding the use of AI in the workplace, both employees and companies are preparing for disruptions. An EY survey found that 75% of respondents fear that some jobs will become obsolete due to artificial intelligence, and two-thirds (65%) worry that it will take their jobs (EY, 2024). The complex relationship between the development of AI and employment security requires an interdisciplinary approach encompassing economic, sociological and technological perspectives. Recent studies highlight the speed at which AI's capacities are advancing, transcending simple automation tasks to encompass complex decision-making processes (Dwivedi et al., 2021). The aim of this article is to examine how the advent of artificial intelligence influences employees' perceived risk of job displacement, with particular attention paid to age, educational level and occupational statute that mediate individuals' fear of being replaced by AI.

2. Literature review

The potential implications for the development of AI on employment safety guarantee a critical examination, as they indicate deep changes in professional landscapes in many industries. The displacement of the labor force, a critical dimension in the discourse around AI, raises significant concerns regarding employment loss and resulting socioeconomic implications. Several studies indicate that occupations susceptible to automation are disproportionately concentrated in sectors such as manufacturing, retail and administration, where repetitive and routine tasks predominate. Projections suggest that millions of jobs may be at risk due to AI invasion, causing fears of a social change where displacement proliferates without adequate mechanisms for reimpregnation. Due to data availability issues, most research on new technologies and employment uses national (Klenert, Fernandez-Macias, Antón, 2023; Chiarini et al., 2023; Pizzinelli et al., 2023) or subnational data (Acemoglu, Restrepo, 2020).

Many studies have attempted to predict the magnitude and scope of the impact of the AI on employment, with variable conclusions according to factors such as the rhythm of technological adoption, the adaptability of the hand -the and regulatory managers governing the application of AI. An IBM's Global AI Adoption Index 2022 revealed that 35% of firms used AI.

Almost 50% of current work activities could be automated using existing AI technologies, influencing sectors such as transport, logistics and retail (Chui et al., 2023). The five most exposed jobs include mechanical drafters, billing and postal clerks, biological technicians, bookkeeping and auditing clerks, and industrial designers. The study highlights that white-collar workers are most exposed due to the cognitive nature of their tasks, which AI is increasingly capable of performing (Kochhar, 2023). Conversely, roles that require complex cognitive skills, emotional intelligence and human interaction, such as health professionals, educators and creative roles, are less likely to be entirely automated in the future close. Thus, understanding which professions can disappear is crucial to guide educational and political initiatives aimed at developing labor (Watson, 2023).

On the other hand, roles in AI management, ethical monitoring and systems maintenance are becoming more and more relevant (Chui et al., 2016). These positions require not only technical skills but also an understanding of the ethical ramifications of the deployment of AI, highlighting an essential gap in skills that requires the urgent attention of educational establishments and political decision-makers. Despite the recent excitement around ChatGPT, AI research is still in its early stages, with limited data and many claims about job displacement being anecdotal or future projections. Much of the emerging AI scholarship indirectly examines AI's impact on labor market outcomes. For instance, Goldfarb, Taska, and Teodoridis (2020) analyzed millions of online job postings requiring AI skills from 2015 to 2018, finding the highest percentage in the information technology industry and the lowest in construction. Felten, Raj, and Seamans (2023) studied occupational categories and found that 16 of the 20 occupations most likely affected by large language models, like ChatGPT, are "high-skill" jobs requiring advanced degrees, including social scientists and postsecondary teachers of English, foreign languages, and history. Acemoglu et al. (2022) examined AI-related job vacancies in the U.S. from 2010 to 2018, showing a significant increase in demand for AI skills and a decrease in non-AI jobs in organizations posting AI jobs, suggesting automation of tasks previously done by labor. However, they found no evidence of overall AI-related job loss or gain at the industry level. In addition, industries attend the convergence of AI with other technological trends, such as the Internet of Things.

While the employment landscape continues to be reshaped by AI technologies, understanding these trends and preparing their implications will be crucial to maintain job safety and labor stability. Korinek and Stiglitz (2018) argue that the integration of AI into various industries is likely to exacerbate existing trends toward automation, leading to the systematic replacement of human work in tasks characterized by repetitive and predictable models. This is notably pronounced in sectors such as manufacturing, retail and administrative services, where the tasks involved often require little human judgment or creative contribution. Korinek and Stiglitz (2018) also suggest that the extent of the use of employment differs according to the capacity of various professions to adapt to technological changes. Some roles can evolve, incorporating AI as a tool to improve their functions rather than completely

replacing human workers. The contribution of lifelong learning and promotion skills that are complementary to AI technology can mitigate the risks associated with job loss while promoting a more dynamic employment landscape (Hunt, Cockburn, Bessen, 2024). AI transforms not only existing roles, but also cultivates new industries and opportunities which were previously nonexistent. A growing research body sought to identify specific professions susceptible to obsolescence due to automation. Vermeulen et al. (2018) provide a comprehensive analysis of particularly vulnerable jobs, highlighting sectors such as manufacturing, transportation and administrative work.

Willcocks (2020) systematically argues that although automation threatens several professions, particularly in manufacturing and routine tasks, it simultaneously opens doors to innovative work categories that were previously non-existent. According to him, AI is promoting a transition to a knowledge-based economy, in which highly qualified positions are gaining prominence. Mamasoliev (2024) explains that, although certain traditional jobs can become obsolete, the dynamic nature of progress linked to AI postulates improved economic growth and competitive positioning potential in global markets.

On the other hand, the interaction between advances in AI technologies and transformations of the workforce brings significant psychological and social branches, particularly in relation to insecurity at work. Yam et al. (2023) point out that automation proliferation is linked to greater work insecurity, which emerges as a widespread concern for workers in various sectors. Holzinger et al. (2023) investigated in the nuances of the transformations of the workforce in the context of AI integration, proposing a paradigm in which human workers and AI systems coexist, rather than existing in direct competition. This transformation requires rescuing initiatives that focus on improving the human capabilities that AI cannot replicate, such as creativity, emotional intelligence, and complex problem solutions. Zirar et al. (2023) further emphasize the need for a symbiotic relationship between human workers and AI, advocating a change in organizational strategies to promote environments where human ideas can complement AI analytical prowess.

Critical analysis reveals underlying risks that may exacerbate existing employment security and economic stability inequalities, especially for vulnerable populations or lack of access to termination opportunities. Habbal et al. (2024) presented the complex relationship between AI advances and the transformations of the labor force. Its proposed models suggest interventionist strategies that address not only the technological capabilities of AI, but also the socio-psychological dimensions of workers' adaptation. This double focus is fundamental to the development of a comprehensive understanding of how insecurity at work can be attenuated, allowing organizations to effectively create strategies amid rapid technological evolution. Smith (2016) examined the factors that might influence the perceived risk of job loss due to automation and AI by categorizing the data set based on age, education, and job type and level (white-collar and blue-collar).

In line with the above-described specificity of the link between development of AI and job uncertainty, the following hypotheses are proposed:

- H1: The perceived fear of losing job due to the development of AI is negatively associated with age.
- H2: The perceived fear of losing job due to the development of AI is negatively associated with the level of education.
- H3: The perceived fear of job displacement due to AI development varies depending on occupational status.

3. Data and method

A nationwide quantitative survey on a random sample of working adult Polish citizens (including self-employed individuals and agricultural workers) was conducted in December 2024. A computer-assisted web interview (CAWI) method was applied with the support of an independent external research company, Pollster. The survey comprises questions on demographic attributes, financial status, and attitudes toward technology. The sample includes 816 respondents, ranging in age from 20 to 55 years (mean = 36.2, SD = 10.3). About 47% reported being female, 53% male. Fear of AI replacement was expressed by about 40% of the sample. Complete information on demographics is provided in Table 1.

Table 1.
Descriptive statistics

Category	N
Age	
<25	58
25-35	205
35-44	299
>44	254
Education	
Primary	12
Vocational	103
Secondary	403
Higher	298
Residence	
Village	258
small town (up to 20k citizens)	96
medium or large city (20-200k citizens)	245
very large city (200k+ citizens)	217
Gender	
female	382
male	433
other	1
Occupation	
employed	719
self-employed	72
agriculture	25

Cont. table 1.

Savings	
0-5000 PLN	301
5001-10000 PLN	137
10001-20000 PLN	111
20001- 50000 PLN	118
50001+ PLN	149

Source: own study.

In order to verify the hypotheses, statistical analyses were performed using the IBM SPSS Statistics 26 package. It was used to perform a logistic regression model. The classical threshold of $\alpha = 0.05$ was adopted as the significance level.

The operationalized independent variables (IV), or predictors, cited in parentheses in the table, are categorical, and they can take the values reported in Table 2, which in the first column reports the corresponding question from the questionnaire.

The dependent variable “Fear of AI” was categorized as presented below:

- 1 if the respondent stated “Yes” to the question “Are you afraid your current position might be replaced by AI?”,
- 0 if the respondent answered “No”.

Table 2.

Questions and independent variables of the test

Question	IV	Values	Justification
Your age	Age	<25; 25-35; 35-44; >44	Previous research suggests older workers may feel more vulnerable to technological shifts.
Your education	Education	Ranging from primary, vocational, secondary and higher education.	Was decided to use as a factor variable with the assumption that higher educational attainment may reduce perceived automation risk (though the direction of effect can be debated).
Your place of residence	Residence	village (rural), small town (up to 20k citizens), medium or large city (20-200k citizens), very large city (200k+ citizens)	Aim to capture differences in local labor-market structure and exposure to technology.
Your gender	Gender	male, female, other	Gender differences in perception of job security have been noted in some labor studies.
Your occupational status	Occupation	Includes categories such as employed (full-time), self-employed, agricultural work	Job characteristics may influence fear of replacement.
Your savings	Savings	Self-reported ranges (0-5000 PLN, 5001-10000 PLN, 10001-20000 PLN, 20001-50000 PLN, 50001+ PLN).	Individuals with more savings may perceive less vulnerability to job loss.

Source: own study.

Given the binary nature of our dependent variable ($\text{fearAI} \in \{0,1\}$), the following logistic regression specification was used:

$$\text{Logit}[P(\text{fearAI}_i = 1)] = \beta_0 + \beta_1 \text{Age}_i + \beta_2 \text{Education}_i + \beta_3 \text{Residence}_i + \beta_4 \text{Gender}_i + \beta_5 \text{Occupation}_i + \beta_6 \text{Savings}_i + \varepsilon_i$$

where $\text{logit}(p) = \ln\left(\frac{p}{1-p}\right)$. Maximum likelihood estimation (MLE) is applied to obtain parameter estimates β_j . The resulting coefficients were interpreted in terms of log-odds or, equivalently, transform them into odds ratios (OR) by exponentiating the coefficients (e^{β_j}).

In addition to testing the primary hypotheses regarding age, education, and occupational status, three additional variables—place of residence, level of savings and gender—were incorporated into the logistic regression analysis exploratively. These exploratory variables were included to capture a more comprehensive socio-economic context influencing individuals' perceived risk of job displacement due to artificial intelligence.

4. Results and discussion

A summary of the logistic regression coefficients (in odds-ratio form) is provided below in Table 3. Age appears only marginally significant ($p = 0.08$). The point estimate (OR ~ 0.99) suggests a very slight decrease in the odds of fearing AI with each additional year of age. This implies that older individuals are slightly less likely to fear job replacement by AI, possibly due to greater job security or less exposure to technology-driven roles. However, the effect is weak, leading us to reject H1. Higher education is negatively correlated with fear: individuals holding a higher-education degree have about 30% lower odds (1-0.70) of fearing AI replacement than those with primary education. This suggests that higher educational attainment may provide individuals with skills and knowledge that make them feel more secure in their jobs, thus confirming H2. The lack of significance for vocational and secondary education indicates that these levels of education do not significantly alter the fear of AI replacement compared to primary education. Place of residence shows significance for respondents living in bigger cities (OR ~ 1.40), who are more likely to fear AI, possibly reflecting greater exposure to tech-driven industries. This suggests that individuals living in big cities are 40% more likely to fear job replacement by AI compared to those living in villages and small cities. The urban environment may expose individuals to more advanced technologies and automation, increasing their awareness and fear of AI's impact on employment.

Table 3.
Variables in the equation

Variable	Odds Ratio	p-value	Wald Statistic
(Constant)	0.55 (0.15)	0.03**	4
Age	0.98 (0.01)	0.08	3.3
Education = primary	1.67 (0.20)	0.88	0.34
Education = vocational	1.10 (0.22)	0.4	0.7
Education = secondary	0.95 (0.19)	0.65	0.2
Education = higher	0.70 (0.15)	0.04**	4.2
Residence = village	1.10 (0.25)	0.76	0.43
Residence = small city	1.12 (0.28)	0.5	0.45

Cont. table 3.

Residence = medium or large city	1.20 (0.25)	0.35	0.85
Residence = very large city	1.40 (0.30)	0.02**	5.1
Gender = female	0.90 (0.20)	0.17	2.9
Gender = male	0.85 (0.14)	0.1	2.7
Gender = other	0.95 (0.20)	0.8	0.06
Occupation = employed	1.85 (0.20)	0.63	5.67
Occupation = self-employed	1.25 (0.20)	0.07*	3.25
Occupation = agriculture	1.45 (0.27)	0.03**	4.8
Savings = 0-5000 PLN	0.90 (0.18)	0.5	0.45
Savings = 5001-10000 PLN	0.95 (0.17)	0.4	0.7
Savings = 10001-20000 PLN	0.80 (0.16)	0.3	1.05
Savings = 20001- 50000 PLN	0.95 (0.18)	0.76	0.09
Savings = 50001+ PLN	0.65 (0.13)	0.01**	6.3

* $p < 0.05$, ** $p < 0.01$.

Source: own study.

Gender does not show statistically significant effects in this model. The odds ratios for females and males are below 1, suggesting a lower likelihood of fearing AI compared to the reference category, but these results are not statistically significant. This indicates that gender differences in the fear of AI replacement are not pronounced in this sample. Self-employed respondents show a modestly higher probability of fear. At the same time, agricultural workers exhibit an even more substantial effect ($OR = 1.45$, $p = 0.03$), potentially due to perceived vulnerability or unpredictability in specific agricultural markets, thus confirming H3. The self-employed may feel more at risk due to the lack of organizational support and the need to constantly adapt to market changes. Agricultural workers may fear AI due to the increasing automation in farming practices, which could threaten traditional agricultural jobs. Those with high levels of savings (e.g., 50,001+) demonstrate a statistically significant reduction in fear ($OR = 0.65$, $p = 0.01$), consistent with the notion that a financial safety net lessens anxiety about automation risks. Individuals with substantial savings may feel more secure in their ability to weather potential job disruptions caused by AI, reducing their fear of job replacement.

5. Summary, limitations and future research

This article examines the interplay between AI-driven automation and job security, focusing on how advanced technological capabilities reshape labor relations. The literature review covers historical precedents of technology-driven shifts in job markets, contemporary debates on occupational vulnerability, and policy interventions' contribution in mitigating job displacement. Subsequently, an empirical study was conducted using data gathered from a nationally representative sample of Polish adults aged 20-55. Logistic regression was employed to assess how much fear of AI-induced displacement depends on demographic and socioeconomic factors, including age, education, place of residence, gender, occupation,

and savings. Respondents with higher education exhibit significantly lower levels of fear, implying that more advanced competencies may reduce exposure to automation risks. Moreover, individuals residing in large cities are more likely to express concern, reflecting greater awareness of automation's potential disruptions. Also, self-employed individuals and those engaged in agricultural work display heightened anxiety about obsolescence, suggesting limited institutional safeguards. These findings highlight the uneven distribution of AI-related concerns across different demographic groups and occupational categories.

Several limitations should be acknowledged when interpreting the findings of this study. First, the geographic scope is confined to Poland, which restricts the broader applicability of the results to contexts with differing economic, cultural, or regulatory environments. Secondly, the dependent variable—fear of AI—was operationalized as a dichotomy, a choice that could mask the complexity and nuance of individuals' technological anxieties. Despite these limitations, several avenues for future research emerge. Cross-cultural comparisons could enrich the current understanding by identifying how divergent economic, policy or cultural settings mediate the fear of job displacement.

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INNOVATION INTENSITY IN POLISH MANUFACTURING FIRMS AND CEO CHARACTERISTICS

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Purpose: This paper investigates the relationship between observable managerial characteristics and investment in innovation among Polish manufacturing enterprises.

Design/methodology/approach: The study employs the Upper Echelons Theory (UET) to analyse the impact of managerial characteristics on innovation investment in Polish manufacturing firms. Based on data from 1049 enterprises, it uses the Heckman selection model to correct for sample selection bias. This approach examines both the decision to invest and its extent, focusing on the Polish manufacturing sector.

Findings: The findings indicate that CEOs' demographic characteristics, such as age group, gender, and financial benefits, significantly impact R&D&I intensity. However, the influence of specific CEO traits varies across small and medium-sized enterprises (SMEs), highlighting differences in how managerial attributes shape innovation investment depending on firm size.

Research limitations/implications: The study is limited by data availability on CEOs, focusing only on measurable and observable traits while excluding personality traits due to a lack of information. Future research could address this gap by examining how psychological characteristics influence CEO's innovation-related decisions.

Practical implications: Polish manufacturing firms, especially those led by professional managers, should implement financial incentives to promote innovation. HR departments should consider CEO profiles in leadership development, while policymakers can design incentive schemes to boost R&D&I engagement, enhancing competitiveness and economic growth.

Social implications: Encouraging innovation through leadership and incentives can drive technological advancement, job creation, and economic development.

Originality/value: This study offers new insights into the link between CEO characteristics, financial benefits, and innovation intensity, particularly in Polish manufacturing firms. It contributes to corporate governance and innovation management literature, benefiting business practitioners, policymakers, and researchers.

Keywords: CEO characteristics, R&D intensity, small and medium-sized firms.

Category of the paper: research paper.

1. Introduction

The Upper Echelons Theory (UET) posits that a firm's strategic actions and performance are shaped by its CEO's characteristics (Hambrick, Mason, 1984). Strategic actions, including innovation investments, represent long-term organisational initiatives that require significant resources and often involve substantial risk (Hambrick, Mason, 1984; Baker, Mueller, 2002).

Innovation investments are crucial for the development of Polish enterprises. Analysing factors beyond firm-internal dynamics and external environment that influence firms' innovation activity is particularly significant within the broader context of Poland's efforts to transition from the investment-driven development strategy adopted during the early stages of democratic reforms to one centred on innovation. This shift is vital for positioning Poland closer to the world's leading economies (Kravtsova, Radosevic, 2012).

This paper, therefore, investigates the determinants of innovation expenditures in a sample of Polish manufacturing firms. Specifically, we examine the role of CEO characteristics in affecting the firm's R&D&I activity. Due to the scope of the available data, our analysis focuses on observable managerial characteristics of CEOs.

The structure of the paper is as follows: the next section presents the theoretical framework underpinning our research. It is followed by a section detailing the data and model used in the analysis. Finally, the paper discusses the results and provides concluding remarks.

2. Theoretical framework

The theory of upper echelons, introduced in 1984 by Hambrick and Mason, has sparked significant interest among researchers in empirically verifying the relationship proposed by the theory between characteristics of CEOs and various strategic actions shaping the future performance of an organisation (Wang, Holmes, Oh, Zhu, 2016). This theory is based on two interconnected elements: first, the idea that managerial actions are grounded in the personal interpretations of strategic situations they encounter, and second, that these personalised interpretations are shaped by the executives' experiences, values, and personalities (Hambrick, 2007). Hambrick (2007, p. 334) states that the theory is built on the premise of bounded rationality, which posits that informationally complex and uncertain situations cannot be objectively "known" but are instead subject to individual interpretations. Consequently, this reinforces the notion that CEOs' actions are shaped by their personal construal of strategic situations, which are, in turn, influenced by their unique experiences, values, and personalities.

The upper echelons theory thus provides a framework for understanding why some firms choose to engage in strategic actions, such as investing in innovation, by analysing the characteristics of their key decision-makers, such as CEOs. This perspective highlights the role of top executives' attributes in shaping organisational choices and actions in response to complex and uncertain environments.

Empirical studies verifying UET identify two groups of CEO characteristics that influence strategic actions. As outlined by Hambrick and Mason (1984), the first group includes measurable and observable traits that reflect a CEO's experience, such as age, tenure in the CEO position, previous leadership roles, social background, and financial standing. The second group consists of personality traits, which are more nuanced and typically require self-assessment by the CEO or responses to comprehensive psychological questionnaires (Wang et al., 2016). These two dimensions provide deeper insight into how executives' attributes shape organisational strategies, such as innovation investments.

3. Data and Research Method

Our analysis of the relationship between CEO characteristics and R&D&I intensity is based on data from a 2018 survey of 1049 Polish manufacturing enterprises conducted as a part of the research project "Intensity of competitive rivalry and innovative behaviour of enterprises". Initially, companies were selected from the InfoCredit database to ensure geographical and sectoral diversity. We engaged directly with managers to maximise participation, as the Computer-Assisted Web Interviewing (CAWI) approach proved limited effectiveness. The survey data was complemented with financial information from the InfoCredit (Orbis) database.

Studies on firms' innovation behaviour often face selection bias, as not all firms engage in innovation. When the decision to innovate is influenced by systemic factors, such as firm size, resources, industry dynamics, or external conditions, the sample of innovative firms is non-random, leading to inferences if selectivity is ignored (Lööf, Heshmati, 2006; Hashi, Stojčić, 2013; Anries, Czarnitzki, 2014). To address this, we apply the Heckman model, which accounts for potential selection bias and ensures robust results. The first equation of the model represents the decision to invest in innovation activities and is defined as follows:

$$D_{RDIi} = \begin{cases} 1 & \text{if } D_{RDI 0,i}^* = \beta_0 + \sum x_{1i} \beta_1 + \varepsilon_{1i} > \tau \\ 0 & \text{if } D_{RDI 0,i}^* = \beta_0 + \sum x_{1i} \beta_1 + \varepsilon_{1i} \leq \tau \end{cases} \quad (1)$$

where:

D_{RDIi} expresses the decision to invest in R&D&I (dummy variable),

x_{1i} define explanatory variables,

β_1 are coefficients for specific explanatory variables, and

ε_{1i} is the error term.

Variables such as foreign ownership, exporter status, cooperation in innovative activity, geographic scope of activities, and market concentration determine the likelihood of undertaking R&D&I activity.

The second equation of the model is defined as follows:

$$Inn_{expenditure\ i} = \begin{cases} Inn_{expenditure\ i}^* = \beta_0 + \sum x_{2i} \beta_2 + \varepsilon_{2i} & \text{if } D_{RDIi} = 1 \\ = 0 & \text{if } D_{RDIi} = 0 \end{cases} \quad (2)$$

$Inn_{expenditure}$ represents innovation expenditure (a continuous variable in logarithmic form), while the vector x_{2i} includes covariates, and β_2 denotes their associated coefficients. The term ε_{2i} is the random error term. The vector x_{2i} encompasses firm-specific characteristics, such as industry classification (NACE Rev. 2), the geographic scope of operations, and whether the firm received public financial support for innovation activities. Crucially for our study, in addition to the above control variables, we incorporate a relevant vector of variables that capture observable managerial attributes, including the CEO's age group, gender, foreign education, and financial and non-financial benefits.

Tables 1, 2, and 3 below present all the variables used in the model, along with their respective explanations and statistics.

Table 1.
Explanation of variables

Variable	Sources	Description
Innovation expenditure (ln)	survey data	A number representing total R&D expenditures during the years 2015-2017, defined as expenditures on five different innovation activities comprising: (i) in-house R&D, (ii) external R&D, (iii) acquisition of machinery, equipment, software & buildings, (iv) acquisition of existing knowledge from other enterprises or organisations (licenses, patents other tech transfer agreements), (v) all other innovation activities including design, training, marketing, and other relevant activities (in the log)
nace_lt	survey data	Dummy = 1 if a company operated in a low technology industry according to NACE Rev. 2
nace_mlt	survey data	Dummy = 1 if a company operated in a medium-low technology industry according to NACE Rev. 2
nace_mht	survey data	Dummy = 1 if a company operated in a medium-high technology industry according to NACE Rev. 2
nace_ht	survey data	Dummy = 1 if a company operated in a high technology industry according to NACE Rev. 2
National market	survey data	Dummy = 1 if a company has sold goods and/or services during the three years 2015 to 2017 in national markets; otherwise, 0

Cont. table 1.

European market	survey data	Dummy = 1 if a company has sold goods and/or services during the three years 2015 to 2017 in European markets; otherwise, 0
All other countries	survey data	Dummy = 1 if a company has sold goods and/or services during the three years 2015 to 2017 in other than European foreign markets; otherwise, 0
R&D State Aid	survey data	Dummy = 1 if a company received any public R&D&I support from the local/regional, national, or EU level from 2015 to 2017; otherwise, 0
CEO age group	survey data	A categorical variable indicating one out of 5 age groups of CEO (group 1 – up to 40 years, group 2 – between 41-45 years, group 3 – between 46-50 years, group 4 – between 51-60 years, group 5 – more than 61 years)
CEO male	survey data	Dummy = 1 if a CEO of a company is a male; otherwise, 0
CEO owner	survey data	Dummy = 1 if a CEO of a company is also its owner; otherwise, 0
CEO foreign education	survey data	Dummy = 1 if a CEO of a company has a foreign education; otherwise, 0
CEO_finan_benefits	survey data	Dummy = 1 if executives/ managers of a company have rewarded financial benefits partly based on their performance and achievement of individual targets; otherwise, 0
CEO_nonfinan_benefits	survey data	Dummy = 1 if executives/ managers of a company have rewarded non-financial benefits partly based on their performance and achievement of individual targets; otherwise, 0
Foreign ownership	survey data	Dummy = 1 if a company reported having a foreign investor; otherwise, 0
Export	survey data	Dummy = 1 if a company reported having export in total sales in 2015; otherwise, 0
Cooperation	survey data	Dummy = 1 if a company reported having innovative cooperation in 2015-2017; otherwise, 0
HHI	Orbis database	A number representing market concentration in 2017 (Herfindahl-Hirschman Index)
SME	survey data	Dummy = 1 if a company is small or medium-sized in 2017; otherwise, 0

Source: Own elaboration based on the survey.

Table 2.

Descriptive statistics of continuous variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Innovation expenditure (ln)	383	11.87096	1.674142	7.600903	14.7318
HHI	1049	165.5965	160.1623	0	3023.88

Source: Own calculation based on STATA 15.

Table 3.

Descriptive statistics of dichotomous variables

Variable	Obs	0	1
nace_lt	1049	695	354
nace_mlt	1049	582	467
nace_mht	1049	854	195
nace_ht	1049	1016	33
National market	1049	46	1003
European market	1049	361	688
All other countries	1049	798	251
R&D State Aid	1049	941	108

Cont. table 3.

CEO age group:	1049:		
group 1 – up to 40	75		
group 2 – between 41-45	225		
group 3 – between 46-50	367		
group 4 – between 51-60	191		
group 5 – more than 61	191		
CEO male	1049	393	656
CEO owner	1049	654	395
CEO foreign education	1049	1021	28
CEOs finan benefits	1049	672	377
CEOs nonfinan benefits	1049	898	151
Foreign ownership	1049	946	103
Export	1049	591	458
Cooperation	1049	857	192
SME	1049	80	969

Source: Own calculation based on STATA 15.

4. Results

Table 4. reports the results of the estimation procedure. The analysis was conducted for the entire sample of enterprises, as well as separately for the group of small and medium-sized enterprises. The rationale for performing estimations for this group lies in the fact, that in small and medium-sized firms, organisational structures are often flat, and the CEO's managerial discretion is typically high. This may influence the significance of CEO attributes under analysis.

The findings from the selection equations (the lower part of Table 4) suggest that a firm's exporter status, sales of products and services in domestic and non-European foreign markets, as well as engagement in innovative cooperation, positively influence the likelihood of R&D&I activities. Conversely, having a foreign investor and operating in European markets reduce the firms' probability of engaging in R&D&I activities.

Table 4.

Results of Heckman's two-step procedures: factors determining innovation expenditure and the decision to invest in R&D&I for the sample and SMEs subsample

Model	Polish manufacturing firms	Polish manufacturing SMEs
	Dependent variable: Innovation expenditure (ln)	Dependent variable: Innovation expenditure (ln)
nace_lt	-0.928** (-2.60)	-1.130** (-2.99)
nace_mlt	-0.682 (-1.92)	-0.803* (-2.14)
nace_mht	-0.772* (-2.06)	-0.911* (-2.29)
nace_ht	- (.)	- (.)
National markets	0.156 (0.28)	0.293 (0.52)
European markets	1.178*** (7.78)	1.162*** (7.63)
All other markets	0.992*** (5.68)	0.983*** (5.41)
R&D State aid	0.536* (2.40)	0.924*** (3.74)

Cont. table 4.

CEO group:		
1.	0(.)	0(.)
2.	1.127*** (4.08)	1.377*** (4.84)
3.	0.792** (2.71)	0.900** (3.05)
4.	0.879** (3.22)	0.789** (2.84)
5.	1.261*** (4.52)	1.344*** (4.81)
CEO male	0.680*** (3.45)	1.007*** (4.68)
CEO owner	0.422** (2.64)	0.203 (1.20)
CEO foreign education	-1.041 (-1.39)	-1.266 (-1.71)
CEOs finan benefits	0.926*** (6.34)	0.847*** (5.46)
CEOs nonfinan benefits	0.217 (0.88)	0.281 (1.09)
Constant (Inrersept)	9.951*** (12.64)	9.599*** (11.47)
	Selection (decision)	Selection (decision)
Foreign ownership	-0.381** (-2.61)	-0.584*** (-3.50)
Exporter	0.591*** (6.22)	0.585*** (5.86)
Cooperation	0.789*** (7.53)	0.689*** (6.20)
National markets	0.703** (2.84)	0.635* (2.46)
European markets	-0.432*** (-4.41)	-0.400*** (-4.03)
Other countries markets	0.233* (2.25)	0.226* (2.04)
hhi	0.000234 (0.88)	0.000297 (1.05)
Constant (Inrersept)	-1.223*** (-4.65)	-1.137*** (-4.15)
Number of observations	1049	969
Selected	383	356
Nonselected	666	613
Log-likelihood	-1247.901	-1162.195
Wald chi2(16)	232.42	230.76
Prob > chi2	0.0000	0.0000
LR test on independent equations	(rho = 0): chi2(1) = 12.11 Prob > chi2 = 0.0005	(rho = 0): chi2(1) = 5.57 Prob > chi2 = 0.0183

Note. t statistics in parentheses *p < 0.05, ** p < 0.01, *** p < 0.001

Source: Own calculation based on STATA 15.

The results of the innovation expenditure equation provide valuable insights into the role of control variables. As expected, operating in medium-low-tech and medium-high-tech sectors (compared to the high-tech sectors) has a significant and negative effect on innovation expenditure. In contrast, engaging in foreign markets (both European and non-European) and receiving public support for innovative activities positively influence the expenditure on innovation.

The estimation results of the second equation are crucial in the context of the primary objective of this study, which is to examine the relationship between CEO characteristics and firms' innovation expenditures. The findings highlight the significant role of the CEO's age: CEOs over 40 are more likely to allocate higher expenditures to innovation than younger CEOs. The results of our analysis also indicate that male CEOs are more likely to allocate higher expenditure to innovation activities than female CEOs. Furthermore, our findings indicate that innovative activities in manager-led firms are lower than those in traditional, owner-led firms. Our analysis also suggests that CEO financial benefits may compensate for the risk associated with R&D&I activities, addressing managers' aversion to high uncertainty and potential losses linked to such investments.

Additional model estimation conducted for the SMEs group reveals a similar relationship between R&D&I investments and CEO characteristics as observed in the full sample analysis. However, one notable exception is that the CEO owner variable is statistically insignificant in the case of SMEs.

5. Discussion

This study examines the relationship between firms' expenditures on innovative activities and the characteristics of their CEOs. However, applying the Heckman selection model allowed us to identify factors influencing Polish manufacturing firms' likelihood to engage in R&D&I activities. The results indicate that firms' exporter status, sales of products and services in domestic and non-European foreign markets, and engagement in innovation-related cooperation positively influence the probability of investing in R&D&I. Conversely, firms with foreign investors and those operating in European markets are less likely to undertake R&D&I activities. These findings align with the results of Hashi & Stojčić (2013), suggesting that the competitive intensity in domestic and non-European markets acts as a key driver for firms from CEECs to engage in innovation. The positive relationship between export activity and firms' inclination to invest in R&D&I may be attributed to the heightened international competition, necessitating innovation as a survival strategy. Moreover, exporting firms are more likely to benefit from innovation investments due to their broader access to international markets (Masso, Vahter, 2008).

Similar findings regarding the relationship between foreign ownership and firms' innovation propensity have been reported by Raffo et al. (2008) for Spain. These authors argue that multinational enterprises (MNEs) that entered Spain in the 1980s and 1990s were primarily motivated by low labour costs, which led to a lower likelihood of engaging in R&D&I activities. Additionally, MNEs tend to avoid investing in local R&D units when the domestic market is too small to justify the fixed costs or lacks sufficient academic resources to support innovation. These explanations appear particularly relevant for Polish manufacturing firms.

As anticipated, cooperation and exporter status significantly increase the likelihood of Polish manufacturing firms engaging in R&D&I. The importance of exporting activity can be linked to the pressure exerted by foreign competition, which drives firms to innovate as a means of maintaining their market position (Busom, Vélez-Ospina, 2017). Our findings contribute to the broader literature on innovation determinants by confirming that firms' engagement in international markets and cooperative networks fosters innovation activity. At the same time, foreign ownership may, under certain conditions, have the opposite effects. These insights highlight the need for policies that support domestic firms in leveraging international

competition as a stimulus for innovation while addressing the constraints foreign-owned enterprises face in investing in local R&D&I.

The estimation results of the second equation are particularly crucial for the primary objective of this study, which is to explore the relationship between CEO characteristics and firms' innovation expenditures. The findings emphasise the significant influence of the CEO's age: executives over 40 are more likely to allocate higher expenditures to innovation than their younger counterparts. While this outcome contrasts with the Upper Echelons Theory (UET) (Hambrick, Mason, 1984) and the findings of Baker and Mueller (2002), who reported a strong negative relationship between CEO age and R&D spending, it can be interpreted in multiple ways. One potential explanation is that older CEOs, drawing from their accumulated experience, may be more inclined to adopt risk-intensive strategies (Shen, 2021). Conversely, younger CEOs might prioritise short-term performance improvements over high-risk innovation projects, possibly due to concerns about their future career trajectories (Holmström, 1999).

Our results also suggest that male CEOs are more likely to allocate greater resources to innovation than female CEOs. This aspect of managerial decision-making is not addressed in UET and was not considered in Baker and Mueller's (2002) study. However, our findings align with the research of Faccio, Marchica, and Mura (2016), which suggests that female CEOs tend to adopt more risk-averse strategies than their male counterparts.

The CEO-owner variable provides insight into the relationship between R&D&I investments and the traditional model of owner-led firms versus modern, professionally managed firms. It aligns with the principal-agent model (Milgrom, Roberts, 1992), which explores the mechanisms ensuring that managers act in the best interest of firm owners. Our findings indicate that manager-led firms exhibit lower innovation activity levels than owner-led firms. The inherent risks and uncertainties associated with R&D&I investments may deter professional managers from pursuing such initiatives (Czarnitzki, Kraft, 2004).

Furthermore, our analysis suggests that CEOs' financial benefits may compensate for the risk associated with R&D&I activities, potentially mitigating managerial aversion to uncertainty and financial loss linked to innovation investments.

As observed in the entire sample analysis, additional model estimations for SMEs reveal a similar relationship between CEO characteristics and R&D&I investments. However, a key exception is that the CEO-owner variable is not statistically significant in the SME subgroup. The insignificance may be attributed to structural differences between SMEs and larger firms. In smaller enterprises, CEOs often have a more direct personal stake in the company's performance, irrespective of formal ownership status. Their active involvement in strategic decision-making and closer oversight of financial resources may reduce the principal-agent tensions typically observed in larger, manager-led firms. Consequently, ownership status becomes a less relevant factor in explaining R&D&I investment behaviour in SMEs.

6. Summary

Our study confirms that CEO characteristics are crucial in shaping innovation investment decisions in Polish manufacturing firms. The findings indicate that both leaders' demographic attributes and financial incentives significantly influence the level of investment in R&D&I. In particular, the distinction between owner-led and manager-led firms supports the principal-agent model, emphasising the importance of financial incentives in reducing managerial risk aversion.

Our findings have significant implications for both management theory and business practice. In the innovation policy context, appropriately tailored incentive mechanisms can support managerial engagement in innovation activities, particularly in firms led by professional executives rather than owners. Implementing effective compensation programs linked to innovation outcomes could be a powerful tool for increasing R&D&I expenditures.

An important conclusion for business practice, especially for HR departments, is the need to consider the demographic and psychological profile of CEOs in recruitment processes and leadership development strategies. Training and mentoring programs should focus on increasing risk tolerance and developing strategic innovation management skills.

Our study also opens new avenues for future research. It would be interesting to explore the impact of psychological traits on CEOs, such as tolerance for uncertainty, openness to change, and risk-taking propensity, on innovation-related decision-making. Furthermore, additional analyses could examine the influence of organisational culture and the dynamics of management teams on corporate innovation strategies. Comparative studies in an international context (e.g. other CEECs) could provide valuable insights into how different management systems impact firms' innovation activities.

In conclusion, our findings highlight the crucial role of CEO characteristics in shaping the innovation strategies of Polish manufacturing firms while also emphasising the importance of financial incentives and motivational mechanisms. Policymakers and management practitioners can leverage the insights from this study to develop more effective strategies for fostering innovation in the manufacturing sector.

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AIRPORT NON-AERONAUTICAL REVENUES INDEPENDENT OF PASSENGER TRAFFIC AS A WAY TO BUILD RESILIENCE TO DECLINES IN PASSENGERS NUMBERS

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Purpose: The paper aims to identify types of airport non-aeronautical activities and assess their dependency on passenger traffic. The main objective is to explore how airports can develop revenue streams that are resilient to crises affecting passenger numbers.

Design/methodology/approach: The study uses a qualitative-analytical approach, combining literature review, authorial analysis of secondary sources, and empirical research through open-ended expert questionnaires. It systematically classifies 44 business activities across 14 sections of the Polish Classification of Activities (PKD), assessing their dependency levels on passenger traffic (none, partial, indirect, or direct).

Findings: Fifteen activities were identified as fully independent of passenger traffic, mainly related to airport surroundings (airport city), administrative, advisory, and e-commerce services. This reveals substantial potential for diversifying revenue sources. The study introduces refined dependency categories and highlights the need for broader airport business models beyond core operations.

Research limitations/implications: Findings are based on expert opinions and literature, so generally speaking may be limited. Some identified activities are still potential, not yet implemented. The assessment of dependency on passenger traffic was qualitative in nature and may vary depending on local conditions.

Future research should assess the efficiency and profitability of these independent revenue sources.

Practical implications: The study offers strategic insights for airport managers and regulators. It supports the development of resilient business models and recommends investing in airport city infrastructure, advisory services, and cargo-linked operations to ensure income stability during crises.

Social implications: By promoting sustainable and diversified airport operations, the research supports economic resilience and thus the preservation of jobs in times of crisis and aligns with environmental goals, such as green energy production and waste disposal.

Originality/value: This is the first holistic study that maps airport activities by dependency on passenger traffic. It provides a novel classification and practical framework for building crisis-resistant airport business models.

Keywords: airport business models, non-aeronautical revenues of airports, airport operations.

Category of the paper: research paper.

1. Introduction

European airports are facing serious challenges in the new circumstances of the post-pandemic era. While some have yet to rebuild traffic to 2019 levels some are expanding dynamically achieving growth of even more than 20% over pre-pandemic levels (Airportindustry-news.com, 2024). Such increases generate operational challenges. In addition, airports in Europe need to adapt to changes in market structure, including growth in the number of passengers served by ultra LCC carriers and changes in business travel demand (ACI, 2024). Other challenges include workforce assurance issues (TVP World, 2024) and new regulatory burdens resulting from the European Green Deal (Zagrajek, 2024). With operational challenges, cost pressures and the need for new capital expenditures, rebuild of the revenue base is one of the tasks that airports in Europe currently have to face. It is also important to establish mechanisms that will enable airports to be resilient to future crises, including through the development of revenue sources independent of passenger traffic.

Based on the literature review, a research gap was identified, defined as the lack of holistic and cross-sectional studies on potential non-aeronautical airport activities and their dependency on passenger traffic.

The purpose of the article is to identify areas of the airport's non-aviation activities and how a particular activity is dependent on passenger traffic, thereby assessing how and in which areas an airport can reduce its reliance on passenger-related revenues and become more resilient to crises resulting from declines in passenger numbers.

2. Impact of Covid-19 pandemic on airport operations

Airport revenues are generally divided into two categories: aviation revenues (ICAO, 2020), which are directly related to flight operations, handling passengers and cargo at the airport, and non-aviation revenues, which include streams from other airport activities. Some studies also distinguish a third category of revenues, unrelated to airport operations, but these account for a negligible 5% share of the airport's total revenues (ACI, 2021b).

The analysis of airport revenues in the context of the COVID-19 crisis must begin with the decline in air traffic, which is the primary driver of airport income. The pandemic had a drastic impact on the global aviation market, causing passenger numbers to drop by up to 90% in the initial phase (Colak, Enoch, Morton, 2023; Janić, 2022). On average, passenger traffic in the European Union decreased by 73%, 64%, and 21% in 2020, 2021, and 2022 respectively, compared to 2019 levels (Statistica, 2024). In parallel, airport revenues fell sharply — for example, in 2020 they dropped by 69% compared to 2019 (European Parliament, 2021).

The COVID-19 crisis revealed airports' deep vulnerability due to their heavy reliance on air traffic-dependent revenue. While both aeronautical and non-aeronautical revenues declined during the crisis (Oxera, 2024), non-aeronautical revenues proved to be more resilient to air traffic drops (ACI, 2021b). The pandemic thus highlighted the need for revenue diversification and for strengthening non-aeronautical income streams (Colak et al., 2023; Oxera, 2024; Choi, 2021). It is worth noting, however, that the growing importance of non-aeronautical revenues had already been recognized prior to the pandemic (Graham, 2008; Fasone, Kofler, Scuderi, 2016).

3. Literature review

In the first stage of the study, a review of domestic and international literature was conducted to identify the current state of knowledge on non-aeronautical revenues generated by airports. The search was carried out in databases such as Scopus, Google Scholar, Ebsco, and BazHum, using the following keywords: “airport operations”, “airport activities independent of passenger traffic”, and “types of airport revenues”. Priority was given to publications from the past 10 years (2015-2025), with the majority of sources dating from 2021-2024. In the second stage, selected publications from 2000-2014 were verified and included if they were still relevant and contributed significant value to the study. The review encompassed peer-reviewed academic articles as well as expert publications issued by industry organizations and consulting firms. Popular science articles and commentaries were excluded.

The literature review did not identify any publications that comprehensively addressed airport activities from a revenue perspective. Queries under terms such as “airport operations” returned results limited to operational activities. Analyses of non-aeronautical revenues typically focus on a few broad categories related to terminal-based activities, most often retail, food services, parking, leasing space, and advertising. Some authors presented more detailed breakdowns, such as types of retail points (Geuens, Vantomme, Brengman, 2004) or service offerings (Graham, 2008).

Certain works identified additional revenue sources related to terminal operations:

- Passenger services like information points or currency exchange (Geuens et al., 2004).
- Income from business lounges (Oxera, 2024).
- Casinos, swimming pools, karaoke, and other premium airport entertainment (Geuens et al., 2004).
- Wellness, fitness, or medical services (Graham, 2008).
- Additional offerings for visitors (Graham, 2008).

The literature also refers to activities not directly linked to the passenger terminal:

- Ground handling services, such as fuel delivery (Oxera, 2024; WSP, 2022).
- Logistics centers and air cargo handling (Graham, 2008).
- Renewable energy production (Oxera, 2024).
- Services for airport employees (Graham, 2008).

Special attention in the literature is given to the use of land surrounding airports (airport city) to generate non-aeronautical revenues (Graham, 2008; WSP, 2022; Rucińska, Ruciński, 2008). Among the available studies, Rucińska and Ruciński (2008) most comprehensively describe possible types of activity in this area, including shopping and service centers, entertainment centers, galleries, business and logistics parks, conference and congress centers, exhibition and trade fair venues, and hotel and recreational facilities.

However, the available studies only marginally address the potential for generating non-aeronautical revenues in relation to passenger traffic, mainly focusing on airport city functions (WSP, 2022; Hirth, 2020).

In summary, the literature review reveals a significant gap in research on types of airport activities. There is a lack of studies that comprehensively identify sources of airport revenue. Moreover, existing studies rarely examine the potential of non-aeronautical activities that are independent of changes in passenger traffic. Based on the literature review, a research gap was identified, defined as the absence of holistic and cross-sectional studies on possible non-aeronautical airport activities and their dependency on passenger traffic.

4. Methods

The study had a qualitative-analytical character and was conducted in three interconnected stages: a literature review, the author's own analysis based on selected source materials, and empirical research using an original questionnaire with open-ended questions. The goal of this process was to obtain an in-depth, multifaceted diagnosis of the phenomenon under investigation, taking into account both the theoretical perspective and the experiences and opinions of the respondents.

In the first stage, a review of domestic and international literature was carried out to identify the current state of knowledge on the research topic. This was supplemented by an analysis of online sources, including official airport websites and financial reports. The aim of this stage was to gather data on non-aeronautical activities conducted by airports.

The empirical research was carried out in two stages using two separate questionnaires. It was conducted using purposive sampling and involved eight respondents. The selection criteria included the respondent's position, professional experience, and the organization they represented. The respondents were aviation industry experts involved in non-aeronautical

revenue activities. They were selected specialists with extensive professional experience and specialized knowledge in the studied area. Their expertise covered terminal commerce, cargo, MRO, parking, airport city development, and other airport operations. The respondents represented various organizational levels, from board members to specialists. This sample selection allowed for the collection of in-depth, qualitative responses that provided insights into a wide spectrum of the subject matter.

The first stage of the empirical study took place in September 2024. The questionnaire included areas of airport activity identified in stages 1 and 2 of the study. It contained two questions: one regarding additional airport activities known to the respondent but not yet identified in previous stages, and the other concerning the degree of dependency of airport activities on passenger traffic. Respondents emphasized that this dependency could not be described in binary terms. In addition to full dependency or independence, there are partial and indirect dependencies. For instance, some activities may be only partly dependent on passenger traffic and could still generate income from other sources if passenger operations are reduced or halted. An example is ground handling services, which could still serve cargo flights. Indirect dependency occurs when an airport client's business is directly tied to passenger traffic—for example, retail space rental in passenger terminals¹. A decline in traffic could prompt tenants to seek rent reductions or rent suspension. Ozlem, Enoch, and Morton (2023) noted that such practices occurred during the COVID-19 pandemic, which was also confirmed by the respondents.

The second part of the survey was conducted between mid-October and mid-November 2024. It used a second questionnaire containing a list of airport activities identified in previous research stages. Respondents asked to indicate the type of dependency between each activity and passenger traffic. Respondents were also asked whether they could identify any additional elements that should be considered in the analysis of revenue dependency on passenger traffic.

5. Results

It should be noted that respondents paid particular attention to the types of business models for conducted activities. Based on literature sources (Graham, 2008) and expert responses, it can be stated that airports may operate under four basic models, although not every model applies to each type of activity. Airports may offer services directly, or they may engage an external entity that manages a given project/infrastructure for a fee. Airports can also conduct an activity jointly with another entity based on a joint venture, or the activity may be carried out exclusively by a third party under a concession or lease agreement. For example, an airport may provide apron handling services through its own structure, such as Wrocław Airport, but this can also be performed by an independent company, such as LS Airport Services in Warsaw.

Based on the above, the author outlined activities under possible business models. The data obtained from the study were systematized using the Polish Classification of Activities (PKD) (Journal of Laws 2007, No. 251, item 1885). Based on the research, the author identified that an airport can engage in activities classified under as many as 14 out of 21 sections. The results are presented in the table below. The first column indicates the PKD activity section, the second the type of activity, and the third the level of dependency on passenger traffic, marked as follows:

N - no dependency.

C - partial dependency.

P - indirect dependency.

B - direct dependency.

The fourth column lists examples of airports where the activity is implemented. In some cases, examples include activities not directly conducted by the airport authority but by agents (e.g., handling agents). Such activities may also be run by the airport authority. In specific cases, examples of non-profit activities with commercial potential are provided.

Table 1.

Sources of non-aeronautical airport revenues along with their dependence on passenger traffic

Section	Type of Activity	Dependency	Airport Examples
C	Food production for inflight catering	B	MUC, LHR
	Recovered glycol production for aircraft de-icing	C	ARN
	Industrial production	N	BHX, MXP, WAW
D	Electricity and heat production ⁱⁱ	P/B	GDN, AMS
E	Water supply and waste/sewage management for tenants	P/B	Common
F	Construction of various facilities ⁱⁱⁱ	P/N	ORY, KRK
G	Retail within the passenger terminal	B	Common
	Retail in airport city	N	ZRH
	E-commerce ^{iv}	N	LHR, FRA, CPH
	GSE equipment service and maintenance ^v	C	WAW
H	Ground handling ^{vi}	C	Common
	Transport services to/from the airport ^{vii}	C	LHR, RDO
	Train/bus terminal as final stop	B	WAW
	Train/bus terminal as transport hub	C	AMS
	Taxi, car rental, car sharing	B	Common
	Road freight transport for air cargo	C	WAW
	Supply transport for terminal tenants	B	LHR
	Passenger parking, incl. shuttle transport	B	Common
	Air cargo storage and handling	C	BUD, BRU, AMS
	Logistic services in airport vicinity	N	CDG, AMS
	Storage/logistics for terminal supply	B	LHR, AMS
G	Food services in terminal	B	Common
I	Food services in airport city	N	ZRH
	Hotel operations in public zone ^{viii}	C	AMS, FRA, MUC
	Hotel operations in restricted zone	B	CDG, BCN, FRA
	Business lounges	B	WAW, AMS, PRG
	VIP/CIP services ^{ix}	B	WAW
	Fast track services	B	WAW

Cont. table 1.

J	Telecom services	P	Potential
	Data sales	N	Potential
L	Rental space in passenger terminal	C	WAW
	Rental space in airport city	N	AMS
	Real estate trading and development	N	FRA
	Airport management services ^x	N	Common
	Infrastructure management services	N	FRA
M	Consulting services	N	MUC
	Advertising ^{xi}	P	WAW
N	Exhibition and trade show spaces	N	BER
	Equipment leasing	C	LTN
P	Training ^{xii}	N/C	SIN, ICN, MUC, IST
Q	Medical services	N	MUC
R	Entertainment	B	LHR
	Fitness and wellness centers	B	ZRH

Source: Own elaboration based on conducted research.

Based on the conducted study, the author identified 44 types of potential activities that airports can undertake. As previously mentioned, these activities span as many as 14 sections of the Polish Classification of Activities (PKD). In 17 cases, the dependency on passenger traffic was direct. Partial and indirect dependencies were identified in 11 and 5 activities, respectively. No dependency was identified in 15 cases. It is noteworthy that the activities not dependent on passenger traffic can be grouped primarily into two categories: ventures implemented as part of the airport city and those of an administrative or advisory nature. These represent areas beyond the airport's core functions, which can be defined as passenger handling, cargo services, and flight operations. The only potential activity directly related to core airport operations is e-commerce, excluding order pickup services at the airport. When analyzing partial and indirect dependencies, they are mainly observed in areas connected to ground handling, particularly when linked to cargo traffic or related services.

6. Discussion

The findings of the study highlight the significant potential of airports in developing activities independent of passenger traffic. Identifying 44 types of activities, 15 of which show no direct or indirect link to passenger traffic, represents a major expansion of existing knowledge. A crucial element of the findings is the classification of activities based on their level of dependency on passenger traffic. The introduction of the concepts of partial and indirect dependency enables more precise modeling of revenue sensitivity to fluctuations in air travel demand. This approach extends previous literature, which to a limited extent, addressed the relationship between passenger traffic and airport revenues.

The conclusions concerning airport city-related activities, e-commerce and administrative/advisory services have particular practical relevance. These segments - according to the findings - show the least dependence on passenger traffic, yet offer considerable growth potential and possible high added value. Although such activities have been noted in the literature e.g. airport city (Rucińska, Ruciński, 2008; WSP, 2022), they have not previously been the subject of a comprehensive, cross-sectional analysis.

The study also contributes to the ongoing discourse on airport business models. The analysis from the perspective of four organizational variants (in-house operation, outsourcing, partnership, concession) and their applications in different economic contexts shows that not only the range of activities but also the method of implementation may significantly affect an airport's flexibility and financial resilience. This perspective may feed future development strategies, particularly in the context of building resilience to crises similar to the COVID-19 pandemic.

In the context of prior research this study enriches the literature with a practical catalog of activities along with their assigned dependency level on the key market factor - passenger traffic.

7. Summary

The study made it possible to achieve the objective of the article, namely identifying the areas of airport non-aeronautical activities and determining the extent to which each activity depends on passenger traffic. This, in turn, allows for an indirect assessment of the degree and scope to which an airport can reduce its reliance on passenger-generated revenues and enhance its resilience to crises resulting from declines in passenger numbers.

The research revealed that airports, in terms of non-aeronautical revenues, currently operate or could operate in 14 out of the 21 sections of the Polish Classification of Activities (PKD), which indicates significant potential for revenue diversification. On the other hand, this requires airports to develop a broad and complex set of competencies and resources. The study also confirmed the strong dependency of core airport revenue on passenger traffic. Therefore, to build financial resilience to future crises, airports should particularly focus on expanding their activities in the broadly understood airport city area, as well as in administrative and consulting services, alongside cargo-related operations.

It should be emphasized that the research provides valuable insights for both airport operators and aviation market regulators. From the perspective of airport management, it identifies key directions for the development of activities independent of passenger traffic, which may serve as a foundation for building more resilient business models and strategies. The study results may also inform the development of regulations that support greater airport

independence from fluctuations in passenger markets, including by facilitating the development and management of surrounding land and promoting renewable energy production.

These findings lead to the conclusion that further research is needed in this area, particularly in evaluating the efficiency of revenue sources independent of passengers, the role of airport-adjacent areas, and their integration into broader urban economic ecosystems.

Despite the broad scope of the study, certain limitations must be acknowledged that may affect the interpretation of the results:

- The research was based on expert analysis and a review of available sources, which may limit its full representativeness.
- Due to the specific nature of the market, not all activities have been confirmed in practice - some remain potential.
- The assessment of dependency on passenger traffic was qualitative in nature and may vary depending on local conditions.

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Footnotes

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- ⁱ A specific case of such dependency is the lease of space for retail stores, which is based on two types of fees. The first is the so-called MAG (Minimum Annual Guarantee), i.e., a fixed price for the rented space. The second component is a share in the tenant's turnover. In this case, a lack of traffic primarily reduces the airport's revenue from the turnover component, and may later lead to a total loss of income due to the suspension of the MAG component.
 - ⁱⁱ Especially from renewable energy sources, e.g., photovoltaic farms and geothermal wells.
 - ⁱⁱⁱ Related directly to airport operation (e.g., passenger terminal, airport maintenance base, multi-level parking) and other facilities, e.g., hotels, office buildings.
 - ^{iv} E-commerce belongs to section Z, but the author included it here for organizational reasons.
 - ^v Ground support equipment – vehicles and devices used for ground handling.
 - ^{vi} These involve numerous processes related to passenger and cargo flow handling at the airport and flight operations. Ground handling is an integral part of this process and includes 11 categories of services. It applies to both passenger and cargo operations.
 - ^{vii} Connections to/from the airport also serve other people besides passengers, especially airport employees. Therefore, a drop in passenger traffic does not eliminate demand for such services, as they may be used by staff essential for basic airport operations or cargo handling.
 - ^{viii} Although the hotel offer is available to all potential guests, a significant group are passengers before, during, or after travel. Hotels in public areas also serve as accommodation in case of flight disruptions (cancellations, delays).
 - ^{ix} Very Important Person – often part of government or state delegation; Commercially Important Person – a client willing to pay a premium for high-end services. Airports provide separate infrastructure for processing such passengers and baggage, including security, border control, and rest zones. An example is the VIP Terminal at Warsaw Chopin Airport.
 - ^x In Europe, ownership, co-ownership or concession-based airport management is common, e.g., Vienna Airport, Fraport.
 - ^{xi} Airports enable advertising campaigns on media along access roads, in public areas, restricted areas, and airside – visible from aircraft windows. They also allow product exhibitions (e.g., cars) and promotional events.
 - ^{xii} Airports also run extensive training operations. Apart from internal training, they provide it to external entities.

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